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Streets for Pedestrians and Transit An Evaluation of Three Transit Malls in the United States

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16. Abstract

This report represents the second phase of a two-phase project designed to acquaint the planning community with the concept of transit malls and to provide information about three of the most important and interesting transit mall projects to a wider audience. The first phase of the study consisted of a site report: Streets For Pedestrians and Transit: Examples of Transit Malls in the United States (PB 278-487), which described the characteristics and histories of six transit malls. This second evaluation phase is more analytic in nature and quantifies the benefits and disbenefits of the three major transit malls in Philadelphia, Pennsylvania; in Minneapolis, Minnesota; and in Portland, Oregon. The transit malls in each of these cities was first reviewed in the site report.

This evaluation is concerned with the impact of the three malls on pedestrians, on transit service, on excluded or restricted general traffic, and on economic conditions, particularly on retail sales in the immediate vicinity of the mall. This report contains the results of analysis on the following topics: maintenance and construction costs; transit service improvement including bus speed, reliability, coverage, capacity, ridership, productivity, and system understanding; the level of service provided pedestrians and waiting transit patrons; environmental impacts; pedestrian and bicyclist safety; traffic diversion; parking; goods delivery; and economic impacts.

This report documents fifteen major conclusions regarding the transit malls.

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PREFACE

This transit malls evaluation is intended to acquaint the planning community with the concept of transit malls and to provide information about three of the most important and interesting transit mall projects to a wider audience.

The evaluation is the second phase of a two-phase project, sponsored by the U.S. Department of Transportation (DOT), Transportation Systems Center (TSC) in Cambridge MA, in its role as evaluating agency for the Service and Methods Demonstration (SMD) program of the Urban Mass Transportation Administration (UMTA). The first phase consisted of a site report, Streets for Pedestrians and Transit: Examples of Transit Malls in the United States (Report No. UMTA-MA-06-0049-77-11), which described the project characteristics and histories of six transit malls. This second, evaluation phase is more analytical in nature and seeks to quantify the benefits and disbenefits of transit malls.

The work was performed by Crain & Associates of Menlo Park CA, for whom David Koffman was project manager and wrote a portion of Chapter 4. Richard Edminster of Crain & Associates was the principal

investigator and wrote the remainder of the report. Sydwell Flynn edited the report. Howard Simkowitz was the technical monitor at TSC. Joseph Goodman was project manager at UMTA. Data for the report were gathered on personal visits, verbally or in unpublished material. Individuals who were especially halpful include: in Minneapolis, Dave Koski, Greg Finstad, Tony Kouneski, Scott Dickson, and Tom Duffee; in Philadelphia, Mike Griffin, Dave Engel, Frank Berdan Jr., Stephen Butterfield, Philip Loukissas, and Robert Gangarz; in Portland, Douglas Wright, Roger Shiels, Dave Kuehn, Jim Farrell, and Richard Speer.

We would especially like to thank Joanne Leary of Gladstone Associates, Washington DC, who provided much of the data used in Chapter 7. Gladstone Associates' comparative economic analysis of transit malls, done in late summer 1977, is the most extensive study on the economic impacts of transit malls yet performed.

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1 EXECUTIVE SUMMARY

A transit mall is a street which has been improved for pedestrian use, but retains a roadway reserved for transit vehicles integrated with the city-wide or regional transit system. Access for automobiles is denied or strictly limited, except for cross-street traffic. Transit malls represent a combining of two trends: Traditional pedestrian malls and preferential treatments for buses on city streets. Although the two functions may conflict, there are also ways in which they may reinforce each other. Generally one function or the other predominates in a given project. Transit malls are increasingly popular in the United States and Canada; four are operational in major downtowns and many more are planned or under construction.

This report evaluates the three transit malls in major U.S. cities. They are, with date of project completion, the Nicollet Mall (1967), Minneapolis MN; the Chestnut Street Transitway (1976), Philadelphia PA; and the Portland Mall (1978), Portland OR. The evaluation is concerned with the impact of the three transit malls on pedestrians, on transit service, on excluded or restricted general traffic, and on economic conditions, especially retail sales in the immediate vicinity of the mall. The evaluation contractor interviewed numerous people connected with the malls in all three cities; used existing data collected by local agencies concerning traffic conditions, accidents, and pre-mall transit conditions; conducted studies of pedestrian conditions on the malls, and of transit operations on the malls and parallel comparison streets, in Philadelphia and Minneapolis; and assisted local organizations in conducting surveys of pedestrians and merchants in Minneapolis.

This report documents the following major conclusions regarding transit malls:

1. Transit malls are considered inexpensive improvements compared to other capital expenditures for development or redevelopment. Total costs were $3.8 million ($15 per square foot) for Minneapolis' Nicollet Mall (1967), $7 million for Philadelphia's Chestnut Street Transitway ($22 per square foot)(1976), and $15 million for the Portland Mall ($33 per square foot)(1978). An extension of the Nicollet Mall, identical in design to the original, is expected to cost $2.8 million ($22 per square foot) when completed in 1979. Major construction expenses include utility relocation, advanced technology items, lighting, and labor-intensive work. Many project amenities are relatively inexpensive.
2. In Philadelphia and Portland, responsibility for maintenance is divided between property owners, city agencies, and the transit authority (for shelter upkeep). In Minneapolis, a property owners' assessment district pays all maintenance expenses, which are at an annual rate of $60,000 per block. Major expenses include electricity, sidewalk repair, and labor for cleaning and sweeping. Maintenance is more expensive than on unimproved streets, due to a higher level of upkeep and more elaborate amenities.
3. There is no evidence that overall bus trip time has decreased in Minneapolis or Philadelphia. There is evidence, however, that these transit malls would have shorter trip times than unimproved comparison streets, were it not for longer loading times and delays due to traffic signal timing. Portland reports trip time reduction of about 50 percent. Portland may have had unusually bad congestion before the mall, although new signal timing in Portland appears to allow smoother bus travel than in the other two cities.

4. Contraflow bus lanes in Minneapolis have shorter trip times than either the parallel transit mall or an unimproved comparison street. Controlling for the effects of signal timing, differences in patronage, and loading patterns, the contraflow lanes show a minor advantage over the transit mall in potential time savings.
5. Transit malls may increase the physical capacity for buses due to the removal of auto traffic and increased space for waiting patrons. The addition of a second bus lane on each Portland Mall street clearly increased capacity.
6. Although there is no firm evidence that sidewalk improvements have increased pedestrian volumes, pedestrian convenience is improved by benches and other amenities and ease of circulation has been improved by ramps and, in Philadelphia, by midblock crossings. Shelters encourage waiting bus patrons to stand clear of the pedestrian walking path, and trees and other amenities have improved the pedestrian atmosphere.
7. Bus shelters have provided protection from weather, and sometimes seating and transit information. The Portland Mall shelters are enclosed with clear plastic walls that afford visibility of oncoming buses and better security. The Portland shelters also provide lighted panels with route information and televised bus schedule information. Outdoor trip planning kiosks provide additional route and schedule information via a hookup to a transit authority computer.
8. Air pollution and noise levels appear lower on the Philadelphia and Minneapolis malls than on comparison streets. In Philadelphia, carbon monoxide levels on the mall were less than one-half the levels on nearby streets. In Portland, where bus volumes on the mall have increased much more than in the other cities, carbon monoxide

levels are believed to have dropped, but noise and nitrogen dioxide from bus fumes are believed to have increased. This may be compensated for by reductions on other downtown Portland streets.

9. There was no apparent overall reduction in pedestrian injuries and fatalities, although non-pedestrian accidents have decreased sharply. Factors leading to accidents include increased jaywalking, the conversion of a one-way street to a two-way bus direction (in Philadelphia), and the location of sidewalk amenities, shelters and barriers. In Portland, an enforcement program has resulted in a sharp reduction in jaywalking. Bicycles may also be a hazard to crossing pedestrians. There is no evidence of bus speeding and there is no demand among a majority of pedestrians to remove buses from the malls.

10. General traffic was easily diverted by prominent mall entrances, informational and directional signing, and physical barriers. Resignalization and improvements in the capacity of alternate routes were part of a diversion strategy in Philadelphia. Although auto traffic entering the downtown areas did not decrease in any of the three sites, only relatively minor increases in traffic occurred in the vicinity of the transit malls. Motorists have either found parking at outlying locations or have eliminated unnecessary circulation.

11. Goods delivery was least interrupted where rear alleys were used (in Minneapolis). Block-long cross-street loading zones in Philadelphia are moderately effective, but are inconvenient for delivery persons and merchants. Delivery charges were increased for about 10 percent of merchants on the Philadelphia mall. Cross-street loading in Portland, where block lengths are shorter, appears to work well. Off-peak loading on the mall by

special permit in Philadelphia is not helpful to small businesses unable to arrange precise delivery schedules.

12. Existing parking facilities absorbed losses in on-street spaces in all three sites. Where existing parking facilities had no entrance except onto a mall, autos were allowed on the mall for access to the parking (in Philadelphia and Portland).
13. There are relatively few violations of buses-only blocks by autos. However, violations occur where autos are allowed for access to parking in some blocks but not others, as in Philadelphia.
14. Mall construction reduced pedestrian and business activity in Philadelphia and Portland, but the impact was less than expected by merchants. Minimizing utility work in Philadelphia shortened the construction period, and careful phasing and the use of special walkways, especially in Portland, reduced the interference to business.
15. There is no evidence of an overall increase in retail sales, at least in Philadelphia or Minneapolis, although declining retail sales may have been stabilized. Secondary economic indicators are positive, with national chains and stores oriented toward young, middle-class customers moving in, and low vacancy rates, increasing rental rates, and a rise in public and private investment reported. Also, a new cooperative spirit between business and government is seen as a major benefit in Minneapolis. Transit malls and other downtown developments are mutually supportive, with transit malls providing a retail focus and a transportation and aesthetic link between new developments.

2 BACKGROUND

2.1 WHAT IS A TRANSIT MALL?

A transit mall consists of one or two streets from which automobile and truck traffic is completely or mostly banned. Sidewalks are widened, amenities added, and a narrowed roadway is usually designed for bus operation on the mall, although a rail line may be placed on the right-of-way. Part of the mall may be reserved for pedestrian use only. Cross-street traffic is usually permitted. Figure 2-1 shows Minneapolis' Nicollet Mall, the oldest and best-known American transit mall.

FIGURE 2-1. THE NICOLLET MALL (MINNEAPOLIS)

2.2 HISTORICAL BACKGROUND

Proposals for pedestrian malls have been popular throughout the U.S. and Europe for the last 20 years. Until recently most of these malls have been efforts to make downtown shopping areas competitive with the newer suburban shopping centers by offering similar physical conveniences and amenities: ample parking; pedestrian access to a variety of businesses, unobstructed by traffic; and clean, modern surroundings. In the 1970's an upsurge of concern over business conditions in downtowns combined with increased concern over traffic congestion and environmental problems to lead to an explosion in pedestrian mall building. By 1975 there were malls with permanent, total exclusion of vehicles in 64 U.S. cities of every size, an increase of 30 malls in two years (Ref. 2-1).

For similar reasons, this period brought renewed interest in better transit service. Recognizing that fixed guideway systems are too expensive, or else only very long-range prospects, most cities have focused attention on improving bus service by means of operational measures. Examples are priority signalization, preferential lanes, improved loading facilities, route rationalization, and improved scheduling. In particular, there has been a trend to consolidate routes onto fewer streets in order to make efficient use of preferential treatments, while also simplifying the transit system and making transfers easier.

A transit mall combines these transit and pedestrian-oriented approaches. In many cases a transit mall is a compromise shopping mall, designed to satisfy merchants who feel that some vehicular activity is essential to their business. Others feel that neither pedestrian needs nor transit volumes alone are sufficient to justify removing an entire street from automobile use, but that together they do. Further, they feel that pedestrian and transit uses complement each other. By combining the two, a special focus may be created in downtown that helps business, brings people together, improves bus service, creates an attraction that stimulates bus ridership and, possibly, contributes to stimulating development in a pattern that can be served by transit.

This study evaluates transit malls in three major U.S. cities: Minneapolis, Portland and Philadelphia. Other transit malls are in various stages of construction or planning in Chicago IL; Buffalo NY; St. Louis MO; Brooklyn NY; Denver CO; and Detroit MI. Smaller cities have also built transit malls or similar projects: Madison WI; Erie PA; Allentown PA; and Elgin IL are examples.

2.3 OBJECTIVES

Transit malls are generally part of a downtown redevelopment plan. Different objectives will predominate, depending on the mall. These objectives include:

1. To deemphasize or discourage automobile use in downtown areas,
2. To improve the environmental and aesthetic quality in downtown areas,
3. To promote economic growth,
4. To improve traffic and pedestrian circulation, and
5. To improve transit service and stimulate bus ridership.

Whether or not a transit mall makes sense in a particular setting will depend on the extent to which the conflicting or reinforcing aspects of transit and pedestrian use predominate, on the practicality of providing separate solutions to transit and pedestrian problems, and on the extent to which one objective or the other is considered more important. In a particular locality, the best project might be a pedestrian mall, a transit mall, street beautification, bus-only streets or lanes, other forms of traffic restraint and bus priority, any combination of measures, or no action at all. Deciding factors will include local objectives and attitudes, street pattern, street dimensions, density and spread of land use, the economic condition of retail uses, the facilities available for goods delivery and pick-up, transit volumes, and the intensity of pedestrian activity.

2.4 ISSUES

Transit malls are relatively new municipal projects; they have been constructed in the U.S. only within the last ten years. Establishing transit malls in downtown areas will thus pose many new questions or issues as the project progresses. This section will discuss issues to be examined in this evaluation in three broad areas:

1. Local conditions which affect the decision to build a mall and its subsequent design
2. Cost
3. Impacts of the mall on transit service, other vehicles, pedestrians, the economy and the environment.

2.4.1 Local Conditions Which Affect the Decision to Build a Transit Mall

The decision to build a transit mall occurs within a local context composed of an economic climate, a political climate, and an existing level of transit service. Critical conditions which affect the making of such a decision include the amount of short- and long-term optimism about business conditions held by downtown merchants and property owners, the willingness of local government to improve the downtown environment, the extent to which the community may be termed auto-oriented or transit-oriented, and the existing configuration of streets, highways, and transit routes. All these factors contribute to the demand for a transit mall. Actualizing this demand depends, in turn, on an organizational framework. The organizational framework varies among communities and could include an effective businessmen's group, a city or transit authority planning staff, as well as encouragement from UMTA.

Once the decision to build the mall has been made, further decisions must be made on the extent of allowed bus, auto, taxi, bicycle, and emergency vehicle use; on access to existing parking facilities with entrances on mall streets; and on access for business delivery vehicles. Decisions must also be made on the level of amenity provided. Some cities have designed

their malls as showpieces. The amenities selected differ in the amount of technology involved, in the extent to which they add to the artistic or natural environments, and in the extent to which they add to the level of pedestrian service or convenience.

2.4.2 Cost

How to pay for the construction and continuing maintenance of the mall is the major obstacle which faces most cities. Questions regarding cost include first, What funding sources are used? Potential sources include assessments on nearby property owners; other non-federal funds from transit authority, city, or state budgets; and federal Urban Beautification and UMTA demonstration or capital grants.

Second, How much does a transit mall cost to build? This depends on mall size, regional differences in labor and materials, the amount of underground utility work needed, the quantity of amenities, and the extent to which amenities employ technological or artistic input.

Third, How much does a transit mall cost to maintain, per block, and who is responsible for this? The most important factors influencing maintenance costs appear to be pedestrian volumes, labor costs, energy costs, and the quality of bricks or other sidewalk materials. Usually, responsibility for maintenance is divided among local property owners, the City, and the local transit authority according to a formal or informal agreement.

2.4.3 Project Impacts

The third general issue of concern has to do with project impacts. Whom or what does the project affect and in what ways are they affected?

2.4.3.1 Impacts on Transit Service - A street on which buses do not have to compete with cars and where waiting areas for bus patrons are improved creates the expectation that transit service will improve, whether such improvements are a major goal of the

project or not. Does the elimination of auto congestion allow shorter and more reliable bus trip times, which in turn lead to higher productivity? Factors which might conceivably work against these improvements include inadequate signal timing, longer loading times due to increased patronage or added stops, delays due to jaywalking, factors of mall design such as mid-block signals or curved roadways, or an excessive number of buses, which might cause delays.

The creation of a transit mall often results in an increase in the volumes of buses on existing lines or the rerouting of new lines to make use of the mall. This raises the issues of coverage and capacity. Do routes feeding into the mall reach a wide or narrow geographic area? Is accessibility to downtown trip ends affected by rerouting? Will a higher volume of buses lead to overcrowding of patron waiting areas?

The exclusive use of a street for buses, a high volume of buses, distinctive sidewalk improvements, and new route information systems all increase the visibility of the transit system. Will these changes along with the other improvements noted above, lead to an increase in ridership? Or is the scope of the improvements too minor to significantly affect ridership?

2.4.3.2 Impacts on Other Vehicles - These impacts include a variety of issues related to traffic diversion, the delivery of goods to merchants, parking, and enforcement of restrictions on non-transit vehicles. The most important question is, What impact will diverted traffic have on nearby streets? It is a common fear, before a transit mall is built, that removal of general traffic from a mall will simply add to congestion on nearby downtown streets and/or that total traffic into downtown will decline as shoppers switch to less congested outlying shopping centers. On the other hand, some observers believe that transit malls will reduce congestion caused by unnecessary circulation and turning movements and that shoppers will continue to come downtown, but will use public parking facilities rather than hunt for curbside parking. Of

course, the importance of the proposed mall street to downtown traffic circulation and the existence of excess capacity on nearby streets are factors which must be considered. A related issue is the question of how traffic is to be diverted.

What are the costs and effectiveness of different provisions made for the delivery and pick-up of goods to businesses which front on the mall? Rear-alley loading, full-block loading zones on cross-streets, and partial-block loading zones on cross-streets are possible alternatives. Do existing parking facilities have the capacity to absorb the loss in on-street spaces? How will access be provided to parking facilities with entrances on the proposed mall? Finally, how will complete or partial restrictions of auto traffic on the malls be enforced?

2.4.3.3 Impact on Pedestrians - How will the transit mall affect the pedestrian atmosphere? Will pedestrian volumes increase due to the absence of cars and the addition of certain amenities? Will circulation be improved? Conversely, can a larger increase in pedestrian volumes, along with the sidewalk space taken up by enlarged bus shelters, aesthetic improvements, and so forth lead to a reduction in pedestrian convenience?

The removal of general traffic from transit malls may lead to a reduction in pedestrian accidents; however, the diverted traffic may lead to an increase in accidents on alternate routes. Even on the malls, there are factors which might negate the benefit of a reduced number of vehicles. These include increased jaywalking, higher bus speeds, pedestrian unfamiliarity with a change from a one-way to a two-way bus flow, and particular design features of the malls. A secondary issue concerns bicycle safety. This is a concern in terms of conflicts between buses and bicycles and conflicts between bicycles and pedestrians.

2.4.3.4 Economic Impact - A transit mall is generally intended as part of a plan to revive downtown, particularly in an economic sense. Will the transit mall produce an improvement in retail

sales? Additionally, will the mall encourage a lower vacancy rate, higher rental rate, and turnover to higher-quality businesses? It is also hoped that transit malls will encourage new investment and create a new "spirit of cooperation" between business and government. On the other hand, there is sometimes a belief that little can be done to halt the decline in central business district retail sales, or that the most that can be expected from an improvement such as a transit mall is that conditions will stabilize or get worse more slowly. A secondary issue concerns the amount of impact the construction period has on business, and strategies that can be employed to minimize this impact.

2.4.3.5 Environmental Impact - While it is sometimes expected that the removal of auto traffic will reduce air pollution and noise levels, this could be counterbalanced by increased pollution on nearby streets to which mall traffic has been diverted. Pollution could actually increase on the transit mall itself due to a large increase in the volume of buses, or a different type of air pollution could result. For example, a decline in carbon monoxide brought about by the reduction in auto traffic might be replaced with an increase in oxides of nitrogen from greater bus emissions.

2.5 APPROACH

Four types of data were used to address the issues discussed in Section 2.4. These are:

1. Direct quantitative measurements by the evaluation contractor or local staff,
2. Less formal observations by the evaluation contractor,
3. Records and documents compiled for other purposes by local authorities or project staff, and
4. Surveys performed by local staff, with coordination and assistance in planning and analysis by the evaluation contractor where necessary.

The three cities covered in this evaluation had not, for the most part, undertaken a conscious evaluation effort. Thus data on pre-mall conditions were not always available. Therefore, where appropriate, comparisons between transit malls and nearby unimproved streets have been substituted for before-to-after comparisons.

2.5.1 Quantitative Measurements

On-the-scene measurements were an important source of data, primarily relating to bus service and pedestrian safety. Time checks of buses on the Nicollet Mall in Minneapolis and two nearby streets were performed, using observers with watches stationed at either end of the streets. Similar time checks were made by local staff in Philadelphia. These data were used to address the issues of bus speed, the stability of bus flow, and capacity. On-bus measurements were made in both Philadelphia and Minneapolis, using two observers on each bus surveyed. Data gathered on travel time and its components of moving time, loading time (including on/off counts), and idle time were used to answer questions concerning bus speed and capacity. The on-bus measurements also included counts of conflicts, such as braking or honking a horn, between buses and pedestrians. These counts were used in the analysis of pedestrian safety. Counts of illegal pedestrian crossings were conducted in Philadelphia and Minneapolis, also as part of the analysis of pedestrian safety.

2.5.2 Observations

Where precise quantitative measurements were not feasible, less formal observations of activity on the malls are reported. These were important in establishing the level of service provided pedestrians and waiting bus patrons, environmental conditions, and problems relating to maintenance and enforcement. The three transit malls were visited for a total of five weeks. In addition local leaders, officials and planners were interviewed for valuable insights they could give on a variety of topics.

2.5.3 Records

Existing records, compiled by the local project staff or by others, were used to the fullest extent possible. Regarding the mall itself, important records included detailed cost breakdowns and detailed physical specifications for each mall (and other streets) in the form of diagrams, maps, aerial photographs, construction drawings, etc. Where available, transit authority records on route patronage, boarding/alighting counts, and route and schedule data were used to consider the issues of coverage and ridership. Traffic counts were critical in evaluating the impact of traffic diversion strategies. Pedestrian counts were examined for changes in the level of pedestrian use. Police accident records were used for analysis of pedestrian safety. Retail sales tax figures and building permit data, provided by an economic consultant engaged in a parallel study of transit malls, were important sources of information relating to economic impacts. Where available, air and noise pollution records were used to help evaluate the impact of transit malls on the physical environment.

2.5.4 Local Surveys

Some special surveys were performed by local staff. These related to the effects of the mall and became a major focus of the evaluation effort where available. In Philadelphia, the Delaware Valley Regional Planning Commission (DVRPC) surveyed mall-area businesses and their employees. In addition to their own report, DVRPC provided additional cross-tabulations of data. The results of these surveys helped in determining perceived changes in transit service, pedestrian level of service, environmental effects, and economic effects.

In Minneapolis, the Department of Public Works conducted a survey of Nicollet Mall pedestrians. It was used to evaluate pedestrian reactions to hypothetical changes in transit service on the mall. A businessmen's group in Minneapolis, the Downtown Council, conducted a survey to elicit merchant opinion about economic conditions, maintenance, and hypothetical changes in transit service and the level of amenity on the mall.

2.6 SCOPE

This report addresses each of the issues mentioned in Section 2.4. Section 3 sets the stage for analysis by providing detailed site descriptions; the issue of cost is also discussed in this chapter. Section 4 begins the impact analysis by examining the effect of the malls on transit service and the impacts on transit demand and on the transit operator's productivity. Section 5 looks at impacts on non-transit vehicles: diverted general traffic, delivery vehicles, and the problem of enforcement. The effects of transit malls on pedestrian circulation, convenience, and safety are discussed in Section 6. Section 6 also examines the impact on air and noise pollution. Section 7 concludes the report with an anlysis of changes in economic conditions and the relationship of transit malls to other downtown developments. Section 1 is an executive summary. In addition, a summary of findings is provided at the end of each chapter.

SITE	PROJECT STATUS	PROJECT COST	FUNDING SOURCES	PRIMARY PROJECT BACKERS	AREA LAND USE	EXPECTED BENEFITS	TRANSIT TYPE
MINNEAPOLIS Nicollet Mall	Completed 1967 Extension to be completed in 1979	$3,800,000 $1,170 per ft $15 per sq ft	74% Assessment district 13% UMTA demonstration grant 13% Urban Beautification grant	Downtown business	Retail core Offices	Retail improvement Improve bus service operations	Standard transit buses Shuttle minibuses Re-routing onto mall
PHILADELPHIA Chestnut Street Transitway	Completed 1976	$7,000,000 $1,300 per ft $22 per sq ft	80% UMTA capital grant 16.7% State DOT 3.3% City capital funds	City govt./ planners Downtown business	Retail core Offices	Improve retail environment Transit for Bicentennial crowds Upgrade transit	Standard transit buses Tourist buses Minor re-routing
PORTLAND Fifth & Sixth Streets Malls	Completed 1978	$15,000,000 $3,700 per ft $33 per sq ft Plus $1 - 1.5 million added utility costs	80% UMTA capital grant 20% Tri-Met Plus utility costs by city depts./utility companies	City govt./ planners Downtown business	Office core Intersects retail core	Increase transit use & operational efficiency Retail/pedestrian environment Reduce suburban sprawl	Standard transit buses Re-routing onto mall

SITE	NON-TRANSIT USES	BUS VOLUME	PEDESTRIAN VOLUME	TRAFFIC SIGNAL TREATMENT	MOVEMENT OF GOODS	AMENITIES
MINNEAPOLIS – Nicollet Mall	Taxis Emergency vehicles Bicycles	Peak hr.: Before 20/ea. way After 60/ea. way	Before 1,068/block side/hr., 12 hour period After 1,114/block side/hr., 12 hour period	Re-set for cross traffic flow (computerized traffic control system scheduled)	Alley loading, mall loading by special permit	Extensive, including electric snow melting mats, sign ordinance heated bus shelters
PHILADELPHIA – Chestnut Street Transitway	Taxis at night, one block only day Emergency vehicles General traffic for parking lots (1 block only)	Peak hr.: Before 43 (one way) After 41/eastbound 11/westbound	After 3,016/block side/hr., peak periods on major blocks	Bus-triggered mid-block warning light Signal timings set for expected bus speed. Timings on nearby street reset.	Full block cross st. loading, on mall by special permit in off-hours	Typical, with mid-block crossing area
PORTLAND – Fifth & Sixth Streets Mall	General traffic on one lane for 3 out of 4 blocks	Peak hr.: Before 32 6th Ave. 95 5th Ave. After: 175 6th Ave. 158 5th Ave.	Before: 444 6th Ave./ 686 5th Ave./ block side/hr., off peak periods	Computer controlled with progression adjusted for traffic	Cross st. loading, on mall by special permit in off-hours	Extensive, including bus shelters and concession booths, CRT information display

FIGURE 3-1. SUMMARY MATRIX

3 SITE DESCRIPTIONS

3.1 OVERVIEW

The projects in Minneapolis, Philadelphia, and Portland are described in detail in the transit malls site report, Streets for Pedestrians and Transit: Examples of Transit Malls in the United States (Report No. UMTA-MA-06-0049-77-11).

This section is an updated summary of that report, although the portions of this chapter dealing with sidewalk improvements and transit mall costs are more detailed than in the initial site report. Figure 3-1 on the opposite page is a matrix which summarizes key transit mall characteristics.

3.1.1 Minneapolis

The Nicollet Mall in downtown Minneapolis was completed in 1967, the first project of its type in the United States. Figure 3-2 provides a view of this mall. It is a two-lane, two-directional busway on eight blocks of the major retail street in downtown Minneapolis. Prior to the mall, pedestrian volumes on Nicollet Avenue were the heaviest in the downtown area, up to an hourly average of 1,100 persons per block side on the busiest block. Traffic was lighter than on nearby streets, with a two-way volume of about 6,800 vehicles over a 12-hour period.

Today, autos are banned from the mall, except for cross-street traffic, although taxis are allowed under restricted conditions. The mall now carries between 45 and 60 buses in each direction in the peak hour, about triple pre-mall bus volumes. Major design innovations include a serpentine-shaped roadway, enclosed and heated bus shelters, and electric snow-melting mats imbedded in the widened sidewalks. In general, the Nicollet Mall provides a very high level of pedestrian amenities. Plans have been approved to extend the mall by four blocks, with a scheduled completion date of late-1979. The present location of the Nicollet Mall is shown on the map in Figure 3-3.

FIGURE 3-2. NICOLLET MALL (MINNEAPOLIS)

Transit benefits are regarded as a side-effect of the mall, which was designed to improve the retail sales climate. The major sponsor of the mall was the Downtown Council, a local businessmen's group. In its resources and influence, the Downtown Council is a unique organization. It is responsible for numerous projects ranging from an elaborate system of elevated pedestrian walkways, or "skyways," to government-assisted housing.

There was a seven year time span between the publication, in 1960, of a consultant's report outlining alternatives and the official opening of the mall in late 1967. In addition to several legal entanglements, the major obstacle to mall implementation was to secure funding. A federal Urban Beautification grant and an UMTA demonstration grant provided about one-quarter of the needed funds. The remainder was provided by an assessment on nearby property owners based on square footage of land, plus modifications based on location. Total cost of the mall was $3,800,000 or $15 per square foot including roadway area. The four block extension of the mall is expected to cost $2,800,000 or $22 per square foot. The extension will be funded at least 85 percent by the assessment district. MTC is providing a grant to pay for the bus shelters.

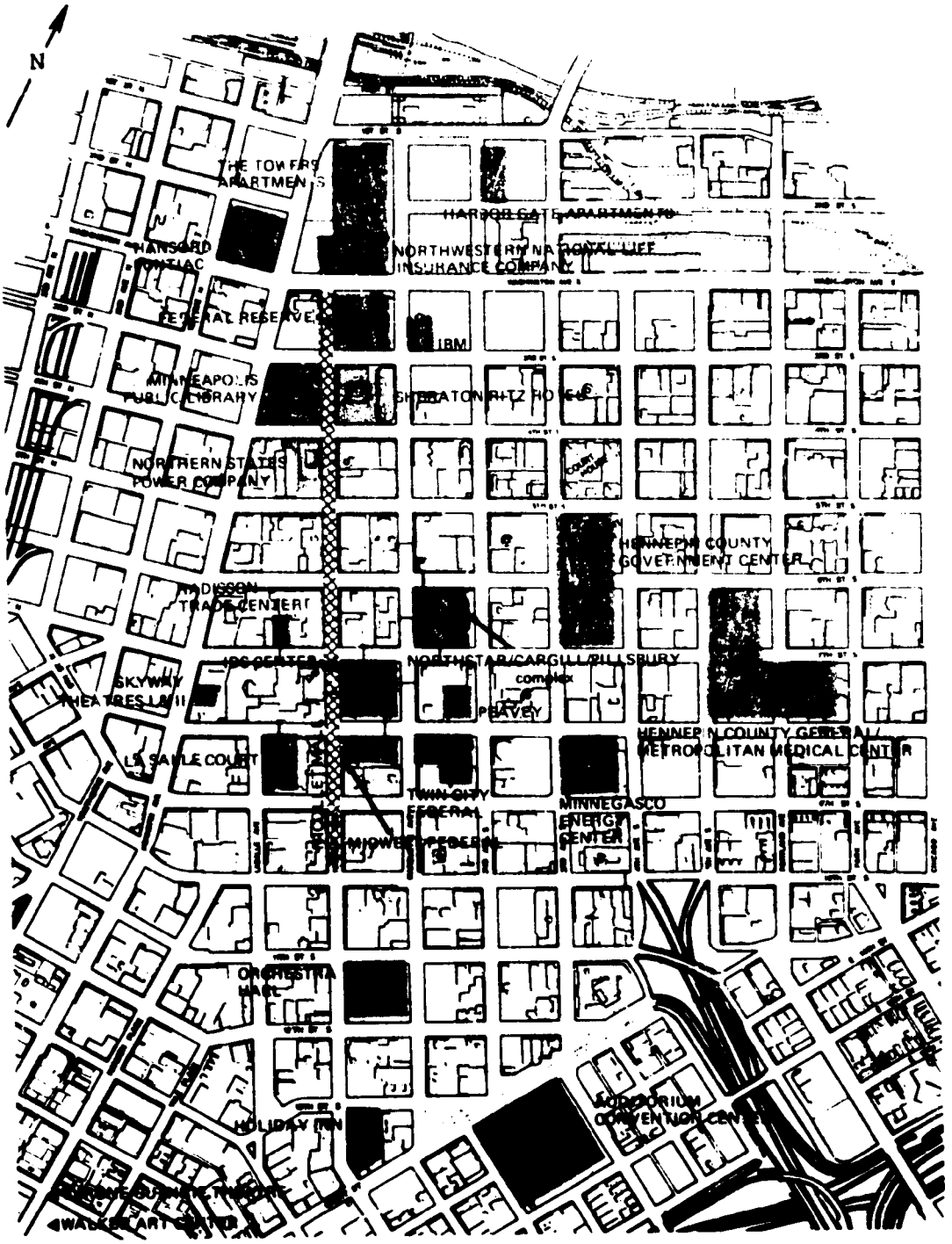


FIGURE 3-3. LOCATION OF THE NICOLLET MALL IN DOWNTOWN MINNEAPOLIS

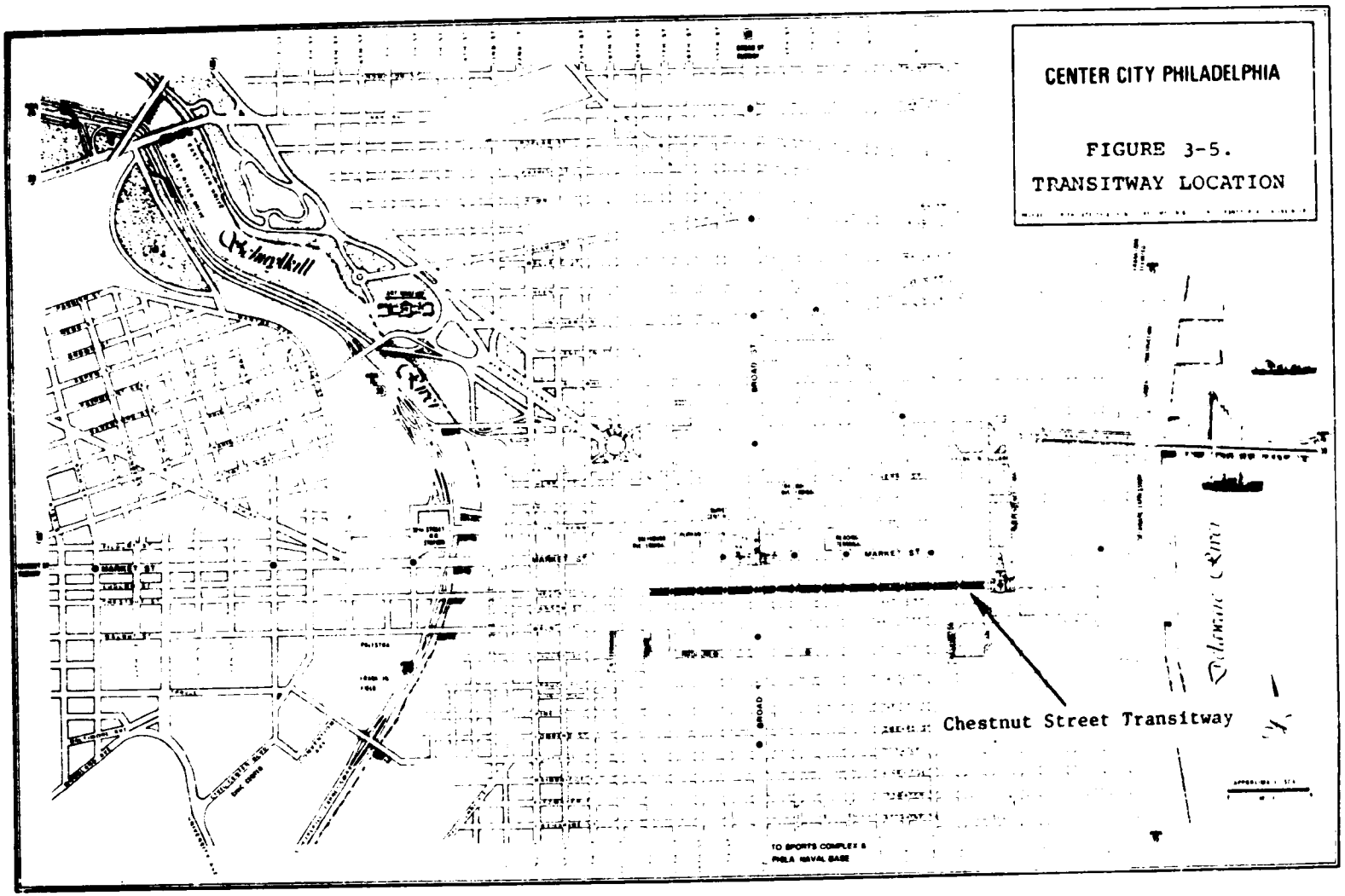
Legend

XXXXXXX Nicollet Mall

3.1.2 Philadelphia

The Chestnut Street Transitway in Philadelphia became operational in November 1975. The twelve block, mile-long project includes the retail core of the city. (The transitway is shown in Figure 3-4 below.) Most of it is a two-lane, two-way busway on a narrow (60') right-of-way. By comparison, both the Nicollet Mall and the Portland Mall have 80' rights-of-way Before the mall was constructed, Chestnut Street was a one-way eastbound street. It had the heaviest pedestrian volumes of the three cities, up to 3,000 persons per block side per hour at peak periods. Average daily traffic per block on Chestnut Street was about 12,000 vehicles in 1973, also the heaviest of the three transit malls. Figure 3-5 opposite shows the location of the transitway in downtown Philadelphia.

FIGURE 3-4. CHESTNUT STREET TRANSITWAY (PHILADELPHIA)


CENTER CITY PHILADELPHIA
FIGURE 3-5.
TRANSITWAY LOCATION
Chestnut Street Transitway
MARKET ST
BROAD ST
TO SPORTS COMPLEX &
PHILA NAVAL BASE

Autos are now banned from the mall except for one block where they are allowed for access to parking lots. Cross-street traffic is allowed. Taxis are permitted to use the mall at night and to use one block of the mall during the day in order to service a major hotel. Bus volume in the eastbound direction on the transitway now reaches a peak of about 40 vehicles per hour, about the same as before the mall was constructed.* However, one bus line now uses the new westbound lane, adding 11 vehicles per hour at the peak period. The major design innovation was the construction of signalized mid-block pedestrian crossings. With the constraint of a narrow right-of-way, a fairly typical set of pedestrian amenities was provided, including bus shelters.

Although the project was spurred by the need to facilitate transit circulation during the 1976 bicentennial celebrations, it is primarily regarded as a retail improvement. The city government was the main sponsor of the transitway, although it was backed by the Chestnut Street Association, a merchant group. The mall project is viewed as part of a general renewal effort in the Center City (downtown) area which has been given a high priority in recent years by the City. The transitway concept was first put forward in the late 1950's, but was blocked by the lack of excess traffic capacity on nearby streets. Eventually this problem was resolved, and the mall idea was revived in 1972. From this point, it took less than four years to complete the transitway, including a construction period of just six months. Providing auto access to existing parking lots with entrances on the mall proved to be the only important obstacle. An UMTA capital grant provided 80 percent of project funds. The local share was paid through a combination of State Department of Transportation (17 percent) and City capital funds (3 percent). Total cost of the mall was $7,000,000 or $22 per square foot including roadway area.

*Philadelphia is the most transit-oriented of the cities in this study. In 1970, 64 percent of commuters to center city used some form of public transportation to get to work; about 30 percent used a bus or street car.

3.1.3 Portland

The Portland Mall was officially opened in March 1978. It is the largest of the three transit malls encompassing 11 blocks on each of two parallel streets, Fifth and Sixth Avenues. Each street is one-way with two bus-only lanes and one lane for general traffic. Every fourth block the general traffic lane is replaced by widened sidewalks. This forces autos to divert from the mall and prevents the use of the mall for through-traffic. The Portland Mall is different from other malls in that it runs the length of the office core although it also intersects major retail streets. Figure 3-6 below provides a view of the Portland Mall.

FIGURE 3-6. THE PORTLAND MALL

Before construction, that portion of the Portland Mall that now intersects the retail core had hourly pedestrian volumes as high as 700 persons per block side in off-peak periods. Traffic volumes were relatively heavy on the two one-way streets, up to 13,000 vehicles in a 24-hour count on one block of Sixth Avenue and nearly 10,000 on one block of Fifth Avenue. The count on Sixth Avenue was the highest in the downtown core. Figure 3-7 shows the location of the mall in downtown Portland.

In 1975, 21 percent of person-trips to downtown were by bus; Fifth and Sixth Avenues combined carried 127 buses per hour during peak periods. There has been significant rerouting of bus lines onto the Portland Mall and the number of buses on the two streets has now risen to 333 buses, by far the heaviest volume of transit vehicles on the three malls in this study. There are two bus shelters per block, with two blocks forming a pair. Each bus stops once every two blocks, at one of the four shelters. Both shelters and bus lines are designated by a colored emblem corresponding to a geographic service area.

In addition to the general traffic lane, bus rerouting, and shelter and bus line identification system, the major design innovation is the trip information system. This includes eight computer terminals, or sidewalk trip planning kiosks, where patrons can get route and schedule information for the entire bus system, and CRT (television) displays in each bus shelter which provide schedule information for buses on lines stopping at the shelter. The general level of amenity provided to pedestrians on the Portland Mall is very high.

Although the mall is regarded as an environmental improvement by the public, the emphasis on improving transit service is much stronger here than in either Minneapolis or Philadelphia. Backing for the project came from a variety of sources including Tri-Met, the metropolitan transit authority; a businessmen's group called the Downtown Committee; and the City of Portland. The idea for a transit mall was first suggested in a consultant's report in 1971. There was more than a four-year time span until construction began in early 1976. Construction took two years. The major

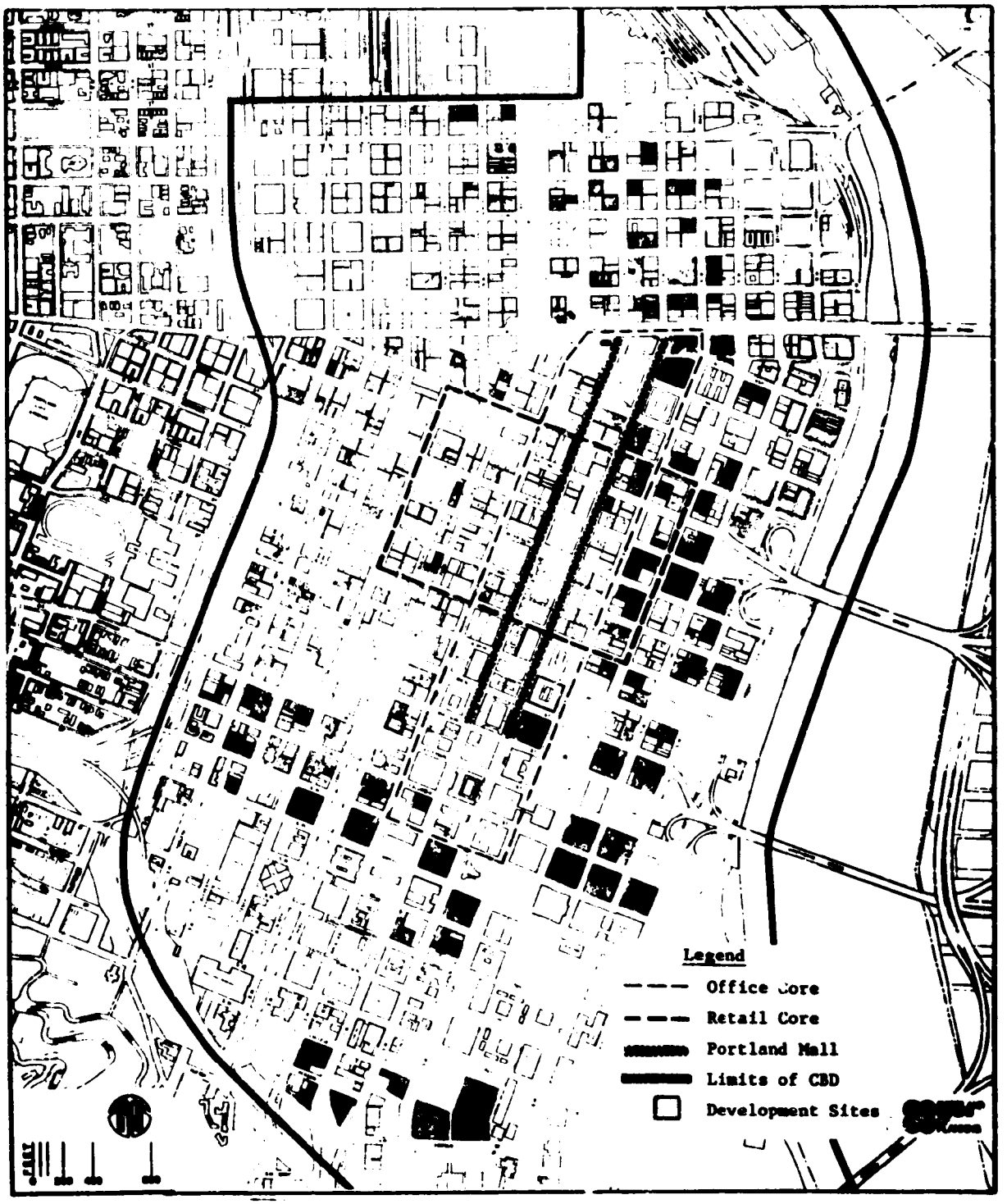


FIGURE 3-7. DOWNTOWN PORTLAND

obstacle to beginning construction was deciding what degree of auto access would be allowed on the mall. UMTA rejected a preliminary grant application by Tri-Met which called for a continuous left-hand lane for general traffic and a mixed-use center lane. Tri-Met then submitted a revised application which described the current configuration of two bus-only lanes and a discontinuous general traffic lane. The UMTA capital grant provided 80 percent of funding. Tri-Met, which is substantially supported by a 0.5 percent regional payroll tax, provided the remaining 20 percent of funds. The cost of the mall was about $15,000,000 or $33 per square foot including roadway area.

3.1.4 Comparative Block Designs and Dimensions

The diagrams in Figure 3-8 show the different transit mall block design types. Figure 3-9 compares the dimensions of the three malls and locates the different block design types on each mall.

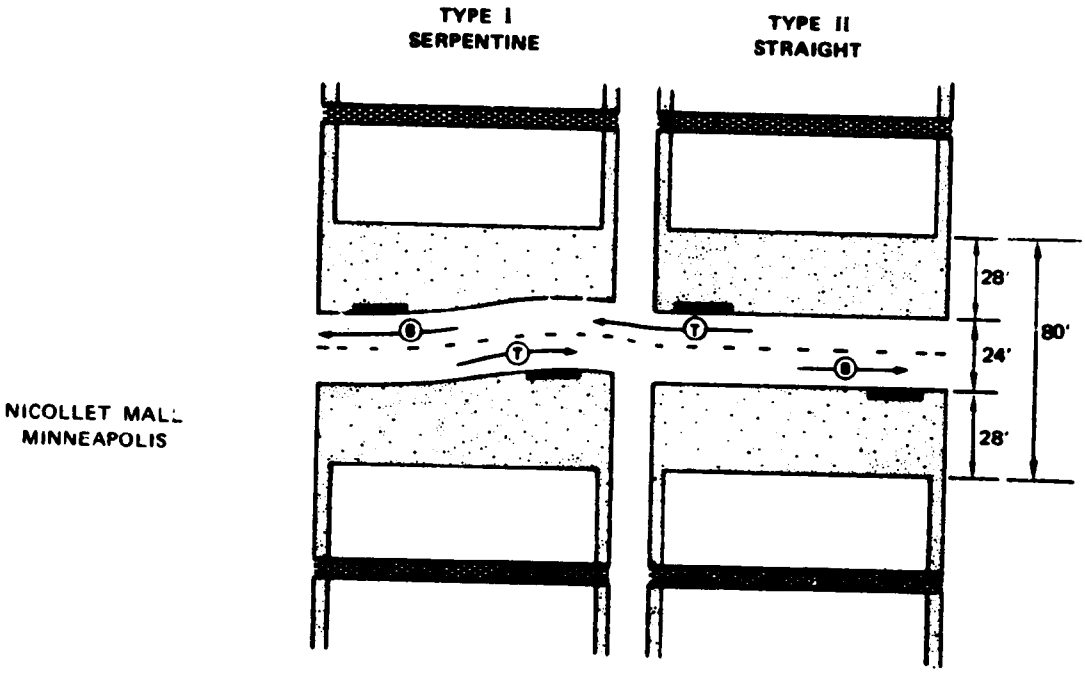


FIGURE 3-8. TYPICAL MALL BLOCK DESIGNS

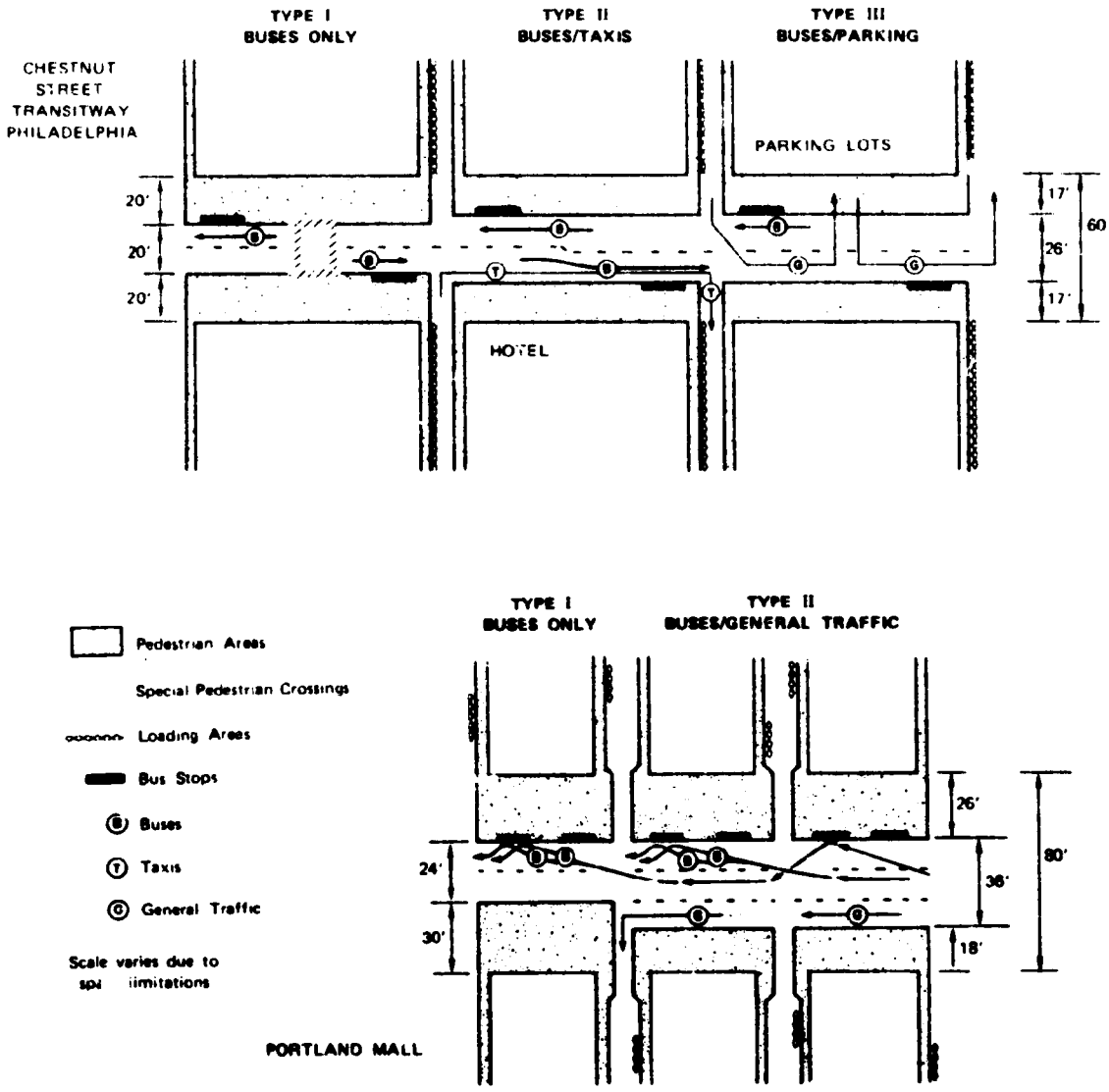


FIGURE 3-8. (cont.)

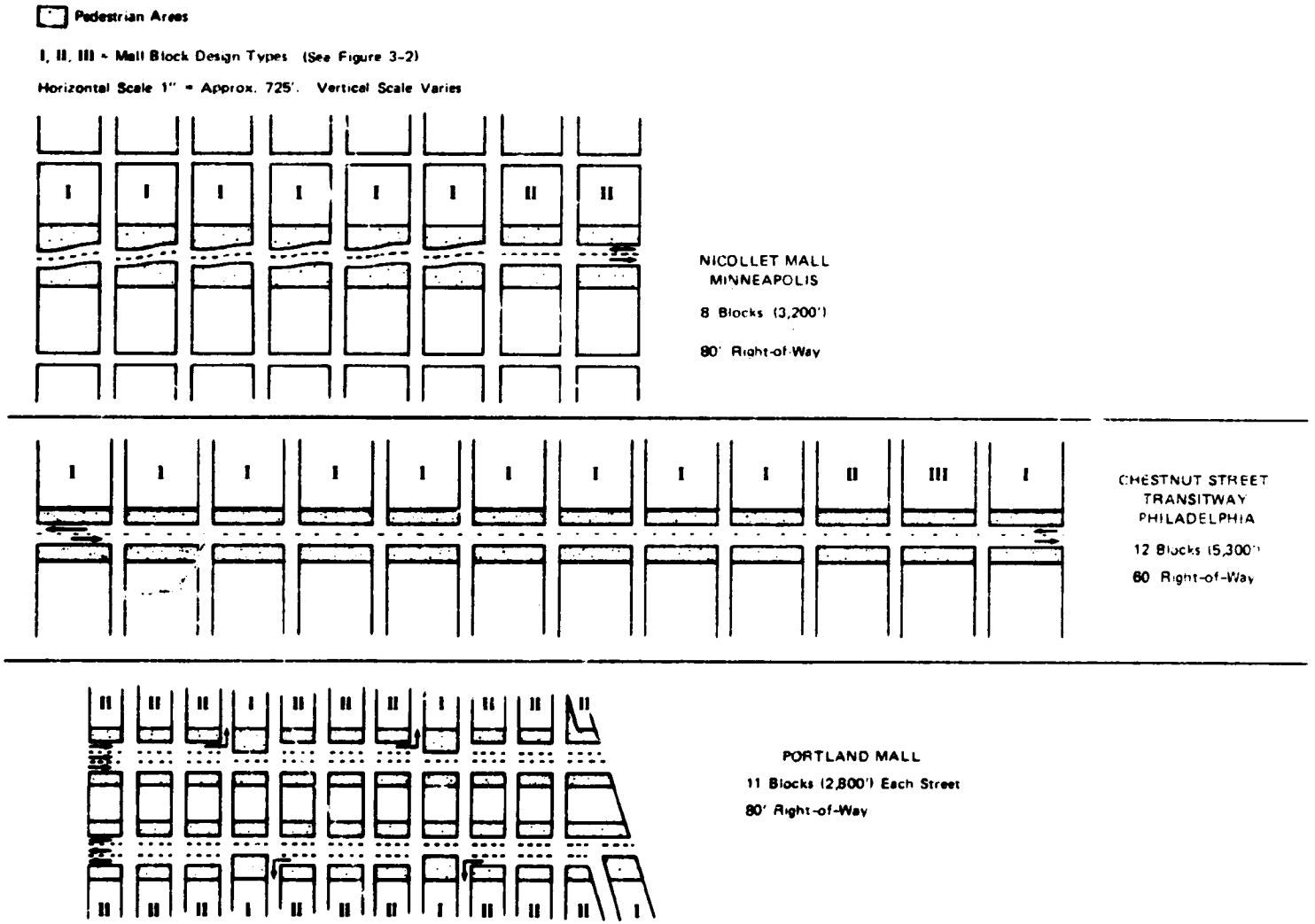


FIGURE 3-9. TRANSIT MALL DIMENSIONS

3.2 GENERAL TRANSIT CONDITIONS

Minneapolis has extensive and frequent bus service, including several crosstown routes and freeway express service during peak periods. Peak-hour headways under ten minutes are scheduled on most lines. There were two downtown shuttle routes on six-minute headways until August 1975, when one route was discontinued and a downtown Dime Zone instituted (regular fare is 30 cents). The remaining downtown shuttle, which runs on the mall, now maintins nine minute headways. Public acquisition of the bus system in 1970 brought expanded service and an aggressive marketing program. Since then, ridership has grown, as has the percentage of person trips to downtown by bus. In 1975, 24 percent of person trips to and from downtown were by bus (up from a low of 17 percent in 1970) and 40 percent of people leaving the downtown in the peak hour did so by bus (Ref. 3- 1). Bus volumes leaving and entering the downtown have grown from a 1964 low of 4,800 in a twelve-hour period to 6,500 in 1975. The system carried 63 million revenue passengers in 1975. Transit service levels have been upgraded considerably since public acquisition. Notable projects, in addition to the Nicollet Mall, are the Interstate 35W Preferential Access Bus Operating on Metered Freeway demonstration, and exclusive contraflow bus lanes on Second and Marquette Avenues.

The major transit operator in the Portland area is the Tri-County Metropolitan Transportation District (Tri-Met), which took over from two private operators in 1969 and 1970. Since then both service and patronage have increased dramatically. Tri-Met inherited an aging fleet of 289 buses. They now operate just over 500 diesel buses, including 100 that are brand-new. By 1970, the percentage of downtown workers commuting by transit had declined to 15 percent from 38 percent in 1950. Total annual ridership fell from 60 million in 1950 to 15 million in 1969. Since that time new routes have been added, including an express commute service; headways have been reduced; park-ride lots and bus shelters have been installed; a flat fare for the entire service area has been introduced (recently increased from 30 to 40 cents), as well as a

monthly pass program and a downtown free-fare area. Annual ridership increased to 29 million in fiscal 1975, up 95 percent from 1969; 21 percent of person-trips to downtown were by bus. Tri-Met's goal is to increase this to 36 percent by 1979.

In terms of transit ridership, of the three sites discussed in this report only Philadelphia may be considered a "transit-oriented" rather than "auto-oriented" city. The Southeastern Pennsylvania Transportation Authority (SEPTA) carries 850,000 base-fare riders per day on 2,400 miles of streetcar, bus, and trackless trolley lines and 73 miles of high-speed rail lines; extensive commuter rail service is provided by the Penn Central and Reading railroads. A subway line parallels the Chestnut Street Transitway on Market Street, one block north. SEPTA's City Division operates 1,320 buses, 128 electric trolley buses,364 light rail cars, and 489 rapid transit cars. Many of these rapid transit cars are old; 40 percent have been in service for 35 to 45 years.

From the 1970 Census "Journey to Work" data, it is known that of the 228,000 workers in the Philadelphia CBD, 64 percent commute by some form of public transportation (18.7 percent by subway and elevated, 29.2 percent by bus and streetcar, and 16.5 percent by commuter railroad). A spring, 1977 survey by the Delaware Valley Regional Planning Commission (DVRPC) of employees in the intensely developed area within two blocks of the transitway shows an even higher level of transit use. Nearly 90 percent of the respondents used public transportation to get to work, about one-third riding on SEPTA buses (Ref. 3-2).

3.3 TRANSIT MALL BUS SERVICE

In Philadelphia, 43 eastbound buses on two regular lines plus the special Mid-City Loop used Chestnut Street during the peak hour prior to the transitway. Both regular lines used nearby Walnut Street for the westbound return. As part of general service cutbacks, the number of eastbound buses at peak hour (AM) has been reduced to 41; however, one of the eastbound routes now returns on the transitway westbound, contributing 11 buses at the peak

morning hour. In late 1977 and early 1978, about two years after completion of the transitway, one low-volume regular route and one peak-hour express were rerouted to use the transitway in both directions. Total daily bus volume on the mall is now 439 eastbound and 205 westbound buses. The peak hourly use is 46 buses eastbound between 8 AM and 9 AM. Because both the regular lines loop back just east of the transitway, eastbound buses primarily deliver passengers to the CBD, while westbound buses board passengers from the CBD. During three years of construction along Market Street, beginning in 1980, westbound transitway volumes are planned to reach 532 buses per day.

In Minneapolis, buses ran in both directions on Nicollet Avenue before the mall was built. Transit vehicle volumes have increased considerably since the mall opened. In 1968, one bus route was moved from neighboring Marquette Avenue onto the Nicollet Mall and headways on that route and the route already on the mall have been reduced. The downtown shuttle route was introduced in 1971 and operates on the mall. In 1973 several freeway express routes were created, three of which run on the mall. One of four remaining private bus lines (accounting for some fourteen buses a day) successfully petitioned to run its buses on the mall. Bus volumes now reach between 45 and 60 buses per hour in each direction during the afternoon peak, compared to about 20 in each direction before the mall. The 12-hour two-way bus count on Nicollet Avenue at 12th Street is now up to 610, from 188 in 1964. By comparison, the two-way count on Hennepin Avenue (one block north of the mall) declined from 761 in 1964 to 623 today. The combined one-way counts for the contraflow lanes on nearby Marquette and Second Avenues fell from 677 to 644; however, during the 7-9 AM and 4-6 PM peak periods, these avenues are still the most heavily used, carrying 522 buses in both directions for the combined peak periods. The comparable figure for the Nicollet Mall is 307 buses and on Hennepin Avenue 287 buses.

Portland has instituted significant service changes. Prior to the mall, 22 lines ran on either Fifth or Sixth Avenues, only five of these for the entire length of what is now the mall. Originally, plans called for 45 of Tri-Met's 52 lines to use the mall; peak hour bus volume for the two streets was to rise from 117 to

418. However, by the time the mall opened in March 1978, this plan had been scaled down to 40 routes, 10 of which use only one of the mall streets, and a peak hour volume of 333 buses. Nearby Third and Tenth Avenues, originally planned as non-bus streets, carry from 12 to 24 buses each during the peak hour. Originally it was hoped that a number of loop or single-ended routes could be converted to through-routes, allowing Tri-Met to maintain service levels with a lower volume of vehicles. This idea was dropped, however, when it was determined that this would be expensive, that bus volumes would not be significantly lowered, and that the change was not justified by existing patronage levels. Bus volumes are still more than triple the pre-mall level. In part, the heavier volume has been accommodated by having each bus stop only at every second block, rather than at every block as before.

In addition to receiving the benefits of changes in bus service described above, bus patrons in the three cities have received the benefits of increased waiting space, shelter from the cold or rain, and bus information displays (see Figure 3-10). The Chestnut Street Transitway shelters have the simplest design of the three malls; they consist of two narrow columns and a clear plastic roof. The covered area is about 137 square feet. No seating is provided either in or near the shelters. No schedule information is provided, although a route map of the Center City area is posted at the mid-block crossings, about 140 feet from the shelters. The location of these route maps reflects an original plan to place the bus shelters at the mid-block crossing. This plan was discarded because it made transfers difficult and would force buses to stop twice on each block (once for the corner stoplight). Shelters are now located immediately adjacent to the corner crosswalks.

Shelters on Minneapolis' Nicollet Mall are enclosed except for a rear entrance and an open front on the curbside. The shelters are heated and equipped with piped-in music and a telephone booth. There is bench space for about six patrons. The area under the roof line measures about 312 square feet; the actual interior floor space is about 146 square feet. Because shelters are located

Philadelphia Shelter

Minneapolis Shelter

Portland Shelter

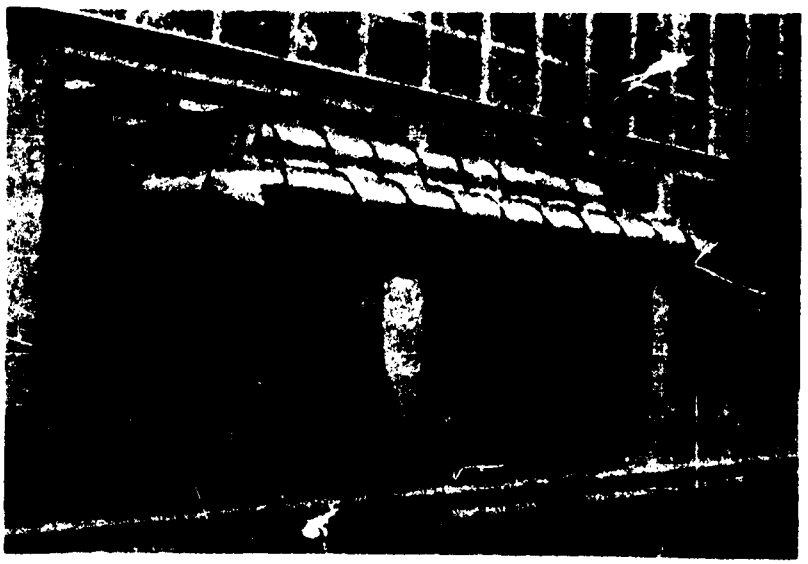


FIGURE 3-10. SHELTERS ON THE MALLS

at the widest point on the curved sidewalks there is extensive outdoor waiting space, often including seating areas. Bus schedules are posted within the shelters.

Bus shelters on the Portland Mall are enclosed with a clear plastic material, with large openings on both the curb and sidewalk sides. They are designed to match the Victorian theme of the mall. There are four seats for patrons; additional outdoor seating is sometimes available close by. Portland shelters are the largest on the three malls; there are about 400 square feet under the roof line and about 170 square feet of enclosed area. There are two shelters per block on the right hand (flow of traffic) side of both mall streets except that every other block on Sixth Avenue has only one shelter, with a "FOR ARRIVALS ONLY" sign posted in the remaining space. On block sides with two shelters, 30 percent of the curb length and over 15 percent of the total sidewalk area is covered by shelters.

Portland employs a complicated bus stop assignment plan. Each bus line is identified by a colored emblem corresponding to one of seven geographic service areas. For example, nine lines comprise the "brown beaver" service area, meaning that these buses deliver patrons from the mall to the southeastern part of Portland. Each mall shelter, in turn, is designated by one of the seven colored emblems and only bus lines heading for the corresponding service area will stop at that shelter. There are four shelter types on Fifth Avenue and three on Sixth Avenue. The system is arranged so that buses of a given service area will pickup passengers once every other block on either Fifth or Sixth Avenues. Thus, patrons going to southeast Portland will board at one of five "brown beaver" shelters on Fifth Avenue.

The bus stop assignment plan is a major reason for an elaborate information system on the Portland Mall. There are eight trip planning kiosks-terminals connected to a Tri-Met computer. Here, by means of a series of punches on a numeric keyboard, a patron can determine the scheduled departure time of a bus from the mall and its

scheduled arrival time at the desired location (and vice versa). In addition, maps posted on the kiosk identify which service area the bus line belongs to and the location of the corresponding shelters on the mall. Within each bus shelter, a television display shows the scheduled arrival time of the next three buses of each line stopping at that shelter. In addition, each shelter has a color-coded Tri-Met System Map, a Service Area Map for lines stopping at that shelter, and a Portland Mall Map that shows the location of each shelter with its appropriate service area emblem. All three maps are lighted. On the outside of the shelters there are two bronze plaques engraved with the service area emblem.

3.4 CONDITIONS FOR NON-TRANSIT VEHICLES

3.4.1 Pre-Mall Traffic Conditions

In most cases the streets selected to become transit malls had been important, but not the most important, traffic routes in the downtown areas. A Minneapolis 1964 cordon count (pre-mall) showed a two-way volume of 6,800 vehicles on Nicollet Avenue. Traffic was moderately congested and appeared to consist largely of pick-up/drop-off trips of shoppers with destinations on Nicollet Avenue (see Figure 3-11). By comparison, nearby one-way streets had volumes of 10,600 (Marquette Avenue) and 7,700 (Second Avenue) while the nearest two-way routes, Hennepin Avenue and 3rd Avenue, carried 15,900 and 10,300 vehicles respectively (Ref. 3-3).

In downtown Portland, 5th Avenue carried 9,800 vehicles one-way southbound just prior to the street closing. The two nearest southbound streets carried one to three thousand more vehicles. On the other hand, northbound 6th Avenue carried about 13,500 vehicles, slightly more than the nearest northbound alternative (4th Avenue) (Ref. 3-4). In fact, 6th Avenue was the most heavily trafficked street in the downtown core, probably due to large department stores which front on this street. Because downtown blocks

FIGURE 3-11. PRE-MALL NICOLLET AVENUE (MINNEAPOLIS)

are only 200 feet long, the street system is closely spaced. This encourages excessive turning and circulating movements. Generally, speaking, however, downtown Portland did not have a serious congestion problem.

Perhaps the most interesting case is in Philadelphia, where problems associated with traffic restrictions were a major obstacle to creation of the transitway. In the middle 1960's Chestnut Street was a major artery with three lanes of eastbound traffic. About 22 percent of eastbound traffic into Center City (18,900 vehicles) crossed the Schuylkill River on the Chestnut Street Bridge (second only to the Vine Street Bridge one-half mile north), and the average block between the Schuylkill and Delaware Rivers carried about 14,000 vehicles. Like most downtown streets, a narrow right-of-way and lax enforcement of parking regulations contributed to congestion (see Figure 3-12). The 1966 Traffic Feasibility Study prepared by consultants concluded that, in the absence of two new expressways proposed for Center City, it would be "impractical" to close Chestnut Street west of

15th Street and difficult to close it west of 11th Street (Ref. 3-5). Since the most intensive land use is west of 11th Street, plans for the mall were shelved.

FIGURE 3-12. PRE-MALL CHESTNUT STREET (PHILADELPHIA)

By the early 1970's, plans to complete the expressway system were dropped, but other changes appeared to make an auto ban on Chestnut Street more feasible. First, traffic had declined slightly (between 8th and 18th Streets average daily traffic per block fell from 12,500 in 1966 to 12,100 in 1973) whereas earlier it had been projected to increase (Ref. 3-6). Second, Philadelphia had begun an active program to discourage illegal parking, thereby increasing the functional capacity of Center City streets. Third, and most important, Market Street (one block north of Chestnut Street) was converted from a two-way to a one-way eastbound street west of Broad Street (part of an east-west pair formed with JFK Boulevard).

This provided an alternative route to which eastbound traffic from Chestnut Street could be diverted. As a result of these events, Philadelphia proceeded with plans for the mall.

3.4.2 Auto Use on Transit Malls

Buses do not have exclusive use of the transit malls in any of the three cities. Municipal and emergency vehicles are allowed on all three transit malls. In Minneapolis, taxis are allowed on the mall, but must enter and leave only at the ends of the mall, and only in response to a telephone call for service. Because of concern over access to stores and parking, Portland provides one lane of general traffic on each one-way street. This lane is interrupted every fourth block by a widened sidewalk, and traffic must divert to cross-streets. This prevents use of the lane for through-traffic. In Philadelphia, general traffic is allowed on one block of the Chestnut Street Transitway, in order to provide access to parking lots, and taxis are allowed on another block to service a major hotel. Taxis are allowed on the entire mall at night.

3.4.3 Strategies to Divert Traffic

Convincing drivers to change previous habits and divert to new routes is one of the first issues to be faced by local planners. One advantageous factor, not found where auto restrictions do not include sidewalk improvements, is that the construction period makes a transit mall impassable and forces drivers to find new routes to their destinations. Once construction is over, however, a strategy must be developed to keep motorists, particularly occasional users, from trespassing on the mall. Where planners have identified preferred alternate routes, strategies must be developed to encourage motorists to use these streets.

Minneapolis depends primarily on signing to divert traffic. Signs reading "BUSES ONLY" are used at mall ends, with "NO TURNS" signs used to direct cross-street traffic straight ahead. In addition, Minneapolis has installed a concrete median at the southern

entrance to the Nicollet Mall. The median divides the widened northbound traffic lane into two parts. Cars are diverted to use the right side, which forces them to turn right at the corner. Buses are directed to use the left side, which allows them to continue onto the mall. The device has not been entirely successful, however, since this point has been the scene of several accidents between vehicles and fixed objects. No preferential treatment was given diverted traffic and no preferred alternate routes were identified.

As in Minneapolis, Portland depends primarily on signing to divert traffic. On blocks where no autos are allowed, "NO TURNS" signs are posted on cross-streets and "BUSES ONLY" signs are posted on the mall and also painted on the pavement of the bus lanes. Because of the general traffic lane which operates on three out of four blocks, signs reading "BUSES ONLY RIGHT LANES" have been installed. In addition, northbound traffic at the southern entrance to the mall on Sixth Avenue is diverted using a concrete median similar to the one in Minneapolis. At the northern entrance to the mall on Fifth Avenue, motorists are alerted to special conditions by a large fountain. A computerized traffic signal system based on traffic volumes registered by roadway detectors was recently put into operation in downtown Portland. The time cycle of a traffic signal now varies with the actual volume of vehicles on the street at any given time.

Pre-mall inbound traffic on Philadelphia's Chestnut Street was much heavier than that in the other two cities. For this reason, and because Philadelphia planners had as a specific objective to divert traffic north to Market and Vine Streets, a complete diversion strategy was outlined in that city's UMTA grant application (Ref. 3-7). The most important aspects of this plan have been implemented. Lights have been retimed on Market Street to serve projected traffic. One crosswalk was removed to improve the Market Street traffic flow around the square which contains the City Hall. Informational signs warning that Chestnut Street is closed at 18th Street now appear as far west as 52nd Street and also on north/

southbound streets which cross the transitway. Left-turn-only lanes were added on Chestnut Street at key northbound cross-streets (30th, 22nd, and 20th Streets). Morning peak-period parking prohibitions were added on southbound streets crossing the mall. Both AM and PM peak-period parking prohibitions were placed on several streets crossing the transitway, including 18th Street at the transitway entrance. Peak-period parking prohibitions apply to the block-long loading zones on these streets. Finally, a buses-only lane was added on the south side of Chestnut Street between 18th and 19th Streets. In part, this was to prevent a motorist from inadvertently following a bus onto the transitway. Except for signing, no special effort was made to distinguish the entrances to the transitway.

The UMTA grant application suggested additional devices which might be employed if congestion occurred after completion of the mall. Although none of these second-phase ideas has been implemented to date, the range of such strategies is of general interest. One suggestion was for additional left-turn-only lanes for inbound traffic. Another possibility would be to reverse the direction of flow on eastbound Pine and westbound Spruce Streets, both south of the transitway and parallel to it. Although the carrying capacity of the two streets is the same, Spruce Street is slightly less residential than Pine Street and, being a block closer to Chestnut Street, would represent a more convenient alternate for diverting eastbound Chestnut Street motorists. Finally, it was suggested that signal timing on Chestnut Street west of the mall could be altered to discourage use. Actually, the opposite has recently been introduced. Synchronization plus frequent signs which advise motorists of the correct speed now allow vehicles to travel forty blocks without meeting a red light. The success of the various transit mall diversion strategies will be discussed in Section 5.4 dealing with enforcement problems.

3.4.4 Delivery of Goods

The provision of space for delivery of goods to merchants was a concern of planners in each city. Moreover, it is an issue which can generate intense opposition to a mall project by those individuals immediately affected. In Minneapolis deliveries are generally not allowed on the mall. This does not present a problem, since there are only two businesses without access to a rear alley. These two are allowed to use the mall for loading purposes. On the Portland Mall, pick-up and delivery of goods is not permitted except by special permit at night and on weekends. New curbside loading zones have been established on all cross-streets, resulting in a net increase of 525 feet of available loading zones. Most cross-streets now have a mixture of special zones, loading zones, and curbside parking. Tri-Met has paid for the relocation of some service elevators (or access to the elevators) to cross-street locations.

Provision of adequate loading facilities proved a serious problem in Philadelphia. A pre-transitway survey showed that about forty businesses on Chestnut Street had to load from the front (Ref. 3-7). Merchants on the north side of the street had a special problem, since the rear alley is too narrow to be a reliable means of access. Loading zones on cross-streets were proposed as a solution. Given the existing conflicts between trucks and parked vehicles on Chestnut Street, there was understandable concern about enforcement problems in the proposed loading zones. The final proposal, including suggestions from the Police Department, called for block-long loading zones with distinctive pavement markings. The zones are in effect from 7 AM to 6:30 PM, except for peak-period restrictions which allow for an additional traffic lane. Only commercially licensed vehicles may use the zones. No deliveries are allowed on the transitway itself on a regular basis, except during non-business hours with special permission granted in advance, or in exceptional circumstances, on a once-only basis, during off-peak hours.

3.4.5 Parking

Removal of curbside parking spaces and limitations on access to off-street parking facilities adjacent to transit malls can generate strong opposition from those affected. No new parking has been provided near any of the transit malls as a part of the mall project itself. However, identification of alternative parking and the provision of access to existing facilities have been part of the transit mall planning process.

Parking has not been a problem in Minneapolis. There are about 44,000 spaces in the downtown area, about 14,000 of these in downtown parking garages. In 1974 there were about 10,000 spaces within two blocks of the Nicollet Mall. A six-story garage situated on the mall has an indoor connection to the skyway system. This degree of integration of automobile, skyway, and mall is a rare but growing phenomenon in downtown Minneapolis.

Portland's 1975 "Parking and Circulation Policy" established a lid on the number of parking spaces to be permitted downtown (equal to the amount existing or approved for development in 1973, subject to revision) and called for the conversion of curbside and long-term parking to short-term off-street parking (Ref. 3-8). A total of 370 curbside spaces were lost on 5th and 6th Avenues and by the creation of new loading zones on adjoining cross streets. These will be more than made up by 1,300 spaces in two new parking garages long planned for Portland's retail core. Nearly all public garages on the mall are accessible from the general traffic lane or cross-streets. One private garage under an office building does have its entrance located adjacent to a buses-only lane. Autos have been allowed to cross over the bus lane to use this facility. One hotel whose only access was on 6th Avenue had considered relocating its entrance, but has since been sold and a new office building is under construction on the site. A $1,124,000 contingency fund was included in the Portland Mall budget, in part to compensate owners denied access to their parking facilities.

In Philadelphia, Chestnut Street parking-lot operators stated that the project would ruin their businesses, even though they were promised use of the street for general traffic access on two blocks (later reduced to one block). Operators on other blocks had either cross-street or rear alley access. Nevertheless, at one point parking lot owners filed suit in U.S. District Court requesting an injunction to stop the project. Hearings on the suit were delayed until after the traffic ban went into effect. Afterwards, the suit was dropped when expected traffic problems did not occur. In fact, some operators were able to capitalize on useless entrances to the transitway by leasing space to "mini-stores" as shown in Figure 3-13 opposite.

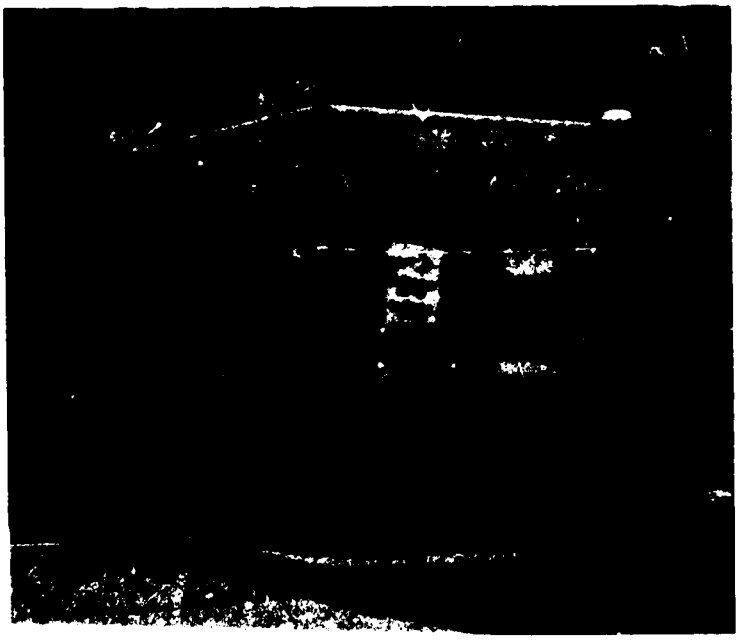


FIGURE 3-13. MINI-STORE AT FORMER PARKING LOT ENTRANCE

A parking study done in Philadelphia early in 1975 showed the project area had barely adequate parking to accommodate current demand (Ref. 3-9). Although the 46 off-street parking facilities in the study area (Chestnut Street from 8th and 18th Streets plus about a block to the north and south) which provided approximately 9,100 spaces had an excess usable capacity of nearly 900 spaces, the amount of illegal parking at the time of the survey was substantial. In an area estimated to have about 160 legal parking spaces, an average peak on-street accumulation of 350 cars was observed over three days. All these parking spaces were eliminated by the transitway project, at least during the day. (Parking in loading zones is allowed after 6:30 PM.) In theory there is

adequate off-street capacity to handle all these cars, although it is not always matched geographically to the demand. However, the report notes that there is insufficient parking capacity for any economic growth which may be induced by the transitway.

3.5 PEDESTRIAN CIRCULATION

Transit malls are frequently associated with improvements for pedestrians, bicyclists, or the handicapped. In Philadelphia, a major change has been the provision of signalized mid-block crossings for pedestrians on the Chestnut Street Transitway (see Figure 3-14 below). The crossings are about 70 feet wide on 400-foot blocks. They are bricked, curbless extensions of the sidewalks. Approaching buses (and other vehicles) trigger detection devices at block ends which change the mid-block signals to green for buses, allowing a relatively smooth passage. Many pedestrians still cross outside of both the mid-block and corner crossing areas. This could be due to a number of factors, including the low volume of buses on the roadway or the placement of wall-and-bench units at both ends of each mid-block crossing, which limits access by pedestrians. On Minneapolis'

FIGURE 3-14. PHILADELPHIA MID-BLOCK CROSSING

Nicollet Mall, mid-block crossings were originally added, then removed when it was found that pedestrians ignored the "WALK/ DON'T WALK" signal. Mid-block crossings have not been added on the Portland Mall, in part because the blocks are short (200 feet) so that corner crosswalks offer sufficient opportunity for pedestrian crossing.

Access for handicapped persons is also increased by providing ramps for wheelchairs. In Portland, these exist on all corners. In Philadelphia, only one side of the street is ramped; the mid-block crossing provides smooth access to the other side. It was not necessary to install ramps in Minneapolis as the sidewalks were designed to slope to 1½" curbs at intersections.

Ease of circulation for pedestrians is unchanged in other respects, however. Street crossing outside authorized areas remains illegal. Signal timing is based on vehicular needs. Little has been done to integrate transit mall sidewalks with other pedestrian facilities as part of a coherent circulation system. Minneapolis, where eleven blocks are tied by a second story network of skyways and interior arcades, comes closest to having a complete downtown pedestrian circulation program. However, access to the skyway system from Nicollet Mall requires pedestrians to enter buildings and hunt for a way to get to the second floor. In some cases, prominent signing is a help but the skyway system remains essentially competitive rather than complementary to the mall in terms of pedestrian flow.*

A significant change in use restrictions can be the legalization and encouragement of bicycles on the malls. Bicycles have been allowed on the Nicollet Mall since it opened and bike racks are provided on each block. In Philadelphia, bicycles were not allowed for the first year and a half of operations. Police found their continued presence there a headache but a legal quirk prevented them from issuing tickets to bicyclists. However, in spring 1977 bicycles were officially permitted on the Chestnut Street

*The planned four block extension of the Nicollet Mall will connect sidewalks to existing walking and bicycle paths in a large nearby park.

Transitway, pending UMTA approval. UMTA rejected this change and bikes have been banned again. Bicycles are not allowed on the Portland Mall.

3.6 PEDESTRIAN AMENITIES

A transit mall offers considerable improvements for pedestrians. New sidewalks and amenities account for the overwhelming share of construction costs. As is probably true of all downtown streets, far more pedestrians than bus riders actually use the transit malls. It is the pedestrian improvements which most appeal to the property owners and city agencies, two groups whose support is necessary for mall implementation. Figures 3-15 through 3-18 identify the amenities on each of the three malls.

3.6.1 Sidewalks

One common pedestrian improvement is the use of brick on sidewalks. Bricking is thought to evoke a feeling of repose in the pedestrian and to add to a "European" or "early American" atmosphere. The most extensive use of brick is on the Portland Mall: the sidewalks are constructed entirely of brick, with large bricks used to section off areas of smaller bricks. This sectioning helps break up the expanse of sidewalk and is also used to outline areas reserved for special purposes or amenities. The Portland Mall is unique in continuing the brick onto the corner crosswalks, creating a brick circle with an asphalt center at each intersection. The sidewalks on the Chestnut Street Transitway are also of brick, with cement sectioning. There is a 6 foot concrete strip along the building line. In Minneapolis aggregate rock is the major material used, with bricks employed for sectioning.

Sidewalks are widened on each of the transit malls. In Minneapolis, the 80 foot right-of-way allowed each sidewalk to be widened by 13 feet to an average of 28 feet (20 feet to 36 feet depending on roadway curve). On the narrow 60 foot right-of-way

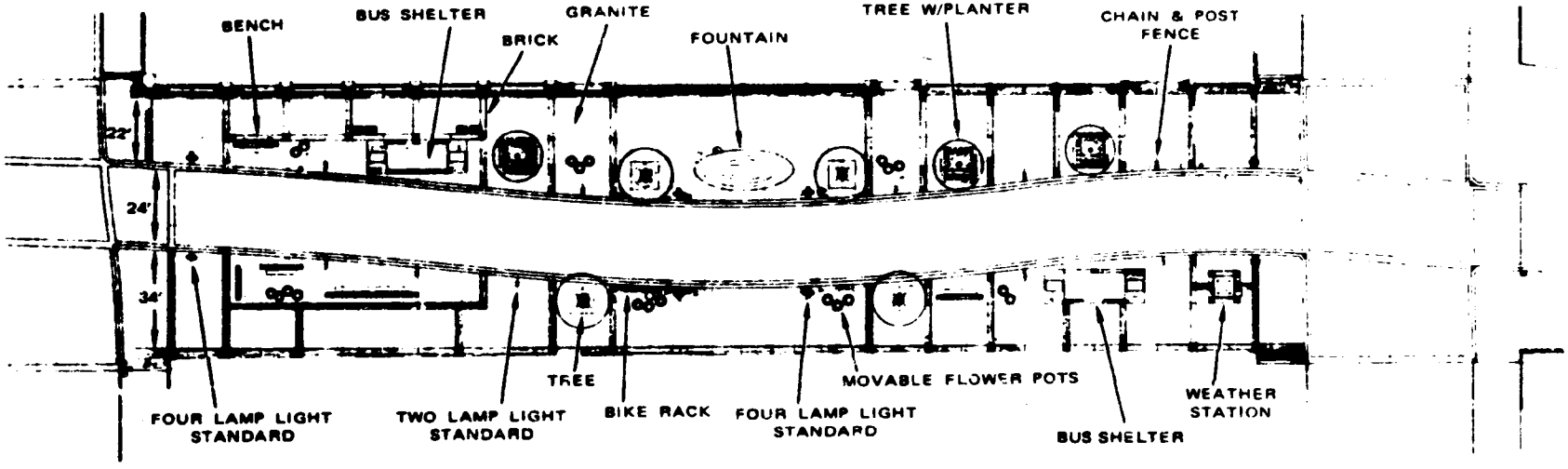


FIGURE 3-15. TYPICAL NICOLLET MALL AMENITIES, MINNEAPOLIS

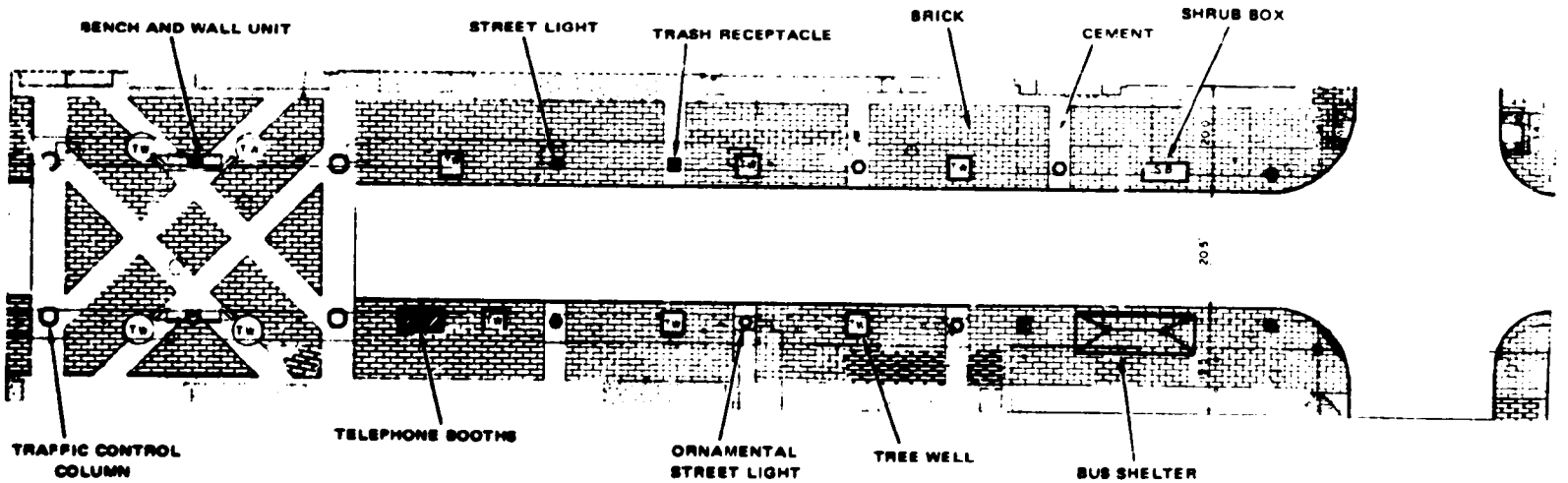


FIGURE 3-16. TYPICAL CHESTNUT STREET TRANSITWAY AMENITIES (HALF-BLOCK VIEW), PHILADELPHIA

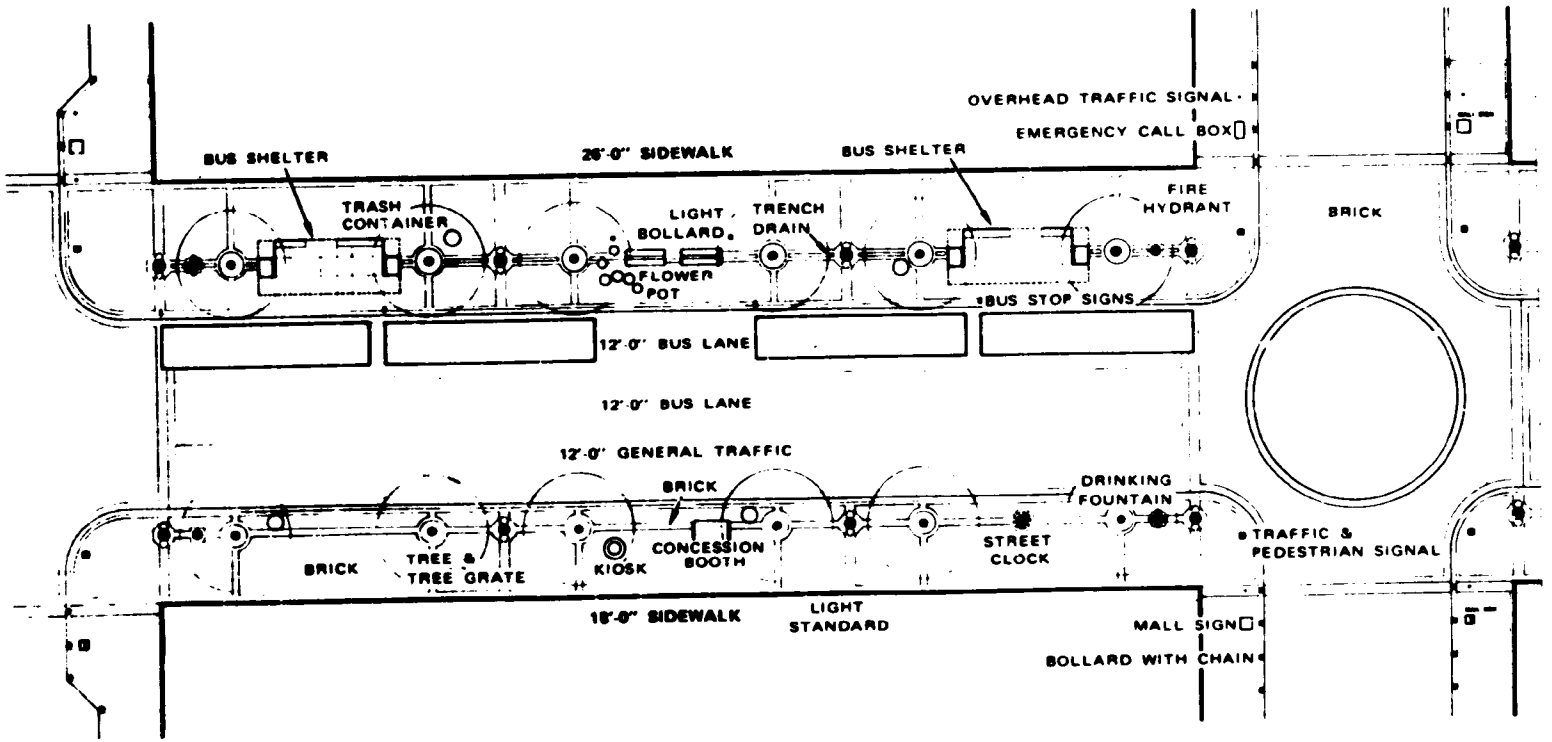


FIGURE 3-17. TYPICAL PORTLAND MALL AMENITIES (THREE LANES)

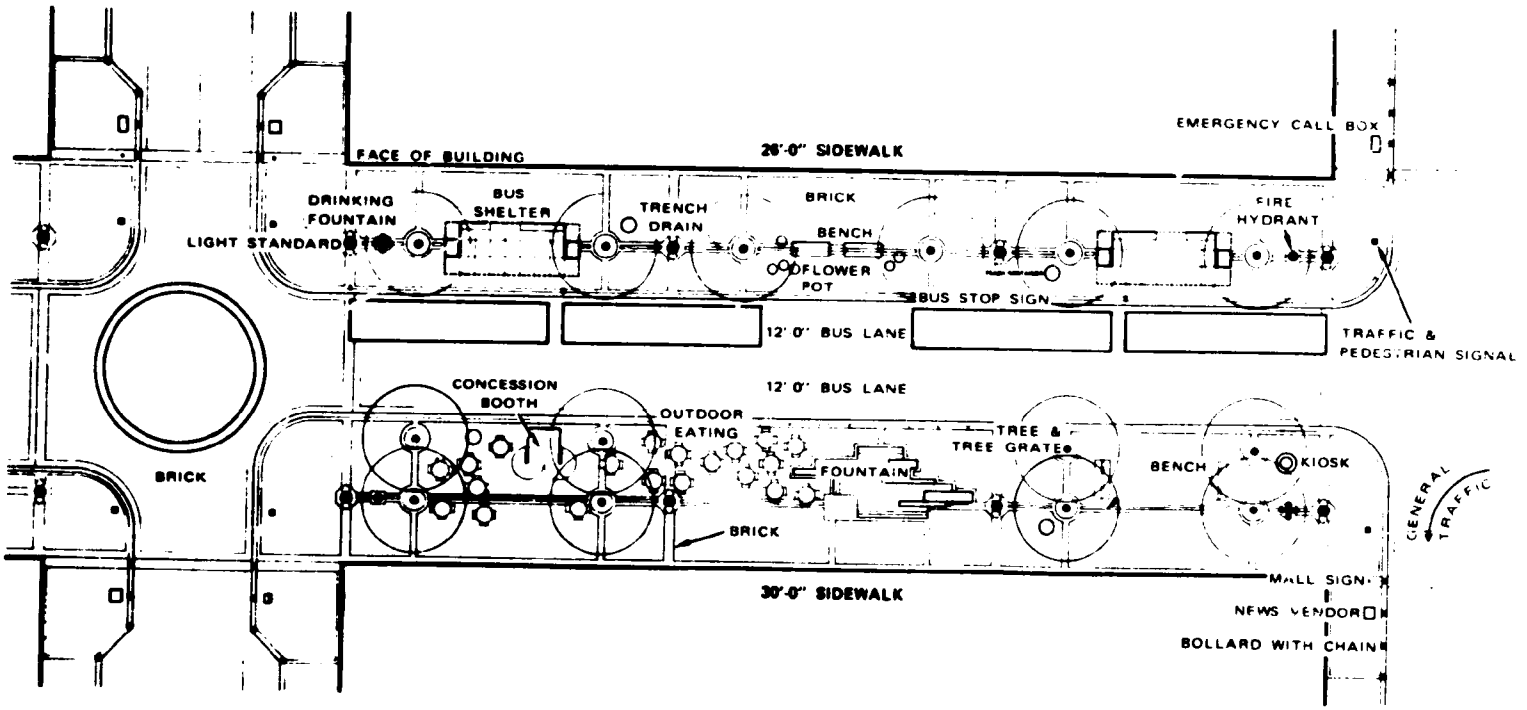


FIGURE 3-18. TYPICAL PORTLAND MALL AMENITIES (TWO LANES)

in Philadelphia, sidewalks could only be widened by 3 feet to a 20-foot width. On the Portland Mall (80 foot right-of-way) the sidewalks on one street side were widened from 15 feet to 26 feet; sidewalks on the other side were widened to either 18 feet or 30 feet, depending on whether the roadway holds two or three lanes.

Because of the space taken up by amenities, and the natural tendency of people to keep an additional distance between themselves and the objects or building fronts they pass, the effective walking width of sidewalks is considerably less than the actual width. Using Fruin's methodology (Ref. 3-10), the effective sidewalk width at a narrow point on the Chestnut Street Transitway is about 9 feet 6 inches, on the Nicollet Mall about 11 feet, and on the Portland Mall about 9 feet on the side with 26 foot sidewalks. There are no data available on the effective sidewalk widths before the transit malls were completed. However, a comparison was made to unimproved Walnut Street (also in Philadelphia). Current conditions on Walnut Street are believed to be comparable to those on Chestnut Street before the transitway. From this analysis it appears that widening Chestnut Street sidewalks by 3 feet resulted in one additional foot of walking space and 2 feet being absorbed by added amenities. Although amenities on the other transit malls are generally bulkier than those in Philadelphia, the sidewalk enlargement was also much greater, which probably results in an even larger net gain for walking space. As will be discussed in Section 4.2, walking room is also improved by the addition of bus shelters on the malls which focus patron waiting outside the pedestrian walking path.

3.6.2 Landscaping

Trees and planters are common additions to transit mall sidewalks. On the Nicollet Mall between seven and twenty trees per block are in place in a casual, offset arrangement along the curb. About four trees per block are in the center of flower beds enclosed by 3 foot walls. Movable flower boxes are also used, generally in groupings of three. The Chestnut Street Transitway follows a more

formal design with 16 trees (eight per side) arranged in a row. The use of large marble shrub boxes also contributes to the formal design. Unfortunately, there has been no planting in these boxes and they are frequently used as trash receptacles by passing pedestrians. (Figure 3-24 on page 69 shows one of these planters on Chestnut Street.) This problem may be solved when responsibility for the planters, now in the hands of a contractor, is taken over by the City Park Commission in 1978. Portland, like Philadelphia, has placed its trees (six per side) in a formal row. On blocks where the elimination of the general traffic lane has created 30 foot sidewalks, a double row of trees has been planted. The strict alignment of trees is offset by the scattering of movable flower pots.

3.6.3 Lighting

Street lights are important in providing nighttime visibility and security; they can also be used to add to mall decor. In Minneapolis street lights are very simple in design and use 8 or 16 bulbs which create a "spotlight" effect rather than an even dispersal of light. Portland is using old fashioned light standards which add to the "Victorian" theme of the mall. The Portland Mall appears very well-lit in the evening. The most extensive use of lighting, however, is in Philadelphia. There, a mixture of single globe lamps on mid-block control boxes, 16-globe ornamental lamps, and simple, tall standards with high level sodium vapor bulbs provide for a well-lit thoroughfare.

3.6.4 Street Furniture

An important element in the level of service provided pedestrians is the amount and quality of amenities such as benches, bollards, fountains, kiosks, and the like. Generally speaking, the level of amenity is much higher in Minneapolis and Portland than in Philadelphia. Both the relatively narrow right-of-way and heavy pedestrian volumes limit the amount of space available for amenities on the Chestnut Street Transitway.

From the standpoint of the pedestrian, probably the most useful amenities are street benches. This is clearly the case for the elderly, as well as lunch hour crowds. However, many merchants feel that benches will attract loiterers and do not see benches as a positive addition to the mall. The Philadelphia and Portland malls provide a minimum number of seating spaces. Portland has purchased 54 benches (6 seats each), just over one per block side. On the Chestnut Street Transitway each block has two bench-and-wall units (4 seats each) located at the midblock crossing. Minneapolis, on the other hand, has provided extensive seating. This takes the form of numerous benches (see Figure 3-19) as well as seating space on walls surrounding planters and flagpoles. The seating is well used in good weather especially by the many elderly citizens who use the transit mall.

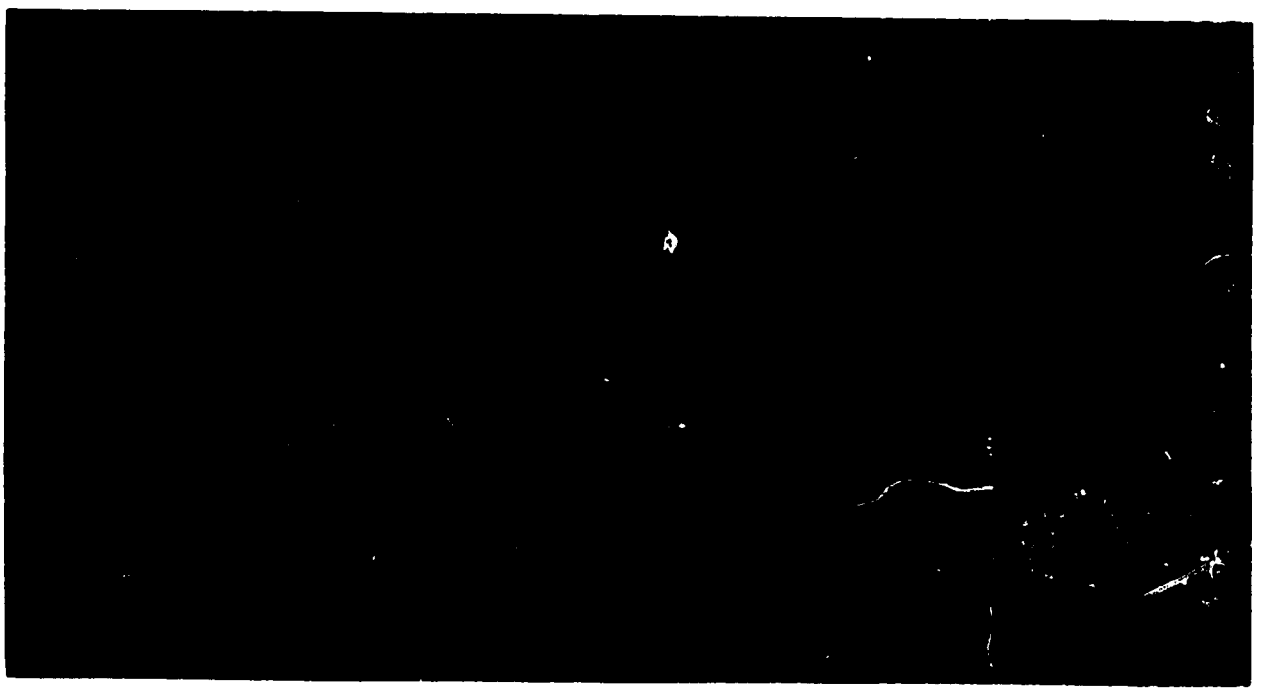


FIGURE 3-19. MINNEAPOLIS BENCHES

Other services are provided for the convenience of pedestrians. In Philadelphia, four telephone booths are in place on each block (although passing buses make hearing difficult) as well as eight decorative trash receptacles. Amenities on the Nicollet Mall are extensive. Electric snow-melting mats imbedded beneath the sidewalks allow ice-free walking during Minnesota's long winters. Information kiosks with store location guides, trash receptacles, bike racks, and a 17-foot four-sided clock with its workings displayed add to the level of pedestrian convenience. The Portland Mall includes most conveniences found on the other malls plus drinking fountains which are a trandition in downtown Portland (see Figure 3-20).

FIGURE 3-20. A DRINK OF WATER ON THE PORTLAND MALL

Both the Nicollet Mall and the Portland Mall include amenities designed to attract new pedestrians for specific purposes. Two concession and information stands are planned for the Portland Mall. The Nicollet Mall includes an old fashioned popcorn truck, a self-service post office, and a large weather station which broadcasts a recorded message. Specially designed newspaper dispensers are in place on all the transit malls. In a few situations, private restaurants and cafes have added outdoor seating on the transit mall sidewalks.

Finally, there are some amenities which are simply an attempt to beautify the malls. The decorative bollards and chain-and-post fences in Portland and Minneapolis fall into this category (although they also serve to direct pedestrians to use legal crossings). Flagpoles also add to the atmosphere. This is particularly effective on the Chestnut Street Transitway where a large American flag flies from each tall light standard. This not only carries the mall atmosphere into the vertical dimension but adds a touch of gaiety. In Minneapolis and Portland, water fountains are a major decorative addition. On the Nicollet Mall, six lighted fountains exist, several heated to prevent freezing in winter. Five fountains have been added to the Portland Mall, along with eleven sculptures. The entrance to the mall at Burnside Street has a 20-foot diameter pool surrounding a 23-foot-high kinetic water sculpture.

The combination of sidewalk improvements, landscaping, lighting, street furniture, and other amenities yields a transit mall "atmosphere" which is different in each city. The Portland Mall has a Victorian theme carried out in the bus shelters, drinking fountains, and light standards on each block. These amenities serve to buffer the pedestrian from street noises, and modern sculptures and moveable flower pots add a relaxed air to the otherwise more formal atmosphere. On the Nicollet Mall, paving, light standards, and the curving roadway provide a continuity; however, it is the uniqueness of each block which stands out. Residents are able to refer to "the block with the clock"

or "the block with the sidewalk cafe." There are sufficient amenities to provide some buffer between pedestrian and roadway. The overall atmosphere is more reminiscent of casual suburban shopping malls than is the case in the other cities. Philadelphia's Chestnut Street Transitway resembles a formal parade route with flags, strict spacing of trees, and marble-faced planters and trash receptacles. However, the mid-block crossings add a more casual touch. Because of the narrow right-of-way and budgetary considerations, it was not possible to add enough amenities to form a buffer between pedestrian and roadway.

3.6.5 Summary

Chapter 6 of this report evaluates the impact of sidewalk improvements on pedestrian circulation and comfort. However, at this point several observations on the level of pedestrian amenity are warranted. First, every effort was made to create a "quality" product. Each mall qualifies as a downtown showcase. Two of the cities, Minneapolis and Portland, now use the malls in advertisements as symbols of their cities, much as Times Square is used as a symbol of New York. Second, it is clear that far more effort, and expense, was devoted to improving the pedestrian environment (by means of bricks, fountains, plants, and the like) than to improving pedestrian convenience. This is particularly true of the malls in Portland and Philadelphia. This may reflect the fact that the major objective of sidewalk improvement was to draw shoppers to the malls and only secondarily to improve the walking mode of transportation. Finally, each mall achieves a unique atmosphere. Not only is each mall different from the others, but each tends to have a more urban character than outlying shopping malls. This is an important difference to emphasize along with other differences such as variety of merchandise, since core retail districts can seldom compete with shopping malls in the areas of easy highway access, free parking, and enclosed, climate-controlled walkways.

3.7 ECONOMIC CONDITIONS

3.7.1 Transit Mall Economic Conditions

The promise of increased retail sales and other signs of economic growth is the primary reason for business backing of transit mall projects. A potential increase in local sales and property tax revenue can also be a justification for local government support. Since the Portland Mall did not formally open until March 1978, this report will focus on trends in Minneapolis and Philadelphia. Of these two, Philadelphia may be the more important since the ten year span since completion of the Nicollet Mall in Minneapolis makes it difficult to separate out the impact of other improvements (e.g., the skyway system).

Economic activities on the two transit malls are similar. The Nicollet Mall has four major department stores; there is only one on the Philadelphia Transitway. Both malls have a Woolworth store. About 14 percent of transitway businesses are eating/drinking establishments versus 7 percent on the Nicollet Mall. Office buildings, government buildings, movies, hotels, and parking facilities represent 10-15 percent of the establishments on both malls Ref. 3-2, 3-11). Prior to the transit malls, both Nicollet Avenue and Chestnut Street were considered the quality shopping streets in the two cities, and both are located at the center of the downtown retail districts.

The downtown retail shops in both cities serve large numbers of CBD employees (about 300,000 in Philadelphia and 95,000 in Minneapolis) as well as central city residents. A recent survey of downtown Minneapolis shoppers indicated 28 percent were downtown workers. About one-half of those shoppers who did not work downtown lived in the city of Minneapolis (Ref. 3-12). Stores on the Chestnut Street Transitway are believed to be heavily dependent on downtown workers and central city residents. CBD employment is believed increasing in both cities. Downtown residential population in both cities may also be reversing long-term declines. Fashionable neighborhoods of townhouses south of

Chestnut Street have undergone extensive renovation and repopulation in recent years. Minneapolis has constructed a large elderly housing project northwest of the mall and an extensive mixed-income condominum project is under construction three blocks south of the mall.

However, despite these favorable new signs of growth, the general economic conditions in downtown Minneapolis and Center City Philadelphia had been in decline prior to construction of the transit malls. Figures 3-21 and 3-22 show that since World War II CBD retail sales were virtually unchanged in Minneapolis (1947-1967) and Philadelphia (1947-1972), and actually declined in comparison to price increases and in comparison to city-wide and SMSA sales patterns.

3.7.2 Promotion

The most impressive promotional campaigns have been undertaken on the Nicollet Mall under the leadership of the Downtown Council, the businessmen's group responsible for originating the mall idea. Activities range from fashion shows and parades to special shopper nights and sidewalk fairs on the mall. These promotional activities are made possible by a reservoir of good will among local businessmen and between business and government which approaches a "small town" atmosphere. In part this is due to the fact that many firms use Minneapolis as a home base and have deep roots in the area. It is also due to a history of cooperation encompassing the mall, the skyway system, and redevelopment projects. In addition, many property owners have already made a significant investment in the downtown, and they know that retrieving that investment requires continued cooperation.

No organized promotional program has occurred in Philadelphia. In Portland, where the transit mall also received strong backing from a businessmen's group, promotional activities have already begun. The "Artquake," a street fair designed to celebrate mall artwork, was organized by several groups including the mall owner,

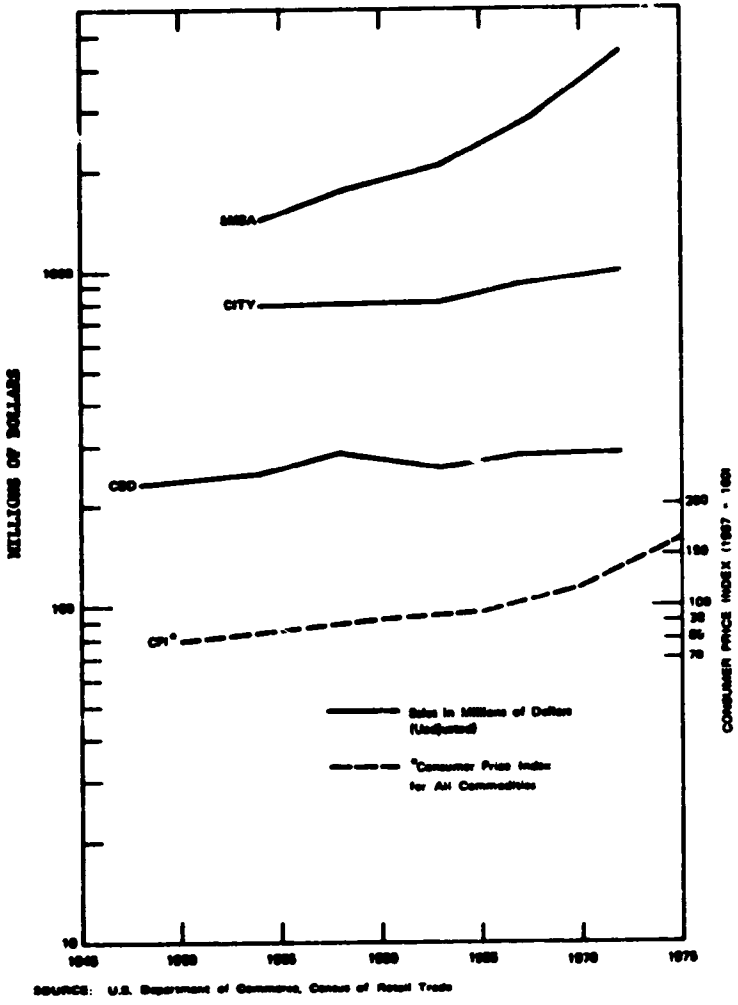


FIGURE 3-21, MINNEAPOLIS RETAIL SALES

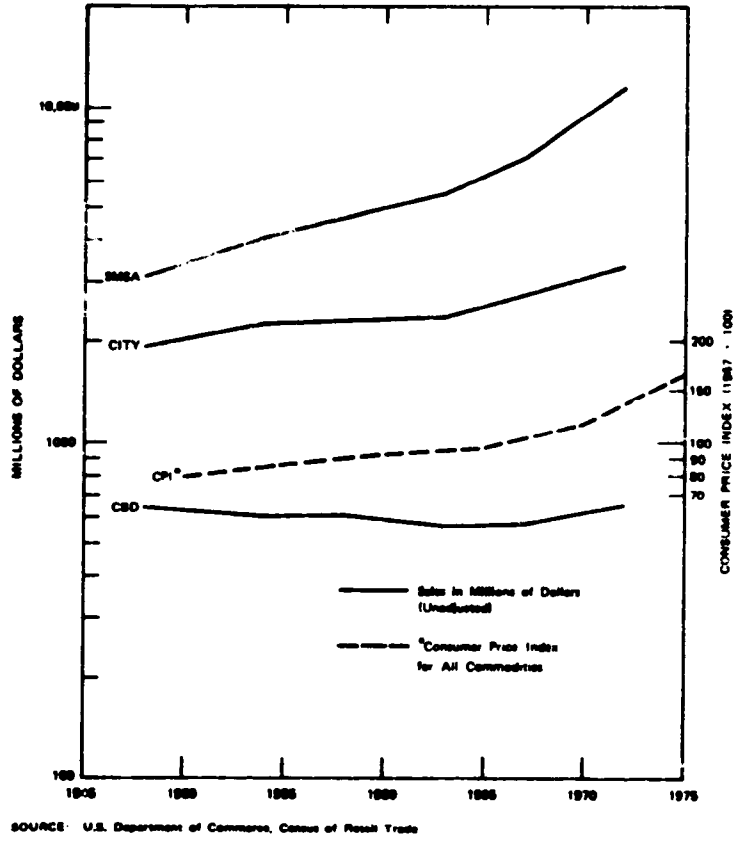


FIGURE 3-22. PHILADELPHIA RETAIL SALES

Tri-Met. Tri-Met also organized a "grand opening" celebration. Long-term retail promotional efforts in Portland are limited by the fact that the mall only intersects the retail core, rather than running its length as do the malls in Minneapolis and Philadelphia.

3.8 TRANSIT MALL COSTS

The issue of cost is the most important obstacle to building a mall, and afterwards, to continuing maintenance of the mall. Analysis of these costs is extremely difficult; local and regional differences in prices and wage rates, inflation since mall construction, and the vagaries of the competitive bidding process all limit transferability. In addition, much cost data are either unavailable or categorized in a fashion which makes analysis impossible. Maintenance costs are extremely difficult to come by, in part because responsibility for maintenance is usually divided among several different groups or agencies.

3.8.1 Construction Costs

Total construction costs, cost per square foot including roadway area, and funding source for the three malls are shown below.

Portland Mall (1978)

$15,000,000 ($33 per square foot)

UMTA capital grant (80 percent), Tri-Met Transit Authority (20 percent)

Chestnut Street Transitway (Philadelphia) (1976)

$7,000,000 ($22 per square foot)

UMTA capital grant (80 percent), State DOT (17 percent), City capital funds (3 percent)

Nicollet Mall (Minneapolis) (1967)

$3,800,000 ($15 per square foot)

UMTA demonstration grant (13 percent), Urban Beautification grant (13 percent), assessments on property owners (74 percent)

Nicollet Mall Extension (Minneapolis) (scheduled completion 1979)

$2,800,000 ($22 per square foot)

Assessments on property owners (85-90 percent)
MTC transit authority (10-15 percent)

Tables 3-1 and 3-2 present the cost of amenities on the Portland and Philadelphia malls. (No such data are available for the Minneapolis mall.) In both cities, these costs represent between 18 and 20 percent of total mall costs. Item by item costs vary considerably between the two malls, largely related to differences in quality. Philadelphia's bench-and-wall units, marble-faced planters and trash receptacles were very expensive. Portland, on the other hand, spent nearly $90,000 a piece for five fountains. Even excluding the television display, Portland's shelters cost $42,000 each, while Philadelphia, using a much simpler design, spent less than $10,000 each. Lighting tended to be a major expense in both cities, largely because of the quantity of light standards needed.

Some of the items which add to pedestrian convenience can be relatively inexpensive. For instance, Portland's 6-seat benches cost only about $1,400 each. A total of 324 seating spaces cost considerably less than one fountain.

Detailed data are not available for the costs (80 percent of total) not shown in Tables 3-1 and 3-2. However, two general comments were made by officials in all three cities. First, labor usually accounts for the largest share of construction costs. Much of the work on rebuilding sidewalks is particularly labor-intensive. Second, the relocation of underground utilities should be avoided if possible. Not only is this work labor-intensive, it tends to prolong the construction period. This was clearly the case in Portland, where the roadway had to be lowered to accomodate sloping sidewalks.

TABLE 3-1. COST OF PORTLAND MALL ELEMENTS (1978)

	Description	Cost/Item	Total Cost
A.	**Street Furniture & Structures**		
1.	Benches (54)	$1,370	$ 74,000
2.	Bicycle Rack Bollards (38)	921	35,000
3.	Newspaper Dispensers (38)	1,000	38,000
4.	Trash Containers (112)	800	89,600
5.	Flag Poles (2)	12,500	25,000
6.	Banner Poles (42)	476	20,000
7.	Light Bollards (83)	1,687	140,000
8.	Concession & Info. Stand (2)	15,000	30,000
9.	Newsstand (3)	2,100	6,300
10.	Display Kiosk (4)	5,000	20,000
11.	Poster Kiosk (4)	3,600	14,400
12.	Bulletin Board Kiosk (2)	1,200	2,400
13.	Artworks	N/A	250,000
14.	Fountains (5)	60,000-138,000	444,000
		Subtotal	$1,188,700
B.	**Landscaping**		
1.	Trees, Lawn & Soil Preparation	--	89,500
2.	Sprinkler Irrigation System	--	15,000
3.	Planters		
	4' diameter (67)	800	53,600
	6' diameter (31)	1,500	46,500
		Subtotal	$204,600
C.	**Bus Shelters**		
	Passengers Shelters (32)	$41,720	$1,335,000
		Subtotal	$1,335,000
D.	**Transit Information System**		
1.	CRT (television) System Complete	--	$189,000
2.	Underground Conduct & Wiring	--	40,000
3.	Trip Planning Kiosks (8)	11,250	90,000
		Subtotal	$319,000
		TOTAL	$3,047,300

TABLE 3-2. COST OF CHESTNUT STREET TRANSITWAY ELEMENTS (1976)

Description	Cost/Item	Total Cost
A. Street Furniture & Structures		
1. Benches		
Bench & Wall Units (16)	$3,600-4,000	$ 60,800
Bench Unit (6)	450	2,700
2. Trash Containers (105)	1,000-2,000	150,000
3. Light Bollards		
Street Lights (28' pole) (102)	749	76,400
Mall Ornamental Lights (13' pole) (128)	2,441	312,450
Side Street Ornamental Lights (11' pole) (46)	912	41,950
4. Mid-Block Traffic Control Columns		
With Controller (8)	18,312	146,500
With Cabinet (8)	6,830	54,650
Empty (16)	6,639	106,200
	Subtotal	$951,650
B. Landscaping		
1. Trees (215)	$273-390	$73,681
2. Tree Wells & Grates (182)	375-600	76,650
3. Planters		
Planter Box (37)	2,100-3,[illegible]00	96,200
Planter Well (3)	1,800-2,[illegible]00	6,450
Shrub Box (15)	4,850	5[illegible],400
	Subtotal	$304,381
C. Bus Shelters		
1. Mall Shelters (23)	$9,257	$212,900
2. Side Street Shelters (8)	9,874	79,000
	Subtotal	$291,900
	TOTAL	$1,547,931

3.8.2 Maintenance Costs

A successful transit mall is more than just a static set of capital improvements that carry buses and pedestrians. There is also a "process" component to a transit mall that may include a promotional effort (see Section 3.7.2), police enforcement (see Section 5.4), and maintenance. Often, these factors are not carefully considered ahead of time. This is certainly true in the case of maintenance, where the agencies responsible for mall cleaning and repair may not even be identified until the mall is well into the construction phase. Few, if any, maintenance cost estimates are provided before mall completion.

In Minneapolis, maintenance is the responsibility of the property owners' assessment district. This includes maintenance of bus shelters. In Philadelphia, major maintenance is divided among City departments; SEPTA, the regional transit suthority, maintains the bus shelters on a voluntary basis. Portland has developed a maintenance program in which the City is responsible for normal street and sidewalk cleaning, Tri-Met for maintaining bus shelters and information kiosks, and property owners for snow removal and repair of sidewalks.

Because of its ten year history, the Nicollet Mall has had the most experience with maintenance problems and costs. The maintenance budget is presented in Table 3-3. The annual expense is now approaching $500,000, with $39,000 provided by the City in lieu of normal upkeep. The proposed 1977 maintenance budget indicates sharp cuts in the various cleaning and sweeping categories and sidewalk and roadway repair items. This is the result of recommendations by a special committee of property owners in the assessment district. Others in the city feel that deferred repair and upkeep may lead to more serious problems in the future. The largest single expenditure in Minneapolis is for electricity. This is true of other malls with heavy energy uses (extensive lighting, fountains, snow-melting mats, etc.). As the Nicollet Mall ages, sidewalk repair is becoming a constant problem (see Figure 3-23) and represents nearly 10 percent of the annual budget.

TABLE 3-3. NICOLLET MALL MAINTENANCE BUDGET

	1976 Proposed Budget
LABOR	
Sweeping & Cleaning	$ 59,088
Snow Removal	8,058
Planting & Plant Maintenance	29,544
Minor Maintenance of Structures/Fixtures	13,429
Cleaning of Structures & Fixtures	24,173
Subtotal Labor	$134,292
OTHER COSTS	
Repair of Streets & Crosswalks	10,427
Repair of Sidewalks	55,013
Repair of Structures & Fixtures	17,236
Repair & Replace Lighting	14,222
Repair & Replace Heating Mat System	46,421
Repair General Electrical System	5,401
Christmas Tree Lighting & Decorations	25,515
Replace & Repair Trees & Shrubs	1,043
Music Rental	1,251
Electricity	107,892
Advisory Board Expenses	2,085
Sweeping & Cleaning	24,944
Snow Removal	4,397
Planting & Plant Maintenance	33,266
Minor Maintenance of Structures & Fixtures	3,592
Cleaning of Structures & Fixtures	6,596
Subtotal Other	$359,301
TOTAL	$493,593

Day-to-day sweeping and cleaning represent about 16 percent of the Nicollet Mall maintenance budget, largely in labor costs. Trash is collected three times a week and large motorized sweepers are run on the sidewalks each morning. The mall appears very clean.

FIGURE 3-23. NICOLLET MALL (MINNEAPOLIS) SIDEWALK DETERIORATION

By contrast, litter is a problem on Philadelphia's Chestnut Street Transitway despite trash collection three times daily and a once daily street wash and broom sweep. This difference between the cities is largely explained by the heavier pedestrian volume on the Chestnut Street Transitway. However, the design of the trash receptacles contributes to the problem. Despite the bulky granite and marble exteriors, the actual trash bins are quite small. A newspaper stuffed in a bin will appear to fill it and cause the accumulation of litter on and around the receptacle. The shrub boxes which do not contain plants are also used as trash receptacles (see Figure 3-24). City officials are aware of the litter problem.

Trash Receptacle

Shrub box

FIGURE 3-24. CHESTNUT STREET TRANSITWAY LITTER (PHILADELPHIA)

In terms of the City's responsibilities, maintenance and repair raise an important question of priorities -- whether it is more important to keep up the "best street," or to allocate scarce resources to other streets in the city that may be in much worse condition. The creation of an assessment district for maintenance has been suggested, but there appears to be little support for the idea. An additional problem in Philadelphia was the choice of a latex cement, for part of the transitway, over the vaults underneath the sidewalks. The material proved to be inadequate and extensive repairs were necessary.

Portland attempted to avoid expensive sidewalk repair by selecting high quality materials. One and a half inch sidewalk bricks have a "high compressive strength" and are believed to be as strong as standard concrete sidewalks. Bricks used in the streets at intersections are 2½ inches thick. Granite, which also has a very high compressive strength, was used for curbs, gutters, and for trim at the intersections. Some problems arose

during construction. Cracks in some sections of granite appeared due to an inadequate base under the granite. Some of the street and sidewalk bricks have also cracked, although it is not yet clear whether this is a matter of faulty design or installation (Ref. 3-13). Property owners are not responsible for repairs during the construction period. Maintenance of the bus shelters and trip planning kiosks currently costs Tri-Met about $17,000 per year. The Portland Mall appears exceptionally clean.

The city of Minneapolis' contribution in lieu of normal street maintenance represents less than 10 percent of the total mall maintenance budget. This may overstate the added expense of a typical mall; nevertheless, it appears clear that transit malls pose relatively expensive maintenance problems. One reason may simply be that the malls are better maintained than regular streets. From observation, this appears to be true. As a Portland newspaperman noted, "the trash may be the same as in the pre-mall days, but the effect might seem worse in light of the new face ..." (Ref. 3-13). Thus there is a pressure to keep maintenance at the same level of quality as the capital improvements. Any increase in pedestrian volumes brought about by the mall contributes to the problem by increasing the amount of litter. There are some built-in expenses not shared by a normal street. In a period of rising utility rates, improved street lighting, snow-melting mats, fountains, and other energy users can add up to a sizable electricity bill. Likewise, gardeners are needed to care for the plantings and the cleaning bill for sidewalk furniture and structures may be higher simply because there are more things to clean than before the mall. Finally, each of the transit malls studied has been forced to repair its sidewalks fairly soon after construction was completed. In most cases this expense could have been avoided through improved installation or a better selection of materials.

3.0 SUMMARY

This report examines three American transit malls. The earliest transit mall, Minneapolis' Nicollet Mall, was completed in 1967. It is a two-lane two-directional busway encompassing eight blocks of Nicollet Avenue. Philadelphia's twelve-block Chestnut Street Transitway is also a two-lane two-directional busway, completed in 1976. The Portland Mall, opened in March 1978, includes twelve blocks on each of two parallel downtown streets (Fifth and Sixth Avenues). Each street has two exclusive bus lanes and, on three out of every four blocks, a lane for general traffic. Additional transit mall highlights are listed below.

1. Transit malls are usually located on major retail streets and include the downtown blocks with the heaviest pedestrian volumes (up to 3,000 persons per block side per hour). Improving retail sales was the major objective of the transit malls in Philadelphia and Minneapolis.
2. Sponsors, responsible for mall design and implementation, typically include downtown business interests, city government, and the regional transit authority. The relative influence of these three groups varies from city-to-city.
3. Philadelphia is the only transit-oriented city of the three cities, based on mode split to downtown. However, ridership is up in the Minneapolis and Portland areas. Other downtown transit improvements include a Dime Zone (Minneapolis) or Free Fare Zone (Portland) and two contraflow bus lanes (Minneapolis).
4. Each city has rerouted buses to the transit malls. At peak-hour, the number of buses on the Portland Mall has risen from 127 to 333, on the Nicollet Mall (Minneapolis) from less than 40 to 105, and on the Chestnut Street Transitway from 43 to 54. Each of these is a two-direction count.
5. Service for waiting bus patrons is improved. Shelters have been added on each mall. In Minneapolis and Portland, the shelters are enclosed, and in Minneapolis the shelters are heated and provided with piped music. Outdoor waiting space is also increased, particularly in Minneapolis. Transit information is also provided. In Portland, this includes sidewalk trip planning kiosks and CRT television displays of schedule information inside the shelters.

6. Usually, the street selected for a transit mall is a major, but not the most important downtown traffic artery. Daily traffic volume before the malls ranged from 6,800 on Minneapolis' Nicollet Avenue to about 12,000 on Philadelphia's Chestnut Street and 13,500 on Sixth Avenue in Portland. Only in Philadelphia is a highway off-ramp located close to the transit mall.

7. A traffic diversion strategy usually includes signing and sometimes concrete medians to direct traffic away from the malls. Prominent entrances may alert motorists to special conditions. Where a preferred alternate route has been selected, as in Philadelphia, resignalization and left-turn lanes can be used to encourage motorists to use this route.

8. Loading zones are provided either on rear alleys or by creating full- or partial-block loading zones on cross-streets. Although on-street parking is eliminated on transit malls, no additional parking facilities have been added as part of a mall project. Existing capacity was deemed sufficient in each city. General traffic is allowed access to parking facilities which only have entrances on the mall itself.

9. Improvements which benefit pedestrian circulation include mid-block crossings and ramps for wheelchairs. In Minneapolis, proximity of the mall to an elevated pedestrian walkway and a future direct connection to park and bicycle paths provide the basis for a full pedestrian circulation system.

10. The amount of amenities provided for pedestrians on transit malls is typically very high, including widened brick sidewalks, street furniture, landscaping, artwork, fountains, and better lighting. Benches, phone booths and similar items add to pedestrian convenience. Artwork and landscaping contribute to an aesthetic atmosphere. Items such as a self-service post office provide a service that may attract new pedestrians for a specific purpose.

11. In Minneapolis and Philadelphia pre-mall economic conditions in the form of retail sales were stagnant, although pre-mall downtown employment was increasing. In Minneapolis a promotional effort is viewed as an important corollary to the physical improvement of the mall itself.

12. Construction costs of recently completed malls range from $22 per square foot ($7 million total) in Philadelphia to $33 per square foot ($15 million total) in Portland. Major expenses are labor costs and sometimes the relocation of underground utilities. Amenities account for only about 20 percent of total costs. Within this category, more is spent for items contributing to the mall atmosphere (landscaping, fountains, etc.) than for pedestrian convenience (benches, improved lighting, etc.)

13. UMTA capital grants were a major source of funds, accounting for 80 percent of the total cost of the malls in Portland and Philadelphia. In Portland, the local share was paid by the transit authority while in Philadelphia a combination of State DOT and City capital funds were used. In Minneapolis, 74 percent of costs were assumed by a property owners assessment district, with the remaining 26 percent split between an UMTA demonstration grant and a federal Urban Beautification grant.

14. Annual maintenance cost of the Minneapolis mall is nearly $500,000, or over $60,000 per block. Major expenses include labor for cleaning, electricity for lighting and other amenities, and sidewalk repair. Sidewalk repair was necessary in each city, partly due to the use of faulty materials. Maintenance costs are also higher than on unimproved streets due to a higher level of upkeep, a larger quantity of amenities to maintain, and possibly increased pedestrian use.

4 IMPACT ON TRANSIT

4.1 INTRODUCTION

4.1.1 Objectives

One set of objectives in building transit malls is to improve various aspects of transit service. Certainly the federal, state and local transportation agencies which provided partial funding for the malls under study intended that transit service would be improved.

The communities examined vary in the priority attached to transit objectives, although all three accept them to some degree. Property owners on the Nicollet Mall favored transit use as a way to link the retail center with most parts of Minneapolis. Improvement of bus service and operations is viewed as a fortunate side effect, incidental to the primary purpose of improving the retail environment. Philadelphia also places a higher priority on the atmosphere for shopping and walking than on transit service. Yet a key factor in the speedy completion of the transitway was concern over circulation problems generated by crowds expected in the Bicentennial year of 1976.

Only in Portland is improved transit service given the highest priority. The transit malls are key elements in the City's 1972 "Parking and Circulation Policy," which in turn is integrated with other core improvements in the City's adopted "Downtown Plan." The objectives of improved transit service, concentration of development in the downtown core near the mall, and reduction of air pollution are all seen as mutually supporting and served by the mall. The mall's purpose is further discussed in the Environmental Impact Statement (EIS) (December 1975), which mentions that the mall is intended to:

1. Minimize conflicts among auto, bus and pedestrian traffic while providing efficient transportation for shoppers and commuters into the CBD;
2. Make bus travel as efficient and convenient as possible because mass transportation promotes better land uses, and is less energy-consumptive and less polluting than automobile travel;
3. Encourage bus travel while discouraging travel by automobile;
4. Make bus travel faster;
5. Make transfers easier;
6. Make the route system more comprehensible; and
7. Provide an environment inviting to residents and visitors, thereby benefiting downtown businesses and making the downtown more competitive with suburban locations.

The EIS also notes that the mall was not in accordance with the existing regional transportation plan adopted in July 1969, which did not reflect the recent renewed interest in public transportation. An "Interim Transportation Plan," adopted by the Columbia Regional Association of Governments (CRAG) in June 1975, reflected this change in thinking.

4.1.2 Issues

This section of the evaluation focuses on a number of transit-related issues. First, does bus travel time decrease on a transit mall? Many planners assume that the elimination of auto traffic will allow bus speeds to increase. On the other hand, other components of transit malls, such as more frequent stops or mall physical design, may slow down buses.

A closely related issue is bus travel reliability. Again it is assumed that elimination of congestion caused by auto traffic will permit improved schedule adherence, by allowing more stable bus flow and reduced trip time.

Third, if bus speed and reliability are sufficiently improved, can fewer buses be scheduled to provide the same frequency of service? This would be an increase in productivity.

Conversion to a transit mall may increase the capacity of

a street for carrying transit traffic. Higher bus volumes may be possible due to lack of competition from general traffic or improved loading and unloading facilities.

Fifth, coverage and convenience to trip ends may be improved, since transit malls are often associated with bus line rerouting. On the other hand, this rerouting could cause inconvenience for some users and a possible reduction in coverage.

Transit malls may improve understandability of the transit system by providing a focus to transit service and by providing route information and prominent street identification on bus shelters.

Finally, project backers in all cities hope that an increase in passenger volumes will result from improvements in transit service and operations and an economically healthy and physically attractive downtown. An additional issue, the impact of bus shelters on the level of service for waiting patrons, is discussed in this chapter.

4.1.3 Data Collection

Due to the after-the-fact nature of the evaluation, available data were limited. Many desired transit company records do not exist or are otherwise unavailable. As a result, two studies were performed: a sidewalk trip time study in Minneapolis and on-bus measurement studies in Minneapolis and Philadelphia. These are described in detail in Appendices A and B. The trip time study consisted of having observers placed at both ends of Minneapolis' Nicollet Mall and two nearby streets, record the time that each bus passed, along with each bus route and I.D. number. A nearly identical study was conducted in Philadelphia by the Philadelphia Department of Public Property. The on-bus measurements were taken by two observers on each of a sample of buses on the transit malls and nearby streets. Data were gathered on trip time, total time spent moving, and

total time spent loading. Total idle time, or time spent stopped for reasons other than loading, was calculated by subtracting moving plus loading time from trip time. In addition, on/off counts were recorded by block. When available, the evaluation in this section also employs route maps and schedules, existing on/off passenger counts, results from local surveys of downtown workers or pedestrians, records on signal timing, and similar data. The Portland Mall began regular operation too late for this analysis, although some initial information, largely impressionistic, is available on bus speed. There are also data relating to the issues of coverage, capacity, and understandability.

4.2 IMPACTS ON TRANSIT SERVICE

4.2.1 Bus Speed

In their UMTA grant applications, both Philadelphia and Portland stated that expected reduction in bus travel time was an important motivation for building their transit malls. It was logically assumed that the elimination of delays due to auto congestion would result in lower overall trip time. On the other hand, buses might be slowed down by design factors (e.g., a curved roadway), by longer loading times due to increased patronage, by inadequate signalization, or by concern over the safety of jaywalkers.

4.2.1.1 Philadelphia - Table 4-1 shows average bus trip times on the Chestnut Street Transitway and parallel Walnut Street. Walnut Street is used here as a comparison street since it is similar to pre-mall Chestnut Street, and is used by the same bus routes that use Chestnut Street. The results suggest differences by direction and time of day. The D line, which runs east on the transitway and returns westbound on Walnut Street,

TABLE 4-1. PHILADELPHIA TRIP TIMES
(July 1977)

Line and Time Period	Street and Direction	Average Travel Time (mins.)	Average Speed (mph)	Std. Dev. of Travel Time (mins.)	Number of Runs	Difference in Time* (Walnut - Transitway) (mins.)
D 7-9 AM	Transitway, eastbound	8.1	6.2	1.38	49	-1.4 ± 0.7**
	Walnut, westbound	6.7	7.5	1.54	32	
D 4-6 PM	Transitway, eastbound	8.7	5.7	.70	22	-1.1 ± 0.5
	Walnut, westbound	7.6	6.6	.99	22	
42 7-9 AM	Transitway, eastbound	8.3	6.0	1.25	31	0.5 ± 0.7
	Walnut, westbound	8.8	5.7	1.32	28	
42 4-6 PM	Transitway, eastbound	8.6	5.8	0.69	16	0.8 ± 1.1
	Walnut, westbound	9.4	5.3	1.79	14	

*Positive values indicate trip times longer than those on the Chestnut Street Transitway, negative values trip times shorter than on Chestnut.

**95% confidence interval.

Source: Philadelphia Department of Public Property. Measurements on Transitway from 8th to 18th Streets on Walnut from 7th to 17th. PM measurements from one day, AM on two days.

appears to have a slower travel speed while on the transitway. This is more noticeable in the AM period, when the D buses are probably delayed by having to deliver commuters on the mall, than in the PM period when buses are delayed picking up commuters on Walnut Street. Nevertheless, the difference exists at both time periods.

The 42 line once used Walnut Street exclusively for the westbound journey. Since 1976, however, the westbound 42 line has been rerouted to use the transitway between 7th and 17th Streets. The figures in Table 4-1 represent the difference between the time noted at 7th and Walnut Streets (before shifting to the transitway) and 17th and Walnut Streets (after returning from the transitway). The rerouting of the 42 line buses to the transitway adds two blocks and four difficult turning movements to the 42's route. Although the 42's eastbound travel times are similar to the D's (both on the transitway), the 42's westbound travel times are much longer. It is clear that the time added by the rerouting is not made up by any time savings while on the transitway.

Pre- and post-transitway time checks by the transit operator, SEPTA, show increased trip times on Chestnut Street (the transitway plus seven non-mall blocks) since fall 1975 (see Table 4-2). About the same amount of increased trip time occurs on an equivalent length of Walnut Street. Some observers believe that the longer trip times are due to reduced service frequencies which cause longer loading times. However, trip times on the non-downtown portion of the D and 42 routes, not shown in Table 4-2, have stayed the same or fallen since 1975. One SEPTA official believes that the transitway has indirectly caused delays on both Chestnut and Walnut Streets. He cites bus delays on the eastern approach to the transitway (20th-18th Streets) as autos attempt to divert from Chestnut Street, and also points to delays on Walnut Street created by the difficult turning movements of the 42 line buses as they leave and reenter the street. Note that both before and after the transitway,

buses moved more slowly on Chestnut Street than on Walnut Street. Thus, the longer trip times on the transitway noted earlier might simply mean "no change" in relative speed on the two streets.

TABLE 4-2. SEPTA TIME CHECKS, 1975 - 1977

Route and Year	Chestnut Street, Eastbound 20th to Dock (Minutes) 8-9AM	12-3PM	4:30-5:30PM	Walnut Street, Westbound 4th to 22nd (Minutes) 8-9AM	12-3PM	4:30-5:30 PM
D						
-1975	15.5	21.5	19	14.5	18.5	18.5
-1977	17	22.5	20	15.5	19.5	20.5
42						
-1975	15.5	21.5	19	14.5	18.5	18.5
-1977	17	22.5	20	16	19.5	20

There is no obvious reason why removing general traffic ought to slow buses down. Therefore, an attempt was made to measure the components of bus travel time in order to isolate any other changes associated with the transitway which may be responsible for the differences just reported. In the on-board study of trip time components (see Appendix B, page B-2 for details), trip time was separated into:

1. Moving time - time spent in motion
2. Loading time - time spent stopped in order to load and and unload passengers
3. Idle time - time spent stopped for reasons other than loading passengers

Table 4-3 presents results for Chestnut Street and parallel

TABLE 4-3. PHILADELPHIA TRIP TIME COMPONENTS

CHESTNUT STREET TRANSITWAY - EASTBOUND (Lines D, 42, 19th to 6th Streets)						
	7 - 9AM		12 - 2PM		4 - 6PM	
Components	Average Time(Secs.)	Standard Deviation(Secs.)	Average Time(Secs.)	Standard Deviation(Secs.)	Average Time(Secs.)	Standard Deviation(Secs.)
Moving Time	312	29	319	43	310	29
Loading Time (Avg.)	130 (52)	60	197 (82)	83	154 (61)	66
On/Off						
Idle Time	214	109	204	77	210	76
Total Trip Time	655	101	720	65	673	114
Number of Runs	6		9		9	

CHESTNUT STREET TRANSITWAY - WESTBOUND (Line 42, 7th to 17th Streets)*						
	7 - 9AM		12 - 2PM		4 - 6PM	
Components	Average Time(Secs.)	Standard Deviation(Secs.)	Average Time(Secs.)	Standard Deviation(Secs.)	Average Time(Secs.)	Standard Deviation(Secs.)
Moving Time	306	15	350	42	307	32
Loading Time (Avg.)	143 (52)	35	314 (85)	225	200 (58)	61
On/Off						
Idle Time	121	44	200	61	166	60
Total Trip Time	569	66	863	244	673	66
Number of Runs	4		2		4	

WALNUT STREET - WESTBOUND (Line D, 6th to 18th Streets)						
	7 - 9AM		12 - 2PM		4 - 6PM	
Components	Average Time(Secs.)	Standard Deviation(Secs.)	Average Time(Secs.)	Standard Deviation(Secs.)	Average Time(Secs.)	Standard Deviation(Secs.)
Moving Time	306	17	364	53	354	21
Loading Time (Avg.)	137 (54)	60	231 (64)	64	204 (70)	128
On/Off						
Idle Time	200	43	168	66	162	102
Total Trip Time	642	84	763	88	720	127
Number of Runs	5		7		5	

*Since westbound 42 line only runs from 7th to 17th Streets, all figures are expanded by 15 percent.

Walnut Street.* The data are not directly comparable with those presented in Tables 4-1 and 4-2 due to differences in study boundaries.

Looking first at the figures for moving time, in the AM period, it is nearly equal for Walnut Street and both directions on the transitway.** In the PM period, moving time is clearly shorter in either direction on the transitway than on Walnut Street. In the midday period, at least the eastbound transitway shows shorter times than Walnut. Thus, ignoring for the moment the effect of loading and idle time, it appears that buses on the transitway move more quickly than Walnut Street buses. The savings is small, however, about 20 seconds in an 8 minute trip.

Turning to loading time, it might be thought that buses on the transitway would take longer to load due to heavier patronage. The data do not bear this out in most cases. Comparing the two streets in the westbound direction, no significant difference in loading time is evident, except in the midday period, probably due to lunch hour crowds. Eastbound on the transitway, loading times are shorter (total and per passenger) than on either street westbound. This is probably because buses in this direction generally let off passengers while the westbound directions board patrons. Boarding takes longer due to the need to collect fares.

The remaining component of total trip time is time spent idling. We might expect idle time to be highest on Walnut Street due to congested auto traffic. The only major cause of

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*For purposes of comparison, the figures for the westbound 42 line have been expanded by 15 percent over the actual results in order to approximate what the times would have been had these buses run on all 12 instead of 10 transitway blocks. The figures were expanded by 15 instead of 20 percent because the two blocks on which the westbound 42 line buses do not run tend to have faster than average trip speeds.

**The sample sizes are very small. However, the consistency of measured moving time for time period to time period, and low standard variations within time periods, suggest that this measure is probably reliable.

idling on the transitway is time spent at stop lights. Signals are set to progress in the eastbound direction on Chestnut Street, based on expected bus speed. Westbound buses on the transitway are said to be disadvantaged by the signal timing. Since Walnut is one-way westbound, signals are set to progress in that direction. Comparing the two cases with signals set to favor bus movement, Walnut Street shows consistently shorter idle times when compared to the eastbound transitway direction.

Since traffic lights are the only major source of delay on the transitway, it appears the signal progression must work against eastbound buses there, rather than for them as intended. Why should this be so on the transitway and not on westbound Walnut, where the same progression is in effect? The only available explanation is that the reduced moving and loading times noted above cause eastbound transitway buses to get ahead of the signal progression; the signals then slow them down, producing overall trip times very similar to those on Walnut.

To summarize, it appears that eastbound buses on the transitway move slightly faster than Walnut Street buses and also have shorter loading times. However this simply results in these buses meeting more red lights. This seems to imply that the transitway has the potential for a slight improvement in travel times, but only if lights are retimed.

Had time savings been shown on the transitway, it would be important to evaluate the change from the passenger's perspective. Clearly a passenger who gets both on and off on the transitway, e.g., lunch hour workers and other shoppers shuttling between stores, would receive the maximum proportional benefit. In 1974, about 36 percent of D line riders on Chestnut Street downtown during the midday period (9-4 PM) boarded in Center City. This may be higher since the transitway was completed and is probably much higher during the noon hour.* For those

*Loading counts from the trip time component study (Table 4-3) show that the number of passengers on/off is highest during the 12-2 PM midday period on the transitway. By comparison, on/off counts on Walnut Street are heaviest in the PM period. A similar but less pronounced pattern existed in the pre-transitway 1974 count.

who board west of Center City, particularly morning commuters, any time savings on the 8-9 minute transitway trip would have to be very substantial to have an impact on long-distance riders (particularly since most commuters onto the transitway deboard within the first four blocks). In the morning peak hour it takes about 40 minutes to reach the transitway from the starting point of the D line and about 35 minutes from the starting point of the 42 line. From a rough midpoint in boardings on the D line it is about a 22 minute trip to reach the transitway and on the 42 line about a 25 minute trip. Thus, a patron who gets on the D line at midpoint and gets off about half-way through the transitway would have about a 27 minute trip (perhaps 5 minutes on the transitway). Even a 10 percent savings on the transitway would result in less than a 2 percent reduction in the patron's line haul (bus) travel time and an even smaller fraction of the patron's total door-to-door travel time.

4.2.1.2 Minneapolis - Turning to Minneapolis, no pre-mall bus speed data are available; however, current trip times for large samples of trips on the Nicollet Mall and two comparison streets are presented in Table 4-4. Hennepin Avenue runs parallel to Nicollet one block to the west; it has two-way bus operations under typical downtown conditions, buses sharing the street with general traffic. Marquette Ave., parallel to Nicollet one block east, has a southbound contraflow lane for buses. Thus it provides a comparison with a different type of exclusive right-of-way than a transit mall. The data in Table 4-4 are computed from measurements taken by pairs of observers with synchronized watches, stationed at the intersections of the study streets with Washington Avenue and 10th Street, 8 blocks apart (see Appendix A for details).

The only case in which a comparison street has trip times significantly longer than the mall, in the same time period and direction, is for Marquette Avenue in the PM peak. In this time period, Marquette Avenue carries a very heavy volume of

TABLE 4-4. MINNEAPOLIS TRIP TIMES

	Average Trip Time (secs)	Standard Deviation (secs.)	Average MPH	Number of Runs	Time Difference* Compared to Nicollet (secs.)
7-9 AM: Southbound					
Nicollet (Mall)	297	57	7.3	55	N/A
Hennepin (Unimproved Street)	310	100	7.2	31	13 ± 40**
Marquette (Bus Lane)	316	68	6.8	100	19 ± 20
7-9 AM: Northbound					
Nicollet	450	80	4.8	72	N/A
Hennepin	366	97	6.1	63	-84 ± 31
12-2 PM: Southbound					
Nicollet	414	74	5.2	51	N/A
Hennepin	391	127	5.7	27	-23 ± 54
Marquette	204	49	10.5	25	-210 ± 29
12-2 PM: Northbound					
Nicollet	406	58	5.3	45	N/A
Hennepin	388	85	5.8	32	-18 ± 35
4-6 PM: Southbound					
Nicollet	421	95	5.1	86	N/A
Hennepin	416	116	5.4	50	-5 ± 39
Marquette	514	165	4.2	152	93 ± 33
4-6 PM: Northbound					
Nicollet	544	83	4.0	65	N/A
Hennepin	394	154	5.7	39	-150 ± 54

*Positive values indicate trip times longer than those on the Nicollet Mall; negative values trip times shorter than on Nicollet.
**95% confidence interval

outbound express buses, as indicated by the 152 buses which were were timed on Marquette Avenue in one two-hour period. At midday, Marquette Avenue with a light volume of buses, is much faster than the mall in the same direction, while in the morning there is no significant difference. Hennepin Avenue southbound has times similar to those on the mall southbound, while northbound it is significantly faster during both peak periods.

As in Philadelphia, on-board measurements, separating total trip time into moving, loading and idle time, were made to seek an explanation for the lack of savings in trip time on the transit mall (see Appendix B for details). These are shown in Table 4-5. Made on a different day than the measurements just discussed, and with small sample sizes, the figures for total trip times differ considerably from those in Table 4-4; however, they support the general conclusion that, in most cases, Nicollet is no faster, and often slower, than the comparison streets. Measurements were also made on Second Avenue, parallel to Nicollet two blocks to the east. Second Avenue has a northbound contraflow lane for buses, and thus provides a mall/bus lane comparison in that direction, adding to the southbound comparison provided by the Marquette Avenue contraflow lane.

First, comparing the mall to Hennepin Avenue, moving times on the mall were less than on Hennepin Avenue for both directions and all time periods; the average difference is about 1.15 minutes.* However, idle times were longer on the mall, in every instance except southbound at midday, by an average of 65 seconds. Loading times were also longer on the mall, in every instance except northbound in the evening, by an average of 24 seconds. In most cases these differences more than made up for the advantage Nicollet Mall buses held in moving time.

By and large, the extended loading time on the mall was not due to a greater on/off count. However, average loading time

*All differences are significantly different from zero at the 99 percent confidence level.

TABLE 4-5 MINNEAPOLIS TRIP TIME COMPONENTS

NICOLLET MALL - NORTHBOUND									
	7 - 9AM			12 - 2PM			4 - 6PM		
Components	Average Time(Secs.)		Standard Deviation(Secs.)	Average Time(Secs.)		Standard Deviation(Secs.)	Average Time(Secs.)		Standard Deviation(Secs.)
Moving Time	168		28	192		20	177		28
Loading Time (Avg. # On/Off)	96	(38)	27	154	(66)	60	114	(30)	59
Idle Time	187		173	87		143	109		63
Total Trip Time	451		138	433		120	400		103
Number of Runs	9			7			9		

HENNEPIN AVENUE - NORTHBOUND									
	7 - 9PM			12 - 2PM			4 - 6PM		
Components	Average Time(Secs.)		Standard Deviation(Secs.)	Average Time(Secs.)		Standard Deviation(Secs.)	Average Time(Secs.)		Standard Deviation(Secs.)
Moving Time	235		19	284		44	273		60
Loading Time (Avg. # On/Off)	62	(46)	18	93	(48)	69	151	(52)	55
Idle Time	37		18	31		41	53		110
Total Trip Time	334		65	409		86	477		150
Number of Runs	4			8			8		

SECOND AVENUE CONTRAFLOW - NORTHBOUND									
	7 - 9AM			12 - 2PM			4 - 6PM		
Components	Average Time(Secs.)		Standard Deviation(Secs.)	Average Time(Secs.)		Standard Deviation(Secs.)	Average Time(Secs.)		Standard Deviation(Secs.)
Moving Time	161		13	171		7	169		10
Loading Time (Avg. # On/Off)	41	(24)	25	85	(29)	56	51	(39)	25
Idle Time	165		76	121		34	99		28
Total Trip Time	368		75	377		57	319		44
Number of Runs	8			7			8		

TABLE 4-5. MINNEAPOLIS TRIP TIME COMPONENTS (Cont.)

NICOLLET MALL - SOUTHBOUND									
	7 - 9AM			12 - 2PM			4 - 6PM		
Components	Average Time(Secs.)		Standard Deviation(Secs.)	Average Time(Secs.)		Standard Deviation(Secs.)	Average Time(Secs.)		Standard Deviation(Secs.)
Moving Time	187		30	201		25	188		18
Loading Time (Avg.) On/Off)	91	(46)	43	174	(49)	47	189	(44)	101
Idle Time	180		86	52		56	178		104
Total Trip Time	459		117	428		93	559		80
Number of Runs	7			8			8		

HENNEPIN AVENUE - SOUTHBOUND									
	7 - 9AM			12 - 2PM			4 - 6PM		
Components	Average Time(Secs.)		Standard Deviation(Secs.)	Average Time(Secs.)		Standard Deviation(Secs.)	Average Time(Secs.)		Standard Deviation(Secs.)
Moving Time	257		69	260		46	272		53
Loading Time (Avg.) On/Off)	74	(49)	42	110	(29)	53	136	(41)	65
Idle Time	74		107	67		40	125		182
Total Trip Time	405		57	436		81	533		178
Number of Runs	4			9			9		

MARQUETTE AVENUE CONTRAFLOW - SOUTHBOUND									
	7 - 9AM			12 - 2PM			4 - 6PM		
Components	Average Time(Secs.)		Standard Deviation(Secs.)	Average Time(Secs.)		Standard Deviation(Secs.)	Average Time(Secs.)		Standard Deviation(Secs.)
Moving Time	169		28	172		27	216		29
Loading Time (Avg.) On/Off)	51	(33)	21	57	(24)	43	66	(15)	51
Idle Time	99		41	79		66	194		140
Total Trip Time	319		48	308		75	476		145
Number of Runs	8			8			7		

per passenger on/off in both directions was 3.1 seconds on the mall versus only 2.5 seconds for both directions on Hennepin Avenue. Observers commented that the Nicollet Mall appears to serve a large number of senior citizens who need more time to climb up or down the stairs and take longer in requesting information and depositing money. Probably a more important fact is that on Hennepin Avenue buses generally stop at every other block while stops are made at every block on the Nicollet Mall. The largest proportion of loading time, of course, is spent in stopping to pick up or let off the first passenger.

Longer idle times on the mall are a much more important factor than loading times in explaining the overall longer trip times on the mall. As in Philadelphia, the only major source of idle time on the mall is waiting for traffic lights. Even on Hennepin Avenue, it was observed that congestion rarely forces buses to make a complete stop, but rather slows them down, sometimes to a crawl. This accounts for the longer moving times on Hennepin Avenue. The longer idle times on the mall must be attributed to signal timing.

As in the case of the Chestnut Street Transitway in Philadelphia, Nicollet Mall buses appear to traverse the mall blocks more swiftly than do buses sharing a street with general traffic, but this results in meeting more red lights. Again the conclusion is that a potential for time savings may be present, but cannot be realized without adjustments to signal timing.

Minneapolis also offers the opportunity to compare bus speed on a transit mall with bus speed on exclusive contraflow bus lanes. Overall trip times are longer on the Nicollet Mall than on the Marquette and Second Avenue contraflow lanes in every time period in both directions. Examining the components of trip time, the contraflow lanes are generally faster in all three components. The differences in moving time are generally insignificant, however. The most important differences are in loading time. The northbound contraflow lane on Second Avenue averages 74 seconds faster than the northbound mall, of which 61 seconds

are due to shorter loading times. The southbound contraflow lane on Marquette Avenue averages 120 seconds faster than the southbound mall, of which 96 seconds are due to shorter loading times.

These shorter loading times result both from lower on/off counts (27 per run average on the contraflow lanes versus 44 on the mall), and shorter loading times per passenger (2.4 secs./passenger on the contraflow lanes versus 3.1 seconds on the mall). The longer loading times on the mall probably are due to more frequent stops (every block rather than every other block) and a different composition of ridership, as was discussed in comparing the mall to Hennepin Avenue.

Summarizing, the mall appears to offer a potential time savings compared to operations on a street shared with general traffic (Hennepin Avenue), but somewhat less than offered by contraflow lanes. Both on the mall and on the contraflow lanes, signal timing works to limit the realization of these potential savings. More frequent stops and a different ridership composition on the mall use up much of the potential time savings there.

4.2.1.3 Portland - Initial impressions of bus operations in Portland suggest that trip time at rush hour on the 11-block mall may have fallen from 20 minutes before the mall to under 7 minutes after the mall. Bus speeds may have changed from about 1.5 mph to 5 mph. The latter figure is comparable to evening peak speeds in Minneapolis (for improved or unimproved streets). The pre-mall estimated speed of 1.5 mph is much slower than any figures encountered in Philadelphia or Minneapolis. A possible explanation is found in the short (200 foot) Portland blocks. Before the mall, the short blocks were said to encourage considerable turning movement, often leaving only the middle lane free for through-traffic. The problem for buses was compounded by the fact that they had to move from bus stops into the middle lane and back again in the next block.

4.2.1.4 Summary - While the transit malls in Minneapolis and Philadelphia do not show improved trip times, severe situations such as existed in Portland prior to the mall may be improved. Also, it could be concluded from the data in Minneapolis and Philadelphia that buses would have had faster trip times if signals were set to take advantage of the actual moving and loading times on the malls. Further analysis, beyond the scope of this report, would be required to determine the proper signal timing in each case. However, in the future cities should consider adjusting signals for the faster moving bus speed on transit malls, as well as for the less predictable factor of loading time.

4.2.2 Bus Reliability

Even though a transit mall may not result in any noticeable savings in trip time, it might lead to more reliable service by eliminating exceptional delays which sometimes occur on unimproved streets. The measure of reliability used is the standard deviation of trip times. These were computed using the sidewalk time check data used in Tables 4-1 and 4-4 earlier.

Tables 4-6 and 4-7 compare standard deviations of trip times on the Chestnut Street Transitway and the Nicollet Mall respectively to standard deviations of trip times on comparison streets. Ratios less than one indicate more reliable trip times on the transit malls than the comparison streets in all cases but one. In Philadelphia, the advantage in reliability on the transitway is only significant in the evening. In Minneapolis, all the comparisons show significant reliability differences, including the one case in which the comparison street is more reliable than the mall - the Marquette Avenue contraflow lane at midday. This is no doubt explained by the very light volumes on Marquette at this hour, and the effect of lunch hour crowds on the mall.

More reliable trip times ought to create more stable headways, reducing the bunching problem common in downtown bus operations. However, an attempt to measure this effect was inconclusive.

TABLE 4-6.

PHILADELPHIA TRIP TIME RELIABILITY

Line	Comparison	Ratio of Trip Time Standard Deviations 7-9 AM	4-6 PM
D	Transitway(East) / Walnut, unimproved (West)	.90 (prob.=.25)*	.71 (prob.=.10)
42	Transitway(East) / Transitway & Walnut (West)	.97 (prob.=.50)	.39 (prob.<.001)

TABLE 4-7.

MINNEAPOLIS TRIP TIME RELIABILITY

Comparison	Ratio of Trip Time Standard Deviations 7-9 PM	12-2 PM	4-6 PM
Nicollet Mall(south) / Hennepin, unimproved (south)	.57 (prob.<.001)*	.58 (prob.<.001)	.82 (prob.=.05)
Nicollet Mall(south) / Marquette, bus lane (south)	.84 (prob.=.05)	1.51 (prob.<.001)	.57 (prob.<.001)
Nicollet Mall(north) / Hennepin(north)	.82 (prob.=.05)	.69 (prob.<.025)	.57 (prob.<.001)

*Probability that true ratio is equal to one, i.e., no difference in variance (the square of standard deviation) between the two streets. Computed using F-statistic, $F = S_1^2/S_2^2$.

4.2.3 Coverage and Convenience to Trip Ends

Since each of the transit malls involves some rerouting of buses from other streets, this raises the issue of whether this rerouting increases passenger convenience to trip ends or leaves portions of the downtown area under-served by transit. A related issue is whether rerouting allows the transit mall to serve a wider area of the surrounding metropolitan region. Since nearly all rerouting to date has involved moving bus lines from adjacent or nearby streets onto the malls, it is doubtful whether there has been a significant increase in convenience or coverage. On the other hand, if increased capacity has permitted more lines to be routed closer to the center of downtown trip ends, some increased convenience could result.

The Chestnut Street Transitway currently is served by five bus lines: the D, 38, 42, 61X, and Mid-City Look (MCL), which serves the downtown area only. Two are eastbound only. In the westbound direction the D line returns on Walnut Street, one block south of the transitway, and the MCL returns on Market Street, one block north of the transitway. The 42 line, which headed westbound on Walnut Street prior to the transitway, now diverts to the transitway at 7th Street, where it returns to Walnut Street. Since a heavier concentration of jobs and stores exists on Chestnut and Market Streets than on Walnut Street, the rerouting of the 42 line may have increased passenger convenience slightly. Both the D and 42 lines serve the same general area of West Philadelphia, an area of poor and working class homes. Center City and the transitway are conveniently reached from other areas of Philadelphia by the Market Street and Broad Street subways and by bus lines on most cross-streets. The 38, serving an area north and west of Center City, formerly used Market St. eastbound and John F. Kennedy Blvd. westbound, turned southward near City Hall and looped south of Spruce Street. It now uses Chestnut Street, for both directions, the length of the transitway. This change has extended service farther east, to the Independence Mall area and reduced it south of

Chestnut; net coverage and convenience to trip ends is probably unchanged.

Further proposals involving four lines would expand the areas with direct bus service along the transitway to include portions of southern, northern, and northwestern Philadelphia as well as a large portion of suburban Montgomery County to the west of the city. The proposal would reduce bus service on Market Street and eliminate it entirely from Arch and 15th Streets. Since significant rerouting is involved, some inconvenience can be expected to existing passengers with trip origins on Arch or 15th Streets. For those with trip origins/destinations on Chestnut Street, some increase in convenience would occur.

In Minneapolis, one bus route was moved from neighboring Marquette Avenue onto the Nicollet Mall. Because the downtown core covers a smaller area than in Philadelphia or Portland, no rerouting within the downtown area is likely to significantly improve passenger convenience to trip destinations. Nearly every part of the Minneapolis metropolitan area has bus service which will bring patrons to within a block of the Mall.

The most significant rerouting occurred in Portland, where the number of bus lines running on the Portland Mall was increased from 22 to 38 (out of a system-wide total of 46 lines). Moreover, prior to the mall only four of the 22 lines ran on both Fifth and Sixth Avenues. Currently, 28 lines run the full length of both these mall streets.

Coverage of the Portland downtown area has been reduced by the rerouting. Buses were entirely removed from the nearest parallel streets, Fourth Avenue and Broadway. Originally it was planned to remove buses from other parallel streets. However, five lines each remain on Third and Tenth Avenues, in order to provide some coverage to areas more than two blocks from the Portland Mall. Coverage on cross-streets has also been reduced. Before the mall, each cross-street carried from two to six bus lines. Now only two cross-streets, Yamhill and Morrison, carry buses across the mall.

There have been no surveys on the impact of rerouting on patron convenience in Portland. However, in most cases the effect would appear to be relatively minor. The large majority of patrons should be able to board their buses within two blocks of their original bus stop.

4.2.4 Capacity

One of the issues generated by proposals to reroute bus lines onto transit malls or add more buses on existing transit mall lines is the question of capacity. The major interest here is in bus service levels. At what point do increases in bus volumes result in significantly lower speeds or inadequate loading conditions?

Currently, Minneapolis' Nicollet Mall appears to be operating well below physical capacity most of the time. For instance, average headways between buses (regardless of route) in the peak period and direction is about 1 minute and 15 seconds. This average headway includes considerable bunching of buses, so that nearly three quarters of the buses arrive at the end of the mall with at least one other bus. About one-third arrive at the end of the mall in groups of three or four. From observation it appears that groups of three or four buses result in one of the buses carrying relatively few passengers. Loading can also be delayed, as buses sometimes must wait before stopping at the bus shelter. Because of the large space alloted to waiting bus patrons, crowding of the sidewalk is not a problem. (Crowding of shelters is sometimes a problem in winter.) Thus, from the standpoint of conditions for most buses, the mall may be operating at capacity. On the other hand, there are long periods when there are no buses on a particular mall block at all.

Minneapolis' Marquette Avenue contraflow lane provides a marked contrast to the Nicollet Mall in terms of utilization. Whereas 97 buses are scheduled in the southbound direction on

the mall in the PM peak, 156 are scheduled in the southbound contraflow lane during the 4-6 PM period. About one-third of these use the contraflow lane in one twenty minute period. This can result in as many as seven buses concentrated in one block at the same time. Observers noted that a number of the buses proceed through the CBD without picking up more than a handful of riders. Sidewalk crowding is a problem on the most heavily used blocks.

On the Chestnut Street Transitway, in peak AM period and direction, average headway between buses on any route is nearly two minutes. Only about one-quarter of the buses arrive at the end of the transitway in groups of two, and none arrive in groups of three or more. Moreover, because most patrons in the AM period are deboarding, there is no significant crowding of waiting areas. At other times of the day, particularly at the midday peak, crowding of waiting areas is common. However, this appears due to the low frequency of buses rather than over-utilization of the street space.

As has been noted earlier, the Portland Mall carries the heaviest bus volumes in the three cities. During the peak AM hour, 158 buses use Fifth Avenue and 175 use Sixth Avenue. During the peak PM hour, the comparable figures are 167 and 142 buses, respectively. Despite these heavy volumes, buses appear to move along the mall quite smoothly. There appear to be several reasons for this. The first is the Portland bus stop assignment plan. Since buses only stop once every two blocks, total loading time is probably less, per passenger, than in Philadelphia or Minneapolis. This is because the largest amount of loading time is spent picking up or discharging the <u>first</u> passenger. Thus, the possibility that there are more boardings per shelter in Portland is more than compensated for by the reduction in time buses spend slowing down, stopping, and opening and closing doors. The second aspect of the bus stop assignment plan, the division of bus lines between two shelters on each

block, (according to geographic service areas) also improves bus flow. In only a few cases were more than two buses observed to arrive at one shelter. This reduces the possibility that buses must "wait in line" before boarding patrons. Probably the most important factor improving bus flow is the existence of a second bus lane. This allows buses of different service areas to pass one another as they skip every other block (see Figure 4-1). It also allows passing when an unusual circumstance, such as delayed loading or a mechanical failure, causes a blockage in the loading lane. Finally, the short-cycle signal timing in Portland (generally about 52 seconds) appears to reduce the time buses must spend idling at stoplights.

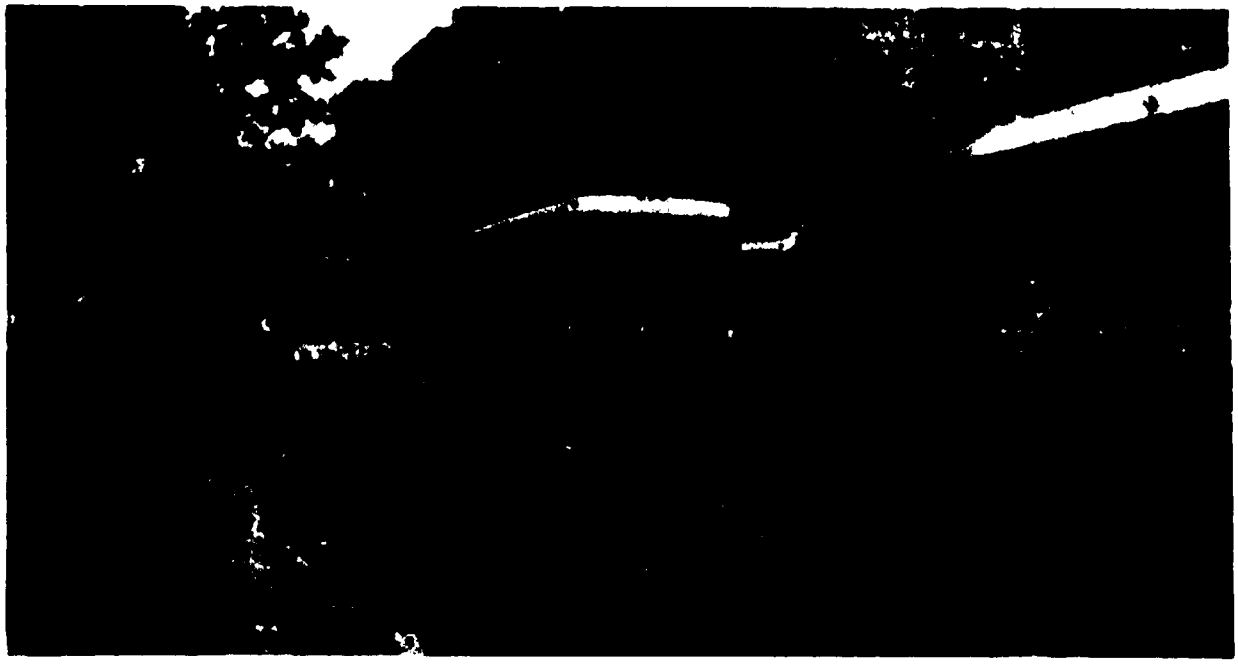


FIGURE 4-1. TWO-LANE OPERATION ON THE PORTLAND MALL

Two additional techniques to increase capacity were considered but not implemented in Portland. A "platooning" strategy was originally proposed whereby groups of four buses would proceed down the mall in unison. This idea was dropped, in part because the plan required precise on-schedule performance, and in part because sufficient space for "staging areas" could not be found near the ends of the mall. A second technique considered was the use of simultaneous signal timing on the mall. By turing all signals to green simultaneously, it was thought that any bus congestion would be "flushed out." This technique is not believed necessary at this time, although it remains a future possibility.

The passenger waiting space provided in the Portland Mall is being utilized beyond its capacity. Despite the relatively large size of the shelters and the division of buses according to the bus stop assignment plan, the shelters and surrounding areas are frequently crowded with waiting patrons. In some cases they overflow into the pedestrian walking path (see Figure 4-2).

FIGURE 4-2. CROWDING AT PORTLAND MALL SHELTER

Roughly 40 buses per hour arrive at each Portland Mall shelter during peak periods. This is comparable to peak volumes on Minneapolis' Nicollet Mall. However, either because of greater patronage or reduced waiting space outside of the shelters, sidewalk congestion is much worse in Portland.

4.2.5 Understandability

Transit malls appear to provide a "focus" to the transit system, perhaps increasing public awareness of the transit option. A high volume of buses, such as on the Portland Mall, certainly draws attention to transit and helps establish the streets as clearly being "for buses." The exclusive use of mall roadways for buses also helps identify the streets as major bus routes. Unfortunately, the three transit malls studied do not provide examples combining both high bus volume and exclusive bus use. Another factor probably helpful in providing a "focus" is the use of the term "transit" or "bus" in the mall name and signs (e.g., the "Chestnut Street Transitway").

Provision of transit information services on the malls also increases understandability of the transit system. On the Nicollet Mall route schedules are posted inside bus shelters and route maps are available at an information counter a few feet from the mall in an indoor retail arcade. On the Chestnut Street Transitway maps of Center City Philadelphia are posted on the mid-block traffic control columns which identify bus routes within the downtown area. Schedule information is not provided. The route maps were located at the mid-block crossings, rather than at the bus shelters, because originally it was planned that the bus stops and shelters would be located at the mid-block crossings.

In Portland, an elaborate information system has been put into operation. Each shelter has a television display showing the scheduled departure time for the next three buses on each route. Originally, it was planned to have bus drivers radio Tri-Met in the event of unusual delays and to have this informa-

tion appear on the television displays. This has not been implemented because fewer than one-quarter of Tri-Met buses are radio-equipped and because bus drivers are seldom able to accurately estimate the time the bus will be delayed. Thus, Tri-Met feels that proceeding with the idea at this time would be likely to result in greater, not less confusion, for patrons. Each Portland Mall shelter is also equipped with lighted maps of the total Tri-Met system and the service area of buses which stop at that shelter. Another lighted panel lists the bus route numbers for each service area(see Figure 4-3). Both the maps and route numbers are color-coded according to service area. Unfortunately, the clear plastic shelter roofs create a glare which makes some panels difficult to read. Finally, a symbol such as a beaver or raindrop placed on the exterior of the shelters identifies the service area of buses which stop at that shelter.

FIGURE 4-3. INFORMATION DISPLAY IN PORTLAND SHELTER

In addition to the shelter information system, there are four trip planning kiosks located on each Portland Mall street. Users are able to request the times of departure and arrival of buses going between two points on any single route. A maximum of 18 points are identified, about twice the number of stops identified in the Tri-Met schedule pamphlet for each route. In response to a series of questions presented on television display, the user makes his request through a series of punches

on a numeric keyboard. A list of arrival and departure times then appears on the display. Since at least six separate punches are necessary, the system is difficult for some patrons to use. Tri-Met reported about 500 users per day when the system was first introduced. No data is available on current usage, although a variety of technical problems have caused frequent breakdowns of one or more kiosks at a time. The trip planning kiosks also have a direct phone line to the Tri-Met information center. Data for the television displays at the trip planning kiosks and in the shelters come from a central computer with access to schedules developed by the RUCUS computerized scheduling package, which Tri-Met implemented prior to the mall.

To the extent that the Portland information system was designed to clarify the rather complicated bus stop assignment plan, it appears to be a success. However, the sophisticated and very costly route schedule information system must be questioned, since it provides only slightly more information than is found in standard route schedule pamphlets. The Nicollet Mall system of posting schedules in the shelters would appear to serve the same purpose at virtually no cost.

4.2.6 Bus Shelters

Bus shelters increase comfort and convenience for waiting bus patrons and provide the most tangible evidence of improvements in transit service. Detailed shelter descriptions and photographs are presented in Section 3.3. Section 4.2.5 discusses transit information services, most of which are provided within bus shelters.

Using Pushkarev and Zupan's (Ref.4-1) standards for standing pedestrians, both the Chestnut Street Transitway and Nicollet Mall shelters could hold about 10 patrons with unimpeded movement and no personal discomfort. Above 20 patrons, movement would be constrained and waiting passengers would feel uncomfortably close. The level of 10 standing patrons is frequent during peak periods in both cities, with more than 20 sometimes occurring in Philadelphia and, less frequently, in Minneapolis.

In Philadelphia, movement on and off buses is sometimes very congested at midday, although this is more a function of frequency of buses than available waiting space. During good weather, of course, patrons are free to stand outside of shelters in both cities. This is particularly encouraged in Minneapolis, where shelters are generally placed at the widest point on the curved sidewalk and outside seating on benches or planter walls is available. In bad weather, problems are reported in both cities. Although the Nicollet Mall shelters provide a high level of comfort, the solid walls reduce visibility of approaching buses. Generally someone waiting at the front of the shelter calls out the number of the approaching bus. In Philadelphia there is no visibility problem, but conditions of rain or snow plus wind reduce the amount of actual shelter by 25 percent or more.

The Portland shelters are somewhat larger than those in Philadelphia or Minneapolis. They should hold about 12 patrons comfortably. This level is frequently exceeded in the afternoon and evening peak periods, causing some sidewalk congestion (see discussion in Section 4.2.4 and Figure 4-2, page 81). The Portland shelters are semi-enclosed with clear plastic walls (see Figure 4-4). This design provides protection from rain or snow (a feature missing in Philadelphia) and also allows patrons to observe on-coming buses (a feature missing in Minneapolis). The clear walls with interior lighting are also a safety feature for nighttime waiting.

FIGURE 4-4. VIEW FROM PORTLAND MALL SHELTER

When no shelters are provided, waiting bus patrons tend to stand away from the curb, either against the building line or, under crowded conditions, directly in the pedestrian walk path. Also, patrons often spread out linearly because they are uncertain of exactly where the bus will stop. The presence of a bus shelter encourages patrons to stand relatively close to the curb and in a more concentrated arrangement, especially in bad weather. This makes loading more convenient and also helps clear the pedestrian walking path.

4.3 IMPACT ON TRANSIT OPERATOR

By improving travel time and reliability and by helping to concentrate demand, a transit mall might improve productivity for the transit operator. The primary improvement to be expected is the ability to schedule fewer buses on a given line to provide the same frequency of service as before the mall. None of the cities examined here reported any increased productivity. In the cases of Philadelphia and Minneapolis, any changes in travel time and reliability were too slight to warrant the removal of buses. Officials in Portland do believe that travel times on the mall have been reduced substantially. The Portland Tri-Met Superintendent of Schedules estimated a potential savings of 34 trips at peak hour, or about one less peak-hour trip per line. However, these potential savings have not been realized. Existing labor contracts prevent a reduction in scheduled travel time on the Portland Mall. This has resulted in some instances of early bus arrivals at bus stops immediately past the mall. There are no immediate plans to correct this situation.

4.4 IMPACT ON TRANSIT DEMAND

There are several ways that a transit mall will help increase

ridership. Improved transit service could cause workers and shoppers entering the downtown area to shift from automobile to to bus use. To the extent that a transit mall creates a more attractive environment or stimulates new economic activity, new people may be encouraged to go downtown, some of whom would use public transit to do so. Finally, among those already downtown, a mall may encourage greater transit use to shuttle between stores or other points of interest.

Before-and-after mall transit passenger counts are only available in Portland. The first four months after the Portland Mall opened in 1978, system-wide transit ridership increased by about 9 percent over the same months in the previous year. However, this increase is comparable to the rise in transit ridership in the months immediately preceding the opening of the mall, and somewhat lower than the ridership increases in previous years since 1973. Thus in Portland and in the other two cities, it is arguable whether even a maximally effective transit mall involves the type and extent of changes necessary to change ridership patterns of commuters. Moreover, in Philadelphia the existing mode split is so heavily weighted toward transit that the size of the market of potential switchers from auto to bus is small.*

It is possible, however, that transit malls encourage greater use of the buses by riders already in the CBD area, particularly during the lunch hour. Use of the malls at midday is heavy, with on/off counts on both the Nicollet Mall and the Chestnut Street Transitway heaviest at midday, a pattern not evident on comparison streets (see Tables 4-3 page 82 and 4-5, pages 88-89). However, at least on Chestnut Street, this tended to be the case before the transitway as well. In response to a question asked of transitway area workers in the DVRPC survey -- "Has the development of the transitway on Chestnut Street encouraged you to use Chestnut Street more than

*In 1970, 64 percent of CBD workers used public transit. In a 1977 survey of workers in the Chestnut Street area, only 5 percent exclusively used the private auto to get to work (Ref. 4-2).

other streets for riding public transportation?" -- 27 percent answered "yes." (14 percent had no response and 59 percent said "no.") Of those living in the residential areas serviced by the D and 42 lines buses, 40 percent answered "yes," 48 percent "no." and 12 percent had no response. However, since only about 4 percent of transitway area workers live in the D or 42 service areas, the vast majority of those in the total sample who reported that they were encouraged to use Chestnut Street Transitway buses probably do so for non-commute trips.

4.5 SUMMARY OF FINDINGS

Overall the transit malls studied have had a minor positive impact on transit, which may be a useful part of a more comprehensive strategy to upgrade bus service.

1. There is no evidence that overall bus trip time has decreased in Minneapolis or Philadelphia. There is evidence, however, that these transit malls would have shorter trip times than unimproved comparison streets, were it not for longer loading times and delays due to traffic signal timing. Portland reports trip time reduction of about 50 percent. Portland may have had unusually bad congestion before the mall, although new signal timing in Portland appears to allow smoother bus travel than in the other two cities. The Portland trip time reports are based on impressions rather than formal studies.
2. Contraflow bus lanes in Minneapolis have shorter trip times than either the parallel transit mall or an unimproved comparison street. Controlling for the effects of signal timing, differences in patronage, and loading patterns, the contraflow lanes show a minor advantage over the transit mall in potential time savings.
3. Trip time reliability is better than on unimproved streets.
4. Rerouting of buses to transit malls probably results in little change in passenger convenience to trip ends, due to the short distances involved. On a shopping street, businesses come into direct contact with more shoppers from a wider geographic area.
5. Transit malls may increase the physical capacity for buses due to the removal of auto traffic and increased

space for waiting patrons. The addition of a second bus lane on each Portland Mall street clearly increased capacity.

6. Understandability of the transit system is improved by the concentration of buses and provision of transit information.

7. As yet, there is little evidence of increased productivity or passenger volumes attributable to the transit malls. Some increase in volume may occur among short-distance riders within the downtown area.

8. Bus shelters increase comfort and convenience and encourage waiting patrons to stand clear of the pedestrian walking path.

5 IMPACT ON NON-TRANSIT VEHICLES

5.1 INTRODUCTION

5.1.1 Objectives

Transit malls are designed, in part, to deemphasize or discourage automobile use in downtown areas and to simplify traffic patterns and make them more logical. The degree to which the study cities have embraced the objective of deemphasizing automobile use varies. In Philadelphia there is no coordinated policy to discourage automobiles, and it is hoped that the impact of the auto restriction can be minimized. Minneapolis also hopes to minimize interruption of auto circulation and access; however, there is an informal policy of discouraging new parking in the core area. In Portland the transit mall is part of a larger plan, Portland's 1975 "Parking and Circulation Policy," which classifies streets as being for general traffic, local service, or auto restricted use. Ultimately, Portland hopes to convert two additional streets into transit malls.

5.1.2 Issues

Because transit malls restrict or prohibit non-transit vehicles on mall streets, a number of issues are raised: (1) How is traffic to be diverted? (2) What impact will diverted traffic have on alternate routes? (3) What will be the impact on delivery of goods to merchants? (4) Is sufficient off-street parking available? (5) Will traffic and parking restrictions be difficult to enforce? Issues (1) and (4) were discussed in the chapter on Site Descriptions, Sections 3.4.3 and 3.4.5. This chapter will help answer the remaining issues of the impact of diverted traffic, goods delivery and enforcement.

5.1.3 Data Sources

Traffic counts were the most important data source for this chapter. In Philadelphia and Portland, pre- and post-mall counts were available for selected downtown streets. Also in Portland and in Minneapolis, pre- and post-mall cordon count data were available. The issue of goods delivery was primarily examined by analysis of merchant survey data gathered in Philadelphia by the Delaware Valley Regional Planning Commission (DVRPC). The issue of enforcement of traffic and parking restrictions was investigated by means of on-site inspections by the evaluators.

5.2 IMPACT ON DIVERTED TRAFFIC

5.2.1 Background

A common obstacle to building a transit mall is the fear that diverted traffic will lead to congestion of alternate routes, possibly discouraging shoppers and others from coming to the downtown area. On the other hand, it is known that much downtown traffic consists of unnecessary turning, circulating, hunting for on-street parking, and pick-up or drop-off traffic.

Although Sections 3.4.1 and 3.4.3 describe pre-mall traffic conditions and diversion strategies associated with transit mall construction, a brief review here may be helpful. In Center City Philadelphia, Chestnut Street runs between two rivers, the Schuylkill and Delaware, a distance of about two miles. The end points of the mile-long Chestnut Street Transitway are six to seven blocks from both rivers. There is no nearby bridge which crosses the Delaware River, but to the west Chestnut Street crosses the Schuylkill River and continues into West Philadelphia. Just west of the Chestnut Street Bridge are ramp connections to the Schuylkill Expressway, which serves the southern and northwestern portions of the city. Chestnut Street carries two-lanes of traffic, one-way eastbound. With 24,000 crossings per day, the Chestnut Street Bridge is the second most important eastbound entrance to Center

City, receiving autos from both West Philadelphia and the Schuylkill Expressway. Prior to the mall, the transitway blocks carried an average of 12,000 vehicles per day. Some of these came from the Chestnut Street Bridge, while others turned onto the street from intersecting cross-streets within the downtown area. General traffic is now allowed on only one block of the transitway, in order to serve several parking facilities. The City's strategy was to divert traffic one block north to Market Street, a major eastbound avenue.* Signals on Market Street were retimed to increse carrying capacity and several left-turn lanes were added to Chestnut Street to encourage eastbound autos to divert northbound.

The Portland Mall encompasses twelve blocks on each of two one-way, three-lane streets, Fifth and Sixth Avenues. In addition to two lanes reserved for buses, there is a third general traffic lane on three out of every four blocks on the mall. Fifth Avenue runs southbound and Sixth Avenue runs northbound, both parallel to the Willamette River. Ramps connect both streets to the Stadium Freeway, about one-half mile south of the mall. Prior to the mall, most traffic on Fifth and Sixth Avenues came from cross streets, notably from several bridges that cross the Willamette River. Downtown Portland is unusual in that short block lengths (200 feet) result in numerous parallel streets which encourage excessive turning movements. At the busiest point, pre-mall traffic volumes were about 10,000 vehicles per day on Fifth Avenue and 13,500 vehicles per day on Sixth Avenue. The latter was the heaviest traffic count on a north-south street in downtown Portland. Although no particular street was identified as a preferred alternate route, capacity was increased on nearby parallel streets by re-routing most bus lines onto the mall. A computerized traffic signal system employing traffic volume detectors was recently put into operation (independent of the mall project). It facilitates a smoother traffic flow throughout the downtown Portland area.

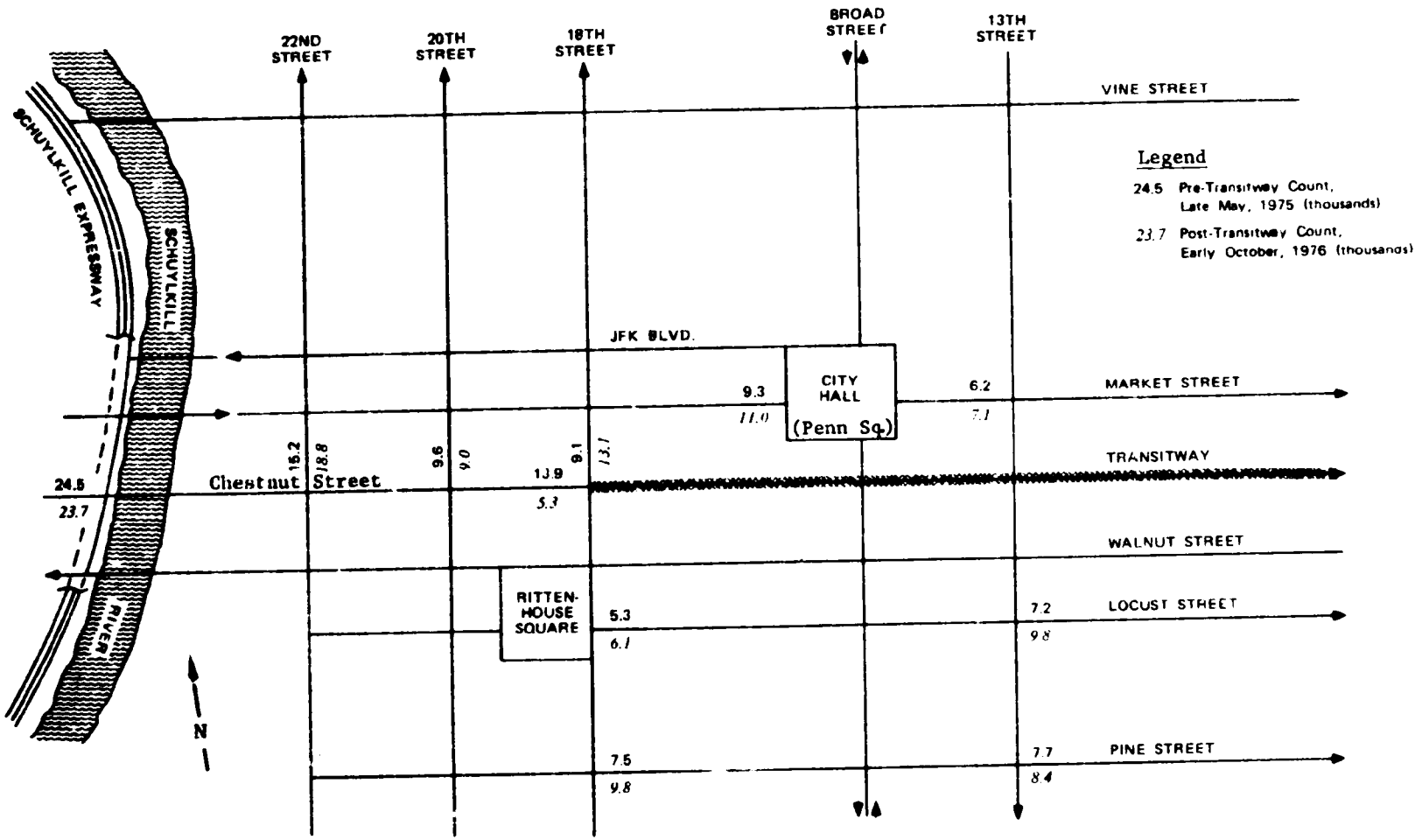
In Minneapolis, Nicollet Avenue is a two-lane, two-way street running in a north-south direction through the southern half of the city. The street terminates in the downtown core, two blocks

*Market Street forms part of an east-west pair with JFK Boulevard. East of Broad Street, however, Market Street reverts to a two-way traffic flow.

short of the Mississippi River. Major bridges cross the river one block west of the mall on Hennepin Avenue and three blocks east of the mall on Third Avenue. The eight-block mall is reserved for buses and taxis (under restricted conditions). No general traffic is allowed. Prior to the mall, Nicollet Avenue carried about 6,800 vehicles at Twelfth Street (two blocks south of the current mall). This was a lighter volume than on any of the nearby parallel streets, and Nicollet Avenue was not thought to carry a significant amount of through-traffic. There are no direct highway connections from Nicollet Avenue. Although signals were reset to favor cross-street traffic flows, no other adjustments were made to accomodate diverted traffic.

5.2.2 Changes in Traffic Patterns

5.2.2.1 Philadelphia - Of the three cities in this study, Philadelphia is by far the largest in population and suffers from the heaviest downtown traffic volumes and congestion. It was also the only city to devise a complete traffic diversion strategy, including the identification of a preferred alternate route. Figure 5-1 shows a pre- and post-transitway comparison of traffic counts in Center City Philadelphia. Although some important blocks, including the western portion of Market Street, are not included in the counts, it is possible to piece together a fairly complete picture of the traffic diversion process. Just prior to the beginning of construction (May, 1975) about 24,500 vehicles approached the Chestnut Street Bridge from the west. Just under 14,000 were on Chestnut Street between 19th and 18th Streets. (The transitway now begins at 18th Street.) Nearly one year after the mall had opened, only 5,300 vehicles were counted between 19th and 18th Streets, a decline of 8,600 vehicles. On the other hand, and despite the City's traffic diversion strategy, there was a drop of only 800 vehicles at the Chestnut Street Bridge. This drop could be due to daily variation in traffic volume, however, some vehicles probably are using the left-turn lanes on Chestnut Street west of the bridge to divert northward to Market or Vine Streets.



Source: City of Philadelphia Dept. of Streets

FIGURE 5-1. TWENTY-FOUR HOUR TRAFFIC COUNTS, PHILADELPHIA (Thousands)

Many of the vehicles crossing the Chestnut Street Bridge found parking or had trip ends in the immediate area even before the transitway, and thus did not have to change their travel patterns after the transitway opened. The drop of 8,600 vehicles on Chestnut Street between 19th and 18th Streets is probably accounted for by Chestnut Street Bridge traffic which now diverts north or south or uses the existing excess parking between the Schuylkill River and the transitway, some Schuylkill Expressway vehicles which now use exits at Vine or South Streets* instead of exiting at Chestnut Street, and vehicles of various origins which originally approached Chestnut Street from north or southbound Center City streets and must now continue north or south or turn onto one of the streets parallel to the transitway.

Whatever their origin, there appears to be a fairly sharp increase in vehicles on the streets at the western end of the transitway. The northbound routes of 18th, 20th, and 22nd Streets, which Philadelphia planners had hoped would be used by traffic diverted from Chestnut Street, show a combined increase from 33,900 vehicles per day to 40,900 vehicles per day. Although not measured, some additional cars may have used a Schuylkill Expressway access road to divert north to Vine Street. On Market Street east of 16th Street there has been an increase of only 1,700 vehicles, and east of Broad Street an increase of only 900 vehicles is found. Thus, most of the added traffic on northbound 18th, 20th and 22nd Streets is not using Market Street as an eastbound alternative to Chestnut Street. They have "disappeared," presumably into parking facilities on Market Street, JFK Boulevard, or areas to the north. This is quite reasonable, since many commuters and shoppers probably have destinations on the more intensely developed western portion of the transitway. Some, with destinations east of Broad Street, may now park west of Broad Street and use public transit to get from parking to jobs or stores.

Traffic has also increased on Locust and Pine Streets, south of the transitway. Traffic on these two streets increased from 12,800 to 15,900 vehicles per day at 18th Street (proportionally,

*Before and After transitway counts are not available for either South or Vine Streets. South Street is located south of Pine Street in Figure 5-1.

a larger increase than on northbound 18th, 20th, and 22nd Streets). Again, the additional traffic may have come from several sources: Chestnut Street Bridge traffic which diverts south and then east, Schuylkill Expressway vehicles which now exit at South Street and then head north and then east, and vehicles of various origins which originally approached Chestnut Street from north or southbound Center City streets and now turn onto Locust and Pine Streets instead.

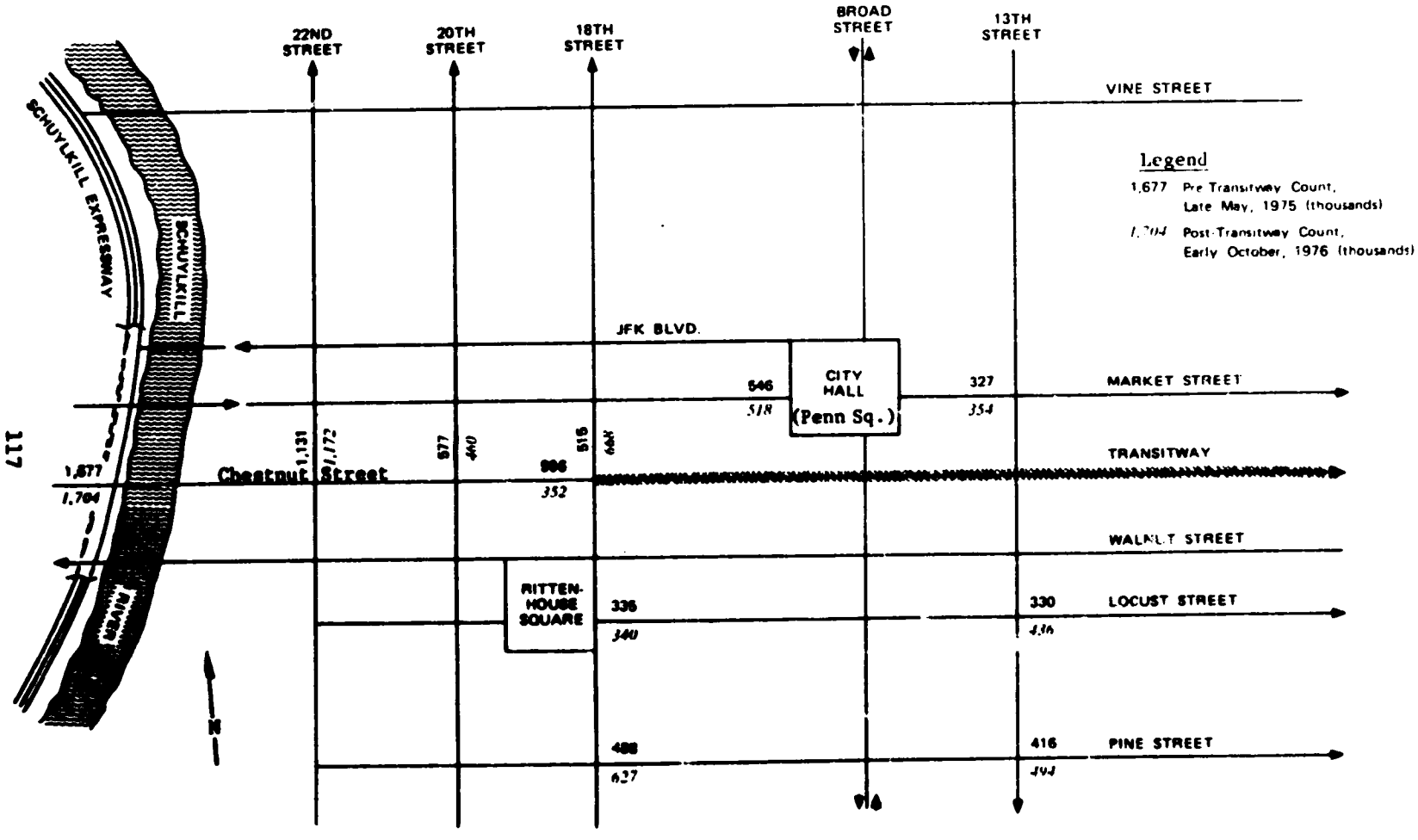
Traffic tapers off (as motorists reach destinations in the core) on Pine Street; 2,300 new vehicles were counted east of 18th Street while only 700 were counted east of 13th Street. Locust Street, on the other hand, shows the reverse pattern with just 800 new vehicles counted east of 18th Street while 2,600 show up east of 13th Street. This could be due to diverted traffic circulating around the transit mall in the vicinity of 13th Street. Overall, traffic on Market, Locust, and Pine Streets where they parallel the transitway, has increased by an average of 20 percent. This represents about one-third of the traffic that used to use Chestnut Street.

Earlier it was noted that the objective of Philadelphia's diversion strategy was to funnel motorists to Market Street. The City's UMTA grant application declared it "imperative" that diverted traffic not appear on the southern alternatives of Locust and Pine Streets because of their residential character. Pine Street was of special concern since it was felt that the interruption of Locust Street by congested Rittenhouse Square (immediately west of 18th Street) would discourage motorists from using Locust Street. This seems to have been the case and explains the smaller increase in traffic on Locust Street than Pine Street, between 18th and 17th Streets, noted above.

The failure of Philadelphia's diversion strategy to prevent increased traffic on Locust and Pine Streets can be explained by several factors. First, a 1974 survey of motorists on what is now the transitway portion of Chestnut Street showed that 50 percent of destinations were south of Chestnut Street and 20 percent were also south of Walnut Street (Ref. 5-1).

Second, a 1976 survey indicates that 41 percent of Center City parking spaces available for the general public are south of Chestnut Street, with 27 percent south of Walnut Street (Ref. 5-2). Thus, the northern diversion strategy had to overcome both a built-in demand for southern destinations and a built-in supply of southern parking spaces.

A final factor is the failure of motorists to divert to Market Street. Because Chestnut Street serves many eastbound commuters into Center City, the morning peak period is critical. Figure 5-2 shows pre- and post-transitway traffic counts for the 7-9 AM period. Although the pattern is close to the all-day figures shown in Figure 5-1, there is one major difference - there is no indication that Market Street is used by diverting traffic. While the all-day counts showed a slight decline in vehicles approaching the Chestnut Street Bridge, there is an increase during the AM period. Moreover, there is only a slight net increase in vehicles using the northbound routes at 22nd, 20th, and 18th Streets, and there is a decline in vehicles on Market Street itself between 16th and 15th Streets. While there is an increase in traffic on Locust and Pine Streets between 18th and 17th Streets, this is comparable to the increase which appeared in the all-day counts. Thus, in the AM period, a larger proportion of traffic diverted before 18th Street "disappears." Again, it appears that these vehicles have either found parking southwest of the transitway or used an access road to Vine Street to the north. The reason motorists do not divert to Market Street at peak periods is the location of City Hall in Penn Square. Eastbound traffic on Market Street and north-south traffic on Broad Street must merge at Penn Square to circle the City Hall building. The Penn Square roadway is narrower than either of the streets feeding into it, creating congestion at peak periods. Thus, those drivers with destinations east of City Hall are likely to select an alternate route. The removal of one crosswalk at Penn Square was a minor improvement that improved traffic flow slightly.



Source: City of Philadelphia Dept. of Streets

FIGURE 5-2. MORNING PEAK PERIOD TRAFFIC COUNTS, PHILDELPHIA (7-9 AM) (Thousands)

In light of the high proportions of trip destinations and public parking spaces located south of the transitway and the inherent problem on Market Street, the goal of little or no traffic increases on Locust and Pine Streets was probably unrealistic. While this study was able to identify changes in traffic demand, no data were available to evaluate the impact of changes on the supply side, such as the improvements in Market Street signalization. For example, before-and-after speed-and-delay studies of through-traffic were not conducted to see the net effect on an auto diverted from Chestnut Street. However, local officials report few, if any, complaints from motorists and have concluded that the closing of Chestnut Street was a success from the standpoint of traffic movement. Likewise, there have not been complaints from the residential neighborhoods south of the transitway although an increase in traffic is evident.

5.2.2.2 Portland - The traffic situation in Portland differs from that in Philadelphia in several key respects. A discontinuous general traffic lane was added to the Portland Mall, wider and more closely spaced streets offered greater excess capacity, and through-traffic was probably less common on the Portland streets than on the Philadelphia's Chestnut Street. Nevertheless, the removal of most general traffic from two downtown streets must be considered a major change in Portland.

Figure 5-3 shows before-and-after traffic counts along a downtown Portland screen line north of Adler Street. The first count was taken in February 1976, just prior to the closing of Fifth and Sixth Avenues for construction. The second count was taken in June 1978, four months after the official opening of the mall. Also included in Figure 5-3 are selected figures from traffic counts along a cordon line around the central business district. The screen line and cordon line counts were taken at the same time.

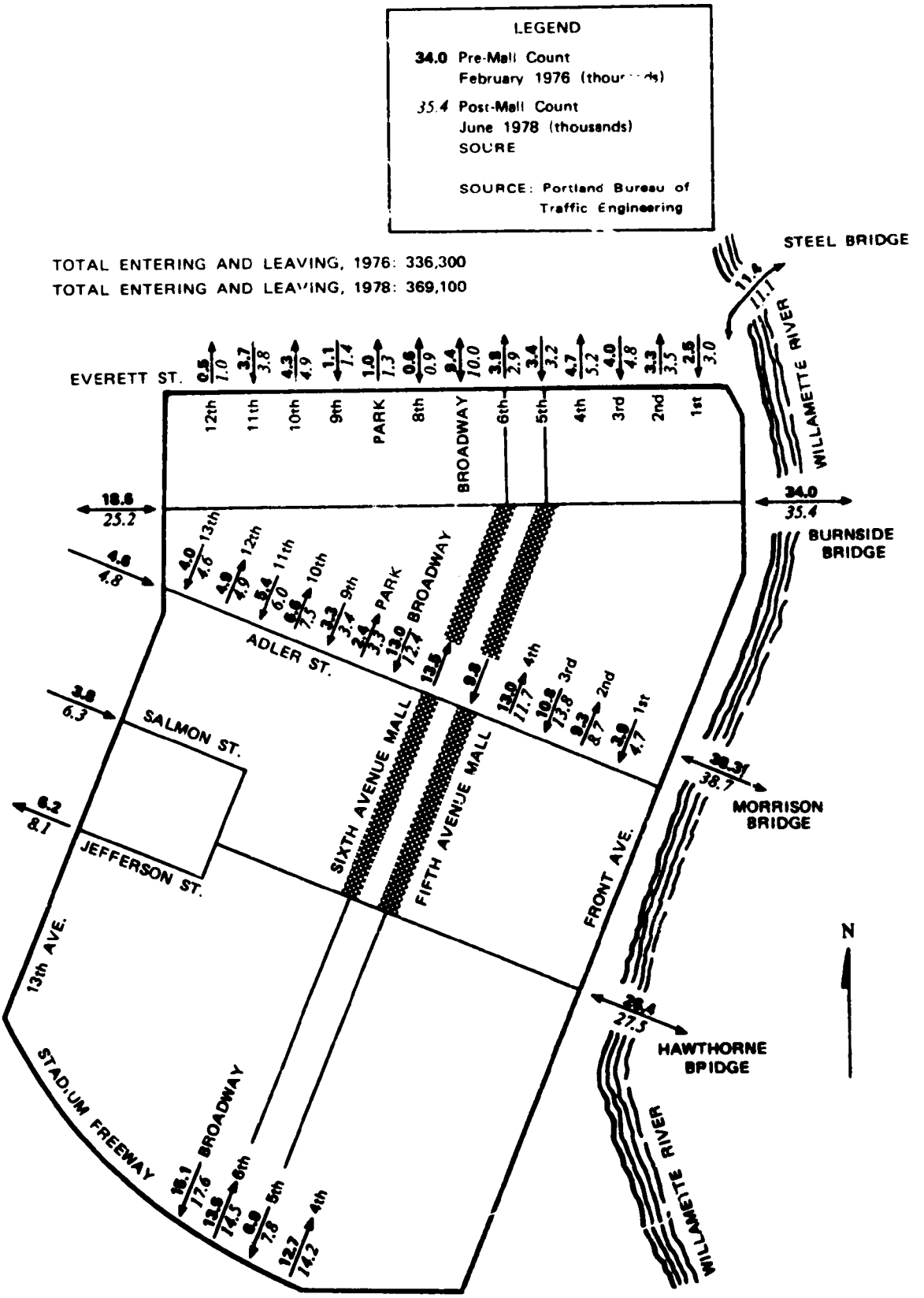


FIGURE 5-3. SELECTED TRAFFIC VOLUMES IN DOWNTOWN PORTLAND, 1976 AND 1978

There is no evidence that the transit mall caused shoppers or other drivers to avoid the downtown area. Total vehicular movement into and out of downtown Portland increased by nearly 10 percent between the pre-mall and post-mall counts. Although some of this increase may be due to seasonal variations between the two counts, other data suggest that average daily traffic into downtown Portland has been increasing since mid-1976 (reversing a long-term downward trend).

Cordon count figures indicate that the Portland Mall has had only a slight impact on the routes chosen by automobiles to enter and leave the downtown area. For instance, traffic has increased on all three bridges with direct connections to the downtwon core. However, the Morrison Street Bridge, which would take through-traffic directly across the mall, shows the smallest increase. Likewise, traffic entering downtown from the south shows a larger increase on Fourth Avenue than on Sixth Avenue. A stronger impact of the mall is shown on the northern cordon line, which is only three blocks north of the mall. Fifth and Sixth Avenues combined show a drop of over 1,100 vehicles per day, or a decline of about 16 percent. All other streets show an increase in traffic at the northern cordon line, although more than half of the combined increase on these streets is due to a general increase in traffic, rather than diversions from Fifth and Sixth Avenues.

Traffic volumes within the downtown core, shown by the screen line counts, provide no evidence of an increase due to autos diverted from the mall streets. Although the total volume of vehicles on north-south streets (excluding Fifth and Sixth Avenues) has increased by 4,400 vehicles, or about six percent, this is less than the ten percent increase in total vehicles entering the downtown area. Of a total of over 23,000 vehicles per day that used Fifth and Sixth Avenues combined before the mall, most are now unaccounted for. The general traffic lanes on the mall streets were observed to carry very little traffic. About 2,000 buses, many removed from parallel streets, now run on the mall. Perhaps as many as 20,000 vehicles have "disappeared" from the mall blocks

north of Adler Street. Presumably, these autos were either engaged in unnecessary circulation or have now found parking outside of the mall area. Both the nearest parallel streets, Broadway and Fourth Avenue, also show a decline in traffic volume. Again, this could be due to motorists seeking parking elsewhere, a reduction in unnecessary circulation, or, since the declines are relatively slight, a reduction due to the removal of bus lines (20 lines were removed from Fourth Avenue and six from Broadway). The remaining streets parallel to the mall show a total increase in traffic of 12 percent, only slightly more than the 10 percent increase in total vehicles entering the downtown area.

Thus the Portland Mall appears to have had no significant negative effects on downtown traffic conditions. Indeed, it is possible that since the computerized traffic control was started, downtown traffic flow may actually have improved over pre-mall conditions. Also, since one bus has a greater impact on traffic flow than a single auto, traffic count data would not fully reflect the impact of rerouting most bus lines off nearby streets onto the Portland Mall. Speed-and-delay studies are not available, however, to confirm any improvement. In informal interviews, taxi drivers in the downtown area reported that traffic conditions were "not much different" since the closure of Fifth and Sixth Averues.

5.2.2.3 Minneapolis - The Nicollet Mall in Minneapolis presented a somewhat simpler traffic problem than Philadelphia or Portland. First, traffic volumes on Nicollet Avenue were lower than those in the other two cities. Second, because Nicollet Avenue did not cross the Mississippi River to the north or have a direct connection to available highways to the south, it was not favored by commuter or through-traffic, as was the case, to some extent, in Philadelphia and Portland. Figure 5-4 and the tables following present cordon counts of vehicles and passengers at 12th Street,

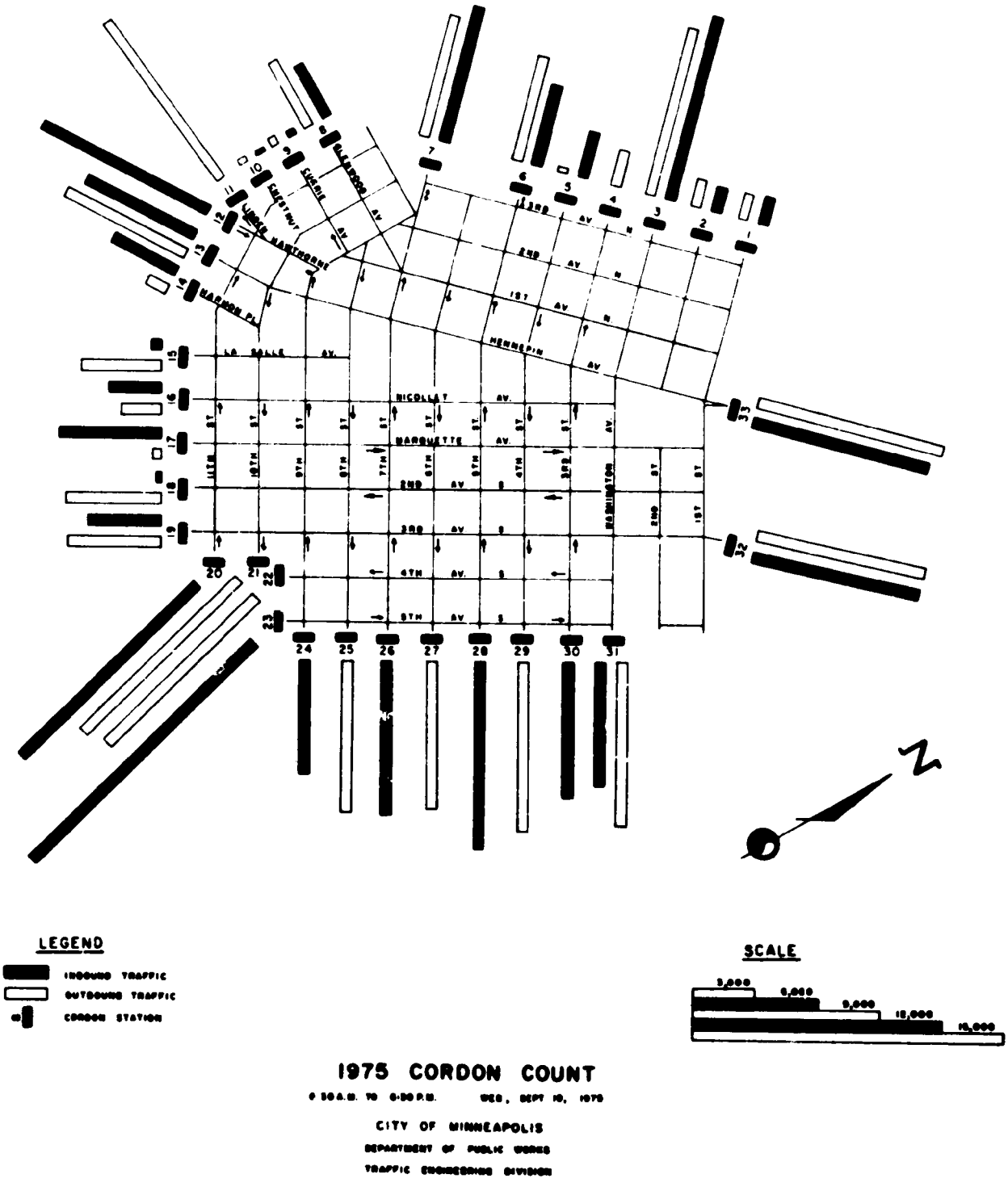


FIGURE 5-4. MINNEAPOLIS DOWNTOWN STREETS AND CORDON COUNTS

two blocks south of the mall, for Nicollet Avenue and four comparison streets. Pre-mall traffic counts on the mall itself were unavailable.

Table 5-1 shows that the decline in the number of vehicles on Nicollet Avenue is comparable to the decline on parallel streets. This tends to support the idea that Nicollet Avenue was not heavily used by through-traffic. The through-traffic which did exist has been diverted, but this probably would have happened anyway with the completion of the highway system. The general decline in vehicle counts on all the nearby parallel streets can largely be explained by completion of highway connections to other streets entering the downtown.

TABLE 5-1. MINNEAPOLIS CORDON COUNTS OF VEHICLES

Location	Number of Vehicles			
	Pre-Mall 1964	Post-Mall 1970	Post-Mall 1975	% Change 1964-1975
Hennepin Ave/12th St.	15,933	13,918	12,412	-22%
Nicollet Ave/12th St.	6,838	4,958	4,557	-33%
Marquette Ave/12th St.	10,625	8,336	5,340	-50%
Second Ave/12th St.	7,721	7,463	4,919	-36%
Third Ave/12th St.	10,298	9,256	8,102	-21%
TOTAL	51,415	43,931	35,330	-31%
CBD Cordon Count Total	290,495	323,958	270,640	-7%

Source: Minneapolis Department of Public Works

A comparison of total vehicles in the downtown area in 1964 and 1970 (three years before and after the mall) shows an increase. This supports the Portland data which indicate that the mall there did not discourage motorists from driving downtown. The later decline (1970 to 1975) in total vehicles in downtown Minneapolis cannot be attributed to the Nicollet Mall.

Table 5-2 shows that the actual volume of passengers and pedestrians using Nicollet Avenue has shown a substantial increase, while the comparison streets have shown a decline. Sixty-eight percent of the Nicollet Avenue count were bus riders, most of whom continue onto the mall. An additional 13 percent consisted of pedestrians, taxi riders, and bicyclists, many of whom also continue onto the mall. Bus ridership is also up on all the comparison streets (except Hennepin Avenue) but not by enough to offset the decline in auto and pedestrian use on these streets. Thus, in creating the transit mall, Minneapolis has seen an increase in persons carried on the street, w thout apparent congestion on parallel streets (in part due to the completion of the highway system).

TABLE 5-2. MINNEAPOLIS CORDON COUNTS OF PASSENGERS/PEDESTRIANS

Location	Number of Persons			
	Pre-Mall 1964	Post-Mall 1970	Post-Mall 1975	% Change 1964-1975
Hennepin Ave/12th St.	41,544	33,101	28,599	-31%
Nicollet Ave/12th St.	17,246	23,708	25,184	+46%
Marquette Ave/12th St.	21,167	14,535	14,116	-33%
Second Ave/12th St.	16,723	14,654	9,404	-44%
Third Ave/12th St.	16,291	18,896	14,786	- 9%
CBD TOTAL	514,425	554,296	489,765	- 5%

Source: Minneapolis Department of Public Works

5.2.3 Conclusions

Several conclusions can be drawn from the traffic data in the three cities. First, there was no evidence that the restriction of auto traffic on transit malls caused motor-

ists to avoid the downtown areas. This was confirmed by cordon counts in Minneapolis and Portland. There was evidence that some through-traffic has selected other routes into the downtown areas in each city. This pattern was less obvious in Philadelphia, where most motorists need to cross a bridge to enter Center City which restricts the number of alternate routes available to motorists.

A second general conclusion is that, within the immediate vicinity of the transit malls, diverted traffic did not cause congestion on nearby streets. The strongest evidence of this was in Portland, although this was an opinion also shared by local observers in Philadelphia and Minneapolis. The lack of congestion was not due to excess capacity on nearby streets, but to the fact that most of the pre-mall traffic simply "disappeared" - either because motorists found parking at more outlying locations or because some of the pre-mall traffic consisted of unnecessary circulation and turning movements.

The situation in Philadelphia deserves special note. Faced with a very heavy inbound traffic on the Chestnut Street Bridge, Philadelphia planners devised a diversion strategy aimed at channeling traffic onto Market Street, a parallel eastbound route one block north of the transitway. Much Chestnut Street traffic did divert northward, although it appears that most cars chose to stop at parking facilities in the area rather than travel on Market Street. Also, despite the diversion strategy, some traffic did divert to the south, using largely residential streets to reach parking and trip destinations south of the transitway. This result was probably inevitable, and the City's diversion strategy should have considered ways of improving traffic flow south of the transitway.

Finally, the Minneapolis data indicated that by rerouting bus lines onto a transit mall, the total number of persons traveling on the street may actually increase. This fact is of special importance to mall merchants, although the impact of passenger volumes on retail sales may vary by type of merchandise sold. (Chapter 7

discusses the impact of transit malls on economic conditions.) The rerouting of bus lines to transit malls may also improve traffic conditions on nearby streets. This impact is not fully documented by the traffic count data presented in this section, since a bus will count as only one "vehicle," but clearly has a greater impact on traffic flow than a single automobile.

5.3 DELIVERY OF GOODS

The provision of space for delivery of goods to merchants was a problem considered in all three cities. It is an issue which can generate intense opposition to a mall project by those individuals immediately affected. Two of the cities, Minneapolis and Portland, were able to reach relatively easy solutions to the delivery problem. A partly successful solution was reached in Philadelphia, although many Chestnut Street Transitway merchants are still dissatisfied with their delivery of goods.

In Minneapolis, deliveries are generally not allowed on the Nicollet Mall. This has not presented a problem, since there are only two businesses without access to a rear alley. These two are allowed to use the mall for loading purposes. On the Portland Mall, pick-up and delivery of goods is not permitted except by special permit at night and on weekends. There is no alley system in downtown Portland and new curbside loading zones were established on all cross-streets. This resulted in a net increase of 525 feet in the length of available loading zones. Tri-Met has paid for the relocation of some service elevators to cross-street locations. Although there has been no survey of merchant opinion, the cross-street loading zones appear to work well. One reason may be that the short blocks (200') in Portland minimize the distance goods must be carried. However, the evaluators observed a few delivery vehicles using the general traffic lane on the Portland Mall for curbside loading.

The situation in Philadelphia was the most severe of the three cities. Although there was a network of rear alleys, most were too narrow to be useful for a high number of loading vehi-

cles. The zones run the full length of the block, both to provide additional space and as an aid to enforcement. The zones have a distinctive pavement marking and only commercially licensed vehicles may park in them.

Table 5-3 shows the results of a survey of merchants concerning their delivery problems. Just over 10 percent report being charged more by deliverymen due to the longer distance involved. (The amount of the additional charge was not reported.) About 30 percent report that loading is more difficult due to the lack of rear access, but no additional charge has been made. A particular problem when deliveries must be carried some distance

TABLE 5-3. TRANSITWAY MERCHANT DELIVERY PROBLEMS

	Delivery Problems				
	Higher Cost	No Rear Access	Hours Changed	Other	No Change
All Merchants (173)	11%	29%	2%	8%	51%
LOCATION					
18th to Broad (67)	10%	40%	3%	--	46%
Broad to 11th (55)	13	18	0	--	69
11th to 6th (51)	14	33	4	--	49
TYPE OF BUSINESS					
Parking (2)	50%	0%	0%		50%
General Merchandise	0	0	0		100
Wearing Apparel (60)	12	35	0		50
Furniture (11)	9	27	0		55
Eat/Drink (25)	12	32	4		44
Miscellaneous (61)	13	33	3		46
Bank (16)	0	13	0		69
Hotel (2)	0	0	0		100
Movie (2)	50	0	50		0
Other (4)	0	0	0		75

Source: Delaware Valley Regional Planning Commission (DVRPC), "Auto-Restricted Zones in the Delaware Valley Region," August 1977, and data supplied by the DVRPC.

is that unguarded trucks must be locked up at each stop to prevent theft. There is also a greater danger of damage to goods occurring along the route from truck to merchant. Very few merchants report a change in delivery hours. Most Chestnut Street Transitway businesses are too small to arrange special delivery hours with their suppliers and so cannot make use of the special permit option to load from the transitway.

Table 5-4 indicates a relationship between delivery problems and overall attitude toward the Chestnut Street Transitway. Those who have not had delivery problems, including most large firms with rear access, tend to favor the mall. Those who now face higher delivery charges for goods have a decidedly negative view of the transitway. Those who report just being inconvenienced are about evenly divided on their overall attitude. Thus, goods access may play an important role in overall merchant perception of the Chestnut Street Transitway.

TABLE 5-4. TRANSITWAY MERCHANT DELIVERY PROBLEMS BY OVERALL ATTITUDE

	Overall Attitude Toward Transitway			
Delivery Problems	Favorable	Indifferent	Unfavorable	NA
No Change (94)	60%	18%	17%	4%
Higher Cost (21)	19	5	71	5
No Rear Access(54)	46	7	41	6
Hours Changed (4)	25	0	25	50

Source: Delaware Valley Regional Planning Commission

Table 5-5 lists suggestions made by merchants to improve deliveries. Very few suggest changes to the existing cross-street loading. The majority would prefer unscheduled off-peak deliveries from the transitway itself to solve the problem of arranging specific delivery times with suppliers. Of those responding, about one in seven mention enforcement problems in the cross-street loading zones. This will be discussed more fully in the next section. While there is an enforcement problem (along with interruptions of loading zones by driveways, no parking, or special zones), there appears to be sufficient loading space available on most blocks. Use of loading zones by delivery vehicles appears heaviest west of Broad Street and north of the transitway, where the rear alley system is inadequate.

TABLE 5-5. TRANSITWAY MERCHANT SUGGESTIONS TO IMPROVE DELIVERIES

Suggestions	Number of Responses
Permit Off-Peak Deliveries along Chestnut Street	31
Rear Load Zone Improvements	11
Enforce North/South Load Zone Restrictions	9
Expand North/South Load Zones	7
TOTAL	58

Source: Delaware Valley Regional Planning Commission (DVRPC), "Auto-Restricted Zones in the Delaware Valley Region," August 1977.

Although there are costs of one form or another to many merchants, the cross-street loading zones appear to be at least a minimally effective solution. The transit mall which was recently opened in Madison WI allows deliveries without permit during restricted daytime hours. Although this solution has not yet been fully tested, the potential for an enforcement problem appears great.

5.4 ENFORCEMENT

Enforcement of use restrictions is a problem frequently raised in pre-transit mall planning. The Philadelphia Police Department, for example, supported block-long loading zones with striping as a means of reducing ambiguity and parking violations. In general, transit malls have an advantage over other forms of use restriction in that their distinct physical form makes them easily noticeable to pedestrians and motorists. In some cases physical improvements may actually help bar illegal behavior. Decorative walls that discourage jaywalking and the concrete traffic diverter at the entrance to the Nicollet Mall are examples. However, transit malls are not immune to enforcement problems.

The most frequent violation is jaywalking. This is discussed more fully in Section 6.3.3. As many as 3,900 violations per hour were observed at mid-day on a crowded Chestnut Street Transitway block. Due to the volume of jaywalking in Philadelphia, it is not feasible for police to effectively control the problem. Moreover, there is virtually no public support for an enforcement program. Portland, on the other hand, has a long history of enforcing pedestrian safety laws. When a jaywalking problem arose on the Portland Mall, a renewed enforcement effort combined with temporary crosswalk warning stickers and a publicity campaign were effective in sharply reducing the number of jaywalkers.

Private autos also trespass on transit mall roadways. Generally, these violations occur only occasionally and often involve

autos with out-of-state license plates who may be confused by the auto ban. Most violators were observed to turn off the transit malls at the first opportunity.

An exception to this pattern are the eastern four or five blocks of the twelve-block Chestnut Street Transitway. Violations are heavy on the last transit mall block (7th to 6th Streets) (see Figure 5-5); not only do autos ignore the "No Entry" signs, they drive on both the eastbound and the on-coming westbound lanes. Because the main westbound bus route enters the transitway at 7th Street, the westbound lane between 7th and 6th Street is only used by an occasional "cultural loop" bus. This low visibility of buses probably encourages motorists to enter this block. Originally this block (7th to 6th Streets) allowed autos for access to a parking lot; however, when it became obvious that the block was being used by through-traffic, UMTA insisted that the block be reserved for buses only, as the parking lot had alternative access. However, the operator of the lot continues to use a Chestnut Street Transitway entrance and maintains a very large sign directing morotists to drive onto the transitway. Philadelphia officials are aware of the problem and are seeking to enforce the law. On one block (8th

FIGURE 5-5. VIOLATORS ON THE CHESTNUT STREET TRANSITWAY (PHILADELPHIA)

to 7th Streets) autos are allowed to enter or leave parking lots and it is impossible to prevent use by through-traffic. On another block (9th to 8th Streets) taxis are permitted to service a major hotel. Autos use the mall frequently between 10th and 8th Streets. Enforcement is lax, possible because of misinformation on the part of police officers on the beat. An officer interviewed between 10th and 9th Streets said that autos were allowed on that block, although they are not.

One conclusion that might be drawn from the Philadelphia experience is that exceptions, such as permitting autos on the mall for access to parking, encourage violations. The design of the Portland Mall presents another test case. With a general traffic lane on three out of four blocks (a widened sidewalk eliminates the lane every fourth block), it could prove difficult to prevent some autos from moving into a bus lane to cross the fourth block. Also, cars entering the Portland Mall from cross-streets might turn onto a buses-only lane.) However, based on observations by the evaluators, there is no significant enforcement problem on the Portland Mall (see Figure 5-6). In making

FIGURE 5-6. DIVERSION FROM THE PORTLAND AUTO LANE

turns from cross-streets, some drivers do initially enter a bus lane, but nearly all drivers quickly move into the general traffic lane. As noted earlier, the general traffic lane on the Portland Mall is very lightly used. It is not known whether an enforcement problem might develop if traffic demand were higher.

A final enforcement question concerns the use of cross-street loading zones. As noted earlier, in Philadelphia, Chestnut Street Transitway merchants were not confident that parking restrictions in loading zones could be enforced, and that block-long zones with special markings might be a help. Point-in-time checks of loading zone use on nine cross-streets, either at mid-morning or mid-afternoon, were made. The results, shown in Table 5-6, indicate an enforcement problem.

TABLE 5-6. USE OF TRANSITWAY LOADING ZONES

Vehicles in Loading Zones			Vehicles in Other No Parking Zones		
Trucks	Private Autos	Public Vehicles	Trucks	Private Autos	Public Vehicles
37	15	3	13	7	1

Loading zone violations vary considerably among blocks. Even where private autos are parked (often with the driver sitting behind the wheel) there is often room remaining for delivery vehicles. Occasionally, however, trucks are forced to park outside the official loading zones. On the day of observation, the situation was complicated by numerous sidewalk vendors on the cross-streets who sometimes prevented trucks from unloading. The cross-street loading zones in Portland appear to work well, although demand for loading and parking space is not as severe as in Philadelphia. Rear alley loading in Minneapolis appears to work well.

Two conclusions are suggested by this section. First, enforcement is comparatively easy on transit malls due to the prominent physical changes involved which draw attention to the mall as a

"special" situation, and due to traffic diversion strategies such as entry signs or barriers. Second, it may be the rule that exceptions from a total ban on traffic encourage violations. This was clearly the case in Philadelphia. In general motorists seem to find it difficult to differentiate when rules apply only to certain vehicles, certain blocks, or only during certain times of the day. The Locust Street Bus Mall in St. Louis, Missouri substantiates this observation. Locust Street is one-way westbound with a buses-only diamond lane all day. Between 4-6 PM, however, the street is restricted to use by buses, taxis, and emergency vehicles. At 4 PM, turn indicators for traffic intersecting Locust Street direct motorists to continue straight, and a police officer oversees a movable barricade to auto traffic at the mall entrance. However, many motorists disobey the auto ban. Indeed, a local consultant found that only half the vehicles on the mall were actually buses during the 4-6 PM period. The Locust Street Bus Mall lacks two critical transit mall characteristics: there have been no distinct physical changes, and the traffic restriction applies for only two hours of the day.

5.5 SUMMARY OF FINDINGS

Impact on Diverted Traffic

1. No decline in auto trips to the downtown areas is noticeable from cordon counts in Minneapolis and Portland. In fact, increases in auto trips in Minneapolis and Portland should dispel the fear that transit malls will discourage shoppers and others from coming downtown.

2. A small change in selected entry and exit points at the border of downtown areas was observed in the Portland cordon counts and may also have occurred in Philadelphia. The impact of a transit mall on the entry point selected (e.g., a particular highway ramp) depends on how close the entry point is to the mall and on the availability of alternate routes.

3. There is a noticeable diversion of traffic approaching the ends of the transit malls. This occurred on Philadelphia's Chestnut Street west of the transitway, and was also observed at the northern end of the Portland Mall. In both cities the major effect occurred over a short distance, with most motorists apparently finding parking near the mall ends, rather than diverting to streets paralleling the malls. In both cities, the diverting traffic appeared to be dispersed among a number of alternate routes. In Philadelphia, this occurred despite efforts to encourage motorists to divert in only one direction. The scattered location of trip destinations and parking facilities appears to be responsible for the failure of Philadelphia's diversion strategy.

4. In general, there was a relatively small increase in traffic on streets paralleling the transit malls, either from the diversion of through-traffic from the mall streets or from the diversion of traffic with trip ends on the malls. In Portland there was actually a decline in traffic on the two parallel streets nearest to the mall, with little or no compensating increase on parallel streets farther from the mall. In Philadelphia, increased traffic on the three major parallel streets averaged about 20 percent. However, this accounted for only about one-third of the traffic that previously used Chestnut Street. Officials in all three cities felt that the transit malls had not caused congestion on nearby streets. It appears that most mall traffic "disappears," either because motorists have found parking at more outlying locations or because some of the original circulation was unnecessary.

5. Data from Minneapolis suggest that, where there is significant rerouting of buses onto the transit malls, the total number of persons traveling on the mall may actually increase.

Impact on the Delivery of Goods:

The problem of providing sufficient areas for delivery access has been solved, with varying degrees of success.

1. Rear alley loading is most effective, if sufficient alley width exists.

2. Cross-street loading zones in Philadelphia are inconvenient to merchants and delivery persons and may increase delivery charges. Cross-street loading in Portland appears to work well, possibly due to short block lengths which minimize the distance that goods must be carried.

3. On-mall loading by special permit in Philadelphia does not work for small businesses which cannot economically arrange deliveries during non-business hours.

Enforcement

Enforcement of restrictions on auto use have proved to be difficult only where special conditions exist:

1. Few violations of buses-only areas, generally by out-of-state autos, were seen on the transit malls. Sidewalk improvements may assist enforcement by identifying the transit malls as "special streets."
2. Exceptions to traffic restrictions may lead to violations on transit malls where autos are allowed for specific purposes, in some blocks but not in others, or in some lanes but not in others. This was evident in Philadelphia. The discontinuous general traffic lane on the Portland Mall does not appear to have an enforcement problem, perhaps because traffic volumes on the lanes are very light.

6 IMPACT ON PEDESTRIANS

6.1 INTRODUCTION

6.1.1. Objectives

Usually the main rationale for creating sidewalk improvements is that the improvements will indirectly serve to enhance local business by attracting shoppers. Other objectives relate more directly to pedestrians. First, improving the walking mode for pedestrians is considered an end in itself. Both federal and local governments are interested in encouraging people to use means other than cars and buses for short trips; walking and bicycling help to conserve limited energy sources and to preserve a clean environment. Second, improving walking conditions is important in assuring adequate circulation for workers in high-density urban areas. Third, mall improvements help to meet the special needs of elderly and handicapped persons by providing wider sidewalks for wheelchaired persons, information booths, benches and other sidewalk facilities. Fourth, by removing or restricting access by general traffic, planners expect to reduce the conflict between the automobile and the pedestrian. Reductions in pedestrian accidents and in air or noise pollution may be anticipated. Finally, a relaxed pedestrian atmosphere is an important element in the creation of a suitable downtown environment. All of these objectives might be served as well or better by a full pedestrian mall. An underlying issue, therefore, is the extent to which buses may counteract the pedestrian improvements.

6.1.2 Issues

There are two main issues which relate to a mall's impact on pedestrians. The first has to do with the effect a mall has on pedestrian use and comfort. Does pedestrian volume increase after

a transit mall is constructed? Is pedestrian circulation improved? While widened sidewalks may improve walking conditions, the addition of street furniture or an increase in pedestrian volume may negate the increase in sidewalk space. Is pedestrian comfort increased by the addition of benches and other amenities? Or are such benefits counteracted by an increase in noise and fumes associated with increased bus volumes? Is the reduction in air and noise pollution once generated by autos made up by the increase in pollution by buses? These questions are discussed in Section 6.2.

The second general area of concern, issues related to pedestrian safety, are discussed in Section 6.3. Reducing the conflict between pedestrians and autos is a frequently-cited objective of transit malls. However, once autos are removed conflicts between pedestrians and buses remain and may even worsen on a transit mall. Does a change from one- to two-directional bus flow (as in Philadelphia) contribute to bus-pedestrian accidents? Pedestrians used to looking in only one direction before crossing may not notice a bus approaching from a new direction. Does the relaxed atmosphere of a transit mall combined with a smaller number of total vehicles contribute to pedestrian carelessness and jaywalking? Does the speed of buses affect pedestrian safety? While roadway design and frequent stops place constraints on moving speed the reduction in auto traffic may allow buses to go faster, causing danger to pedestrians. Finally, do some elements of mall design contribute to accidents? (This section also includes a brief discussion of bicycle safety on the mall.)

6.1.3 Data Sources

A number of data sources were used for the analyses in this chapter. The evaluation of pedestrian use and comfort relied primarily on a series of locally-conducted surveys and counts. This includes surveys of merchants and pedestrians in Minneapolis, (see Appendices D and E) surveys of merchants and mall area employees in Philadelphia, (see Appendices F and G) pre- and post-mall pedestrian counts in Minneapolis, and post-mall pedestrian counts in Philadelphia.

No comparable surveys or counts are available for Portland. In addition, the operation of all three transit malls was observed for a combined period of over four weeks.

The evaluation of pedestrian safety focuses on three main data sources: local accident counts, actual bus-pedestrian conflicts recorded as part of the On-Bus Measurement Studies, (see Appendix B) and counts of illegal pedestrian crossings (see Appendix C). Again, comparable data for Portland are either not available or, in the case of accidents, the mall is too new to yield meaningful comparative data. Figures for citations issued for illegal pedestrian crossings were gathered in Portland.

6.2 IMPACT ON PEDESTRIAN USE AND COMFORT

6.2.1 Pedestrian Volume

An increase in pedestrian use is the major indicator of whether an experiment designed to improve pedestrian service is successful. This increase is expected from three sources: (1) new visits to the downtown; (2) pedestrians attracted to the transit mall from other downtown streets; and (3) mode change from driving or riding to walking or bicycling. Although available data are inconclusive, officials in Philadelphia and Minneapolis believe their malls have met these expectations.

The pedestrian counts taken in Minneapolis in 1958 and 1976 (nine years before and after the mall opened) show a sharp decline in pedestrian volumes and are shown in Table 6-1. There are two explanations for this decline. First, total pedestrian volumes in the downtown have shown a slight decline over the 18-year period. Changing land use patterns suggest this decline may be due to fewer shoppers rather than workers. Because of their in-and-out behavior, shoppers contribute to pedestrian counts disproportionately to their actual numbers. Any decline in shoppers would be most evident in the Nicollet Mall, the main shopping area in downtown Minneapolis.

TABLE 6-1. NICOLLET MALL PEDESTRIAN COUNTS, MINNEAPOLIS

Block	September, 1958 7AM - 6PM	September, 1976 7AM - 6PM	Percentage Change 1958-1976
4th-5th	10,344	9,837	-4.9%
5th-6th	23,902	13,811	-42.2%
6th-7th	33,331	13,711	-58.9%
7th-8th	33,819	19,897	-41.2%
8th-9th	29,784	19,569	-34.3%
9th-10th	18,209	12,282	-32.5%

The second, more obvious explanation for falling pedestrian volumes is the competition provided by the skyway system. All major department stores on the mall are connected by the second-floor passageways. Proportionally, blocks connected by skyways (5th through 9th Streets) show the heaviest drops in sidewalk activity. A 1974 comparison of pedestrian volumes indicates that even with the best outdoor weather conditions the skyways still attract about one-third of pedestrian traffic where the skyways are in competition with sidewalks. On hot summer days this rises to one-half and on winter days to between two-thirds and three-quarters of pedestrian traffic (Ref. 6-1). It should be noted that Minneapolis officials believe there is an interaction effect, such that the skyway and Nicollet Mall improvements support each other in containing the slow drift of shoppers to suburban malls.

Figure 6-1 presents available pedestrian counts in Philadelphia over a 20-month period. No pre-transitway counts were taken in Philadelphia. Midday counts which began shortly after the transitway opened do not show consistent improvement. However, many observers believe that a significant increase in volumes occurred when the transitway first opened, which then stabilized at a point above the pre-transitway level. This idea is partially supported by the result of a 1977 survey of transitway area employees. Sixty-four percent of the workers reported that the transitway improvements encouraged them to use Chestnut Street more

than other streets for "walking to reach a specific destination other than shopping;" 58 percent were encouraged to use the transitway for "walking for pleasure;" and 52 percent were encouraged to shop on the transitway as opposed to other streets (Ref. 6-2).

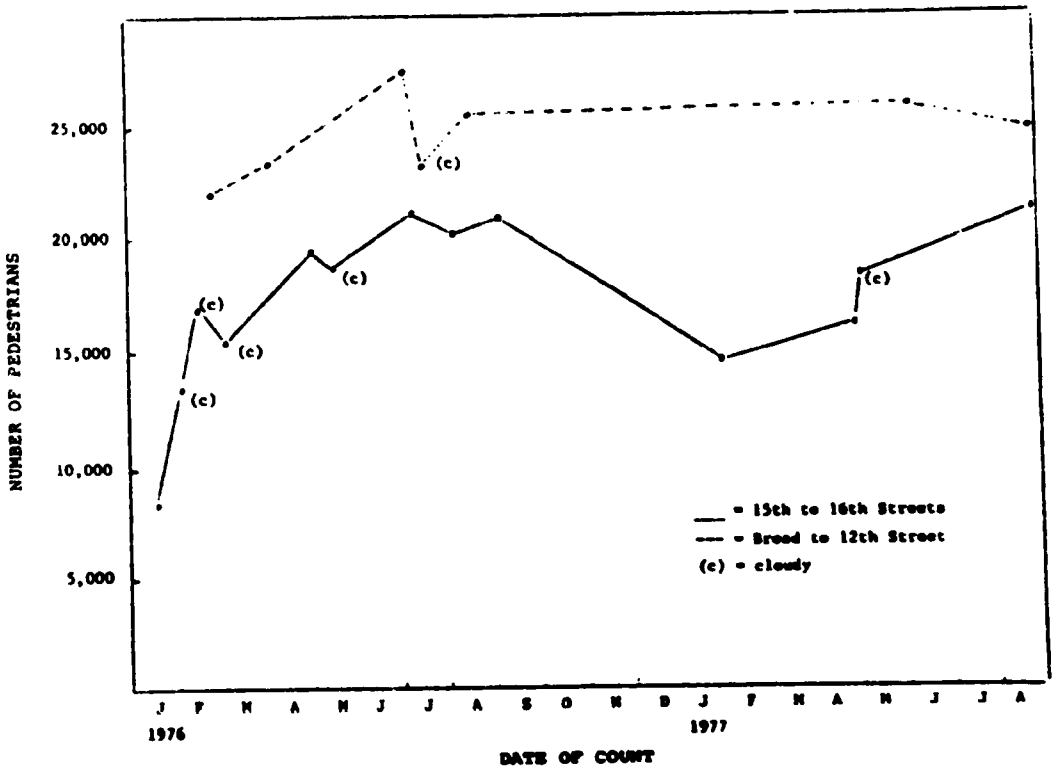


FIGURE 6-1. CHESTNUT STREET TRANSITWAY PEDESTRIAN COUNTS, 11 AM-2PM, PHILADELPHIA

The pedestrian counts in Minneapolis and Philadelphia appear inconclusive by themselves. However, some weight should be given to the Philadelphia survey results and the generally positive reports of local observers. One must also consider than pedestrian counts might have declined, or declined more steeply, if the transit malls had not been built. The most likely conclusion

is that pedestrian volumes stabilized or rose slightly as the result of the transit malls. A stronger conclusion may ultimately come from Portland, where the best pre-mall pedestrian count data exist. Unfortunately, no post-mall counts are currently planned.

6.2.2 Ease of Pedestrian Circulation

Ease of pedestrian circulation is a function of both pedestrian volume and sidewalk width. On a square footage basis, department stores and fast food outlets generate a greater "in-and-out" volume than office buildings. Thus the most heavily used block on Minneapolis' Nicollet Mall is between 7th and 8th Streets, on which there is a 1.3 million square foot department store and a 1.1 million square foot office building, with a two-story retail complex. Average hourly pedestrian volume at midday is 1,650, with an effective sidewalk width at the narrowest point of 11 feet.* The most heavily used sidewalks on Philadelphia's Chestnut Street Transitway are between Broad and 13th Streets, also the site of a large department store. The block is unusual in that an alley, Juniper Street, bisects the mall in place of a mid-block pedestrian crossing. At its narrowest point the effective sidewalk width is 9 feet 6 inches, and average midday pedestrian volume is 7,900. Pedestrians per foot of effective sidewalk width per minute (PFM) is calculated as 13.8 on the busiest Chestnut Street Transitway block and 2.5 on the most heavily used block on the Nicollet Mall.

The point at which pedestrian flow is characterized as "impeded" or "congested" varies considerably. Pushkarev and Zupan (Ref. 6-4), in a report for the Regional Plan Association, believe that pedestrian walking is "impeded" when pedestrian flows fall between 2 to 6 PFM.

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*According to Fruin (Ref. 6-3), effective sidewalk width can be calculated by subtracting the width occupied by amenities plus 18 inches both from the amenities and from the building line. On a shopping street, an additional 18 inches is subtracted to allow for window shopping.

They feel that at this "average" peak level, platooning caused by stop light and elevator arrivals will impede passing of slower pedestrians and lead to conflicts with pedestrians walking in a reverse or cross-flow direction. Flow from 6 to 10 PFM is characterized as "constrained." Flow rates above the 10 PFM level are considered too heavy to be handled by signalized intersections. Fruin (Ref. 6-3) has established much more liberal standards. He finds pedestrian flow unimpeded up to the 7 PFM level, with slight impediment from 7 to 10 PFM. Pedestrian flow is impeded between 10 to 15 PFM and a level from 15 to 20 PFM is acceptable only in the most crowded situations.

By either set of standards, pedestrian flow on the Minneapolis mall (2.5 PFM) is only slightly impeded, if at all. Flow on the mall does appear restricted at midday, but only if one wants to walk unusually fast. Likewise, both sets of standards indicate that the busiest block on Philadelphia's Chestnut Street Transitway (13.8 PFM) is crowded, although they differ on how severe this congestion is. Flow on Chestnut Street sidewalks at the peak midday period does seem impeded, and it is difficult to pass slower walkers. The mid-block signal at the Juniper Street alley is clearly insufficient to handle the midday crush. On this, and other blocks, some pedestrians were observed walking on the roadway due to sidewalk congestion. A special problem is the presence of street musicians who sometimes draw a crowd which blocks the walking path. Generally, however, congestion is not serious, and is about what would be expected on a busy city street. It should also be noted that sidewalk congestion is limited to certain blocks during certain hours of the day. Observation of the Portland Mall indicates that pedestrian flow is not impeded. The only exception to this is the occasional overcrowding of bus shelters, which causes waiting bus patrons to partially block the walking path.

Any improvement in pedestrian circulation could only be accomplished by reducing amenities and/or eliminating transit service. Eliminating transit service might seem to be a constructive

change given heavy pedestrian volumes compared to light transit patronage. However, such a move would work a hardship on some, notably elderly bus riders and would prevent future rerouting of buses to the transitway or increased service on existing routes.

6.2.3 Pedestrian Comfort

Transit mall amenities appear well used in each of the three cities. Benches are particularly popular. During off-peak periods they are frequently used as resting places by shoppers and strollers, especially the elderly. During the lunch hour, workers often use them to enjoy a few minutes out-of-doors or to relax after a meal. Benches located near bus shelters serve as an adjunct to indoor seating space. Such amenities as Portland's outdoor drinking fountains and Minneapolis' store location guides (posted on kiosks) also appear popular. The only amenities which did not appear well used were telephones. In Minneapolis, telephone booths were built into each bus shelter. In Philadelphia, they are free-standing on the sidewalk. It is not clear whether the lack of use by pedestrians is due to a lack of demand or because street noise makes listening difficult. It is possible that a smaller number of phones, enclosed in booths and located away from the roadway curb, would be sufficient.

When Philadelphia workers were asked if the transitway was successful in creating "a more relaxed atmosphere for pedestrians," 76 percent agreed it had versus only 19 percent who felt it had not. This transitway "goal" received the most positive result out of a list of five transitway goals which included improving commercial vitality, environment, traffic circulation, and transit use. This result is also significant because the Chestnut Street Transitway added the fewest amenities of any of the transit malls. Despite the overall favorable survey results, the Delaware Valley Regional Planning Commission reported a number of suggestions made for improving the pedestrian atmosphere including canopies over the street or sidewalks, open air restaurants, and a prominent "entrance" to the transitway at its western end (Ref. 6-2).

On the Nicollet Mall, a mailback survey of pedestrians by the City of Minneapolis yielded a surprisingly high 35 percent rate of return (See Appendix D). Forty-two percent of those responding said they had been "just walking for pleasure" on the mall that day. The mall attracts large numbers of senior citizens who make use of the many benches. Earlier it was noted that the climate-controlled skyway system appeared to offer competition to the Nicollet Mall. When asked if an enclosed arcade over the sidewalks would encourage them to shop more on the mall, almost half of the pedestrians replied affirmatively. Approximately one-third said this change would not affect their shopping and less than one in seven said it would discourage them from shopping on the Nicollet Mall. (It should be noted that only persons already on the mall were handed a questionnaire and conditions were almost ideal.) Thus it appears that the pedestrian level of service is well regarded by mall users in both cities. However, a substantial group would seem to prefer the atmosphere of an enclosed pedestrian shopping mall.

6.2.4 Impact on the Physical Environment

One of the expected benefits of a transit mall is a reduction in air and noise pollution. Pollution is a continuing problem in downtown areas and represents both an annoyance and a possible health hazard to pedestrians. The use of auto restrictions as a means of reducing pollution is becoming more prevalent, especially in areas with a number of pollution "hot spots."

Unfortunately, there are no useful pollution data available in Minneapolis and very little in Philadelphia. Based on observation, however, these transit malls seem to result in substantially lower levels of both air and noise pollution. Although existing buses create both noise and fumes, the increase in bus volumes on these two malls is relatively slight compared to the reduction in auto traffic. Thus it is probable that a slight increase in nitrogen dioxide from buses is more than compensated by the decline in carbon monoxide emissions by autos. This is partially confirmed

by available data in Philadelphia, gathered as part of that city's carbon monixide "hot spot" monitoring program (Ref. 6-5). The level of carbon monoxide pollution on the Chestnut Street Transitway was considerably lower than on comparison blocks:

Location	CO PPM(Part per million)*
Chestnut Street Transitway, 8th to 9th Sts.	2.98
Walnut Street, 10th to 11th Sts.	6.98
Eighth Street, Chestnut to Sansom Sts.	8.28

Pedestrians may also have noticed a reduction in pollution. As part of the DVRPC survey, employees were asked if the Chestnut Street Transitway "improved the environmental (noise reduction/ air pollution) and aesthetic quality of the city." Sixty-five percent answered yes; only 26 percent said no. Unfortunately, this question does not allow one to discern whether workers were responding to improvements in pollution or the "aesthetic quality" of the mall or (probably) both (Ref. 6-2).

The situation on the Portland Mall is significantly different from that in Minneapolis or Philadelphia, primarily due to higher bus volumes. Peak-hour bus volume on one Portland Mall street is 175, versus 105 on the Nicollet Mall and just 54 on the Chestnut Street Transitway. Although there are no pollution reading stations on the Portland Mall, a station near the mall on West Burnside Street, now passed by many buses as they approach or leave the mall, has shown a sharp increase in the nitrogen dioxide level. Where there had been an annual mean of 46.4 micrograms per cubic meter in 1974, this rose to 66.6 micrograms per cubic meter in 1977 (Ref. 6-6). One air quality planner estimates the level on the mall itself to be about 80 micrograms per cubic meter. This is still below the 100 micrograms per cubic meter standard. On the other hand, carbon monoxide levels downtown have shown a significant decline. At the West Burnside Street station, the number of days per year with eight-hour carbon monoxide concentrations in excess of the standard dropped from 75 days

*A 5-day average of maximum 8-hour averages taken just before Christmas, 1976.

in 1974 to 44 days in 1977 (Ref. 6-7). This is primarily attributed to the smoother traffic flow on the street since the computerized traffic signalization project was completed. Presumably, the decline in CO level is much greater on the mall itself, since most auto traffic has been removed.

Noise levels are of special concern in Portland, again due to the high volume of buses. An Oregon Department of Environmental Quality study of the Portland Mall found that the twelve-hour average decibel level has risen about 2 decibels to the 75 decibel level since the mall was completed. This compares to the eight-hour standard of 65 decibels used by HUD in determining the suitability of a site for housing (Ref. 6-8). Tri-Met is now developing a retro-fit program for its buses in order to reduce their noise level.

It appears, then, that the impact of a transit mall on the immediate physical environment may be a function of the amount of buses rerouted to the mall. The impact of the malls on the wider downtown areas is more difficult to estimate. In the case of auto traffic, Section 5.2 indicated that the amount of traffic diverted to nearby streets is less than the amount of traffic eliminated from the mall. Thus there may be a net reduction in CO levels for the downtown as a whole. In the case of buses, the increase in NO_2 and noise on the mall should be compensated by a reduction on the streets from which the buses are removed. Any improvement in the smoothness of bus flow might result in a net reduction in NO_2 and noise in the downtown area. Environmental planners generally prefer that air and noise pollution be dispersed as widely as possible, in order to avoid "hot spots" that may be hazardous to nearby workers. However, even on the Portland Mall the estimated NO_2 level remains below the established standard. While the noise level has risen and is well above standard, it was well above standard even before the mall was constructed. Moreover technological improvement to the buses may ease this problem.

6.3 PEDESTRIAN SAFETY

6.3.1 Introduction

The issue of pedestrian safety was not a major obstacle to mall construction in any of the three case cities. However, pedestrian safety has become one of the most important issues since the malls were completed. In Philadelphia, the issue was first raised in critical newspaper articles which came on the heels of two fatal bus-pedestrian accidents in late 1976. In the spring 1977 DVRPC survey, a number of Chestnut Street Transitway merchants also complained about the safety problem. In particular, they cited excessive bus speeds and the two-way traffic flow. (Since Chestnut Street had formerly been a one-way street, pedestrians were used to looking in only one direction before crossing the street.) The safety issue has received less attention in Minneapolis, although a pedestrian fatality there also generated negative newspaper coverage. The recently completed Portland Mall has had similar problems and the City has had to re-establish its Pedestrian School. Noting the large number of jaywalkers, one Portland bystander compared the buses to "bowling balls heading for ten pins." In each of the cities, both the extent and causes of the problem are subject to debate.

6.3.2 Accident Characteristics on Transit Malls

Tables 6-2 and 6-3 present summary accident count data for Philadelphia and Minneapolis. Table 6-2 allows a pre- to post-transitway comparison in Philadelphia as well as a comparison between Chestnut and Walnut Streets. Table 6-3 allows several post-mall between-street comparisons in Minneapolis. In both cities, "total accidents" include those between vehicles, between vehicles and fixed objects, and between vehicles and pedestrians.*

*No data are available on accidents between pedestrians and bicyclists. The handful of vehicle-bicyle accidents are excluded from these tables, appearing separately in a later part of this section.

TABLE 6-2. PRE- AND POST-TRANSITWAY ACCIDENTS, PHILADELPHIA*

	Chestnut Street Transitway, 6th to 18th Streets**			Walnut Street, 6th to 18th Streets**		
	Total Accidents	Pedestrian Injury Accidents	Vehicle Occupant Injury Accidents	Total Accidents	Pedestrian Injury Accidents	Vehicle Occupant Injury Accidents
Pre-Transitway (May,1974-April, 1975)	234	25	18	191	14	22
Post-Transitway (June,1975-May, 1976	89	14	3	180	16	14
Post-Transitway (June,1976-May, 1977	94	24	7	147	12	4

**Excludes accidents at intersections with 6th and 18th Streets.

TABLE 6-3. POST-MALL ACCIDENTS AND INJURIES, MINNEAPOLIS*

(January, 1975 - June, 1977)

Washington Avenue to 10th Street***

Streets	Total Accidents	Pedestrian Injuries	Vehicle Occupant Injuries
Nicollet Mall	37	23	17
Marquette Ave.	71	25	32
Second Ave.	69	20	51
Hennepin Ave.	265	52	182

***Excludes accidents at intersections with Washington Ave. and 10th St.

*Accidents at intersections involving cross-street traffic are included (this explains nearly all between-vehicle accidents and some pedestrian accidents on the transit malls). Note that in Philadelphia, figures under the headings "pedestrian" and "vehicle occupant" refer to the number of accidents, while in Minneapolis the comparable figures refer to the number of injuries. Thus an incident in which two pedestrians are hurt counts as one accident in Table 6-2 and two injuries in Table 6-3. The reader is advised against making direct comparisons between numbers in the two tables for other reasons as well. There are significant differences between the cities in number of months included in the counts; in the length of the malls and number of intersections; and in pedestrian, bus, and auto traffic volumes.

Table 6-2 presents Philadelphia accident count data for the period May, 1974 through May, 1977. A before-and-after comparison of Chestnut Street Transitway accidents shows that the first year of the ban on autos witnessed a sharp decline in the number of pedestrian injuries. The second year post-transitway figures show pedestrian accidents returning to the pre-transitway level. It is likely that the decline in pedestrian accidents during the first year was a consequence of the five-month construction period, which probably discouraged pedestrian activity on the street. (There was also a sharp drop in retail sales on Chestnut Street in 1975.)

Table 6-2 also shows a sharp decline in total accidents and those involving injuries to vehicle occupants in the first year of the auto ban. These figures remain low in the second post-transitway year. Subtracting pedestrian accidents from total accidents, the remaining non-pedestrian accidents have been reduced by 67 percent (209 versus 70 non-pedestrian accidents) over the two year period. This is approximately what would be expected from the elimination of auto traffic on the Chestnut Street Transitway.*

It is possible that the reduction in property damage and vehicle occupant injuries have been transferred to increased accidents on other streets. However, available evidence suggests that this was not the case. Analysis of post-transitway traffic (see Section 5.2) indicates a relatively moderate increase in the number of vehicles on streets in the vicinity of Chestnut Street. Moreover, there was a decline, rather than an increase, in accidents on Walnut Street (discussed below) and no change in accidents involving only cross street vehicles at intersections with the transitway.

*Detailed analysis (not shown) indicates that, before the transitway was built, two-thirds of non-pedestrian accidents were between vehicles on Chestnut Street while one-third were between vehicles on cross streets which intersect Chestnut Street (e.g., a rear-end collision). Since the transitway does not allow autos on Chestnut Street but does allow traffic on cross streets, the non-pedestrian accidents which involved vehicles on Chestnut Street have been nearly eliminated, while those involving only cross street vehicles have declined very slightly.

Walnut Street is included in Table 6-2 as a "control" situation which has no improvements. Walnut Street is also a one-way street, although in the opposite direction. Pre-transitway traffic and pedestrian volumes are believed to have been similar on the two streets, perhaps slightly less on Walnut Street due to a somewhat less intensive land use. A steady decline in total accidents is shown over the three-year period. This is unexplained, but conforms to a general decline in Center City accidents in recent years that has surprised local officials. Thus, perhaps 40 percent of the decline in total accidents on the Chestnut Street Transitway might have occurred even without the ban on autos. The Walnut Street pattern does support the finding, noted above, that the Chestnut Street Transitway has not created a safety problem by causing diverted traffic to circulate around the mall.

The Minneapolis between-street comparisons shown in Table 6-3 supplement the Philadelphia pre- and post-transitway data. First note that the between-street comparisons of the Nicollet Mall to Marquette and Second Avenues are very similar to the pre- and post-transitway comparison in Philadelphia. Total accidents on the Nicollet Mall are about one-half of those on the two nearby streets, while pedestrian injuries are nearly identical.

It should be noted that Marquette and Second Avenues are atypical streets; each has a one-way direction for three lanes of general traffic with a fourth contraflow bus lane. Thus neither is quite comparable to Nicollet Avenue before the mall, which carried two lanes of general traffic in each direction. Hennepin Avenue is also unique; it is a considerably wider street than the others, with three lanes of traffic in each direction. As a through-street across the Mississippi River, Hennepin Avenue carries a heavier volume of traffic, and the width of the street makes crossings by pedestrians and vehicles particularly hazardous. Also, because Hennepin Avenue is the entertainment district in downtown Minneapolis, it carries heavier volumes of

pedestrians and traffic during the more dangerous nighttime hours. These differences are reflected in unusually high accident and injury counts.

Tables 6-4 and 6-5 disaggregate pedestrian accidents in the two cities by whether the vehicle involved was between intersections, i.e., a non-intersection accident; at an intersection but traveling on the mall; or at an intersection but traveling on a cross-street. In the case of Philadelphia, there is no change in cross-street vehicle-pedestrian accidents at intersections. Pedestrian accidents at intersections involving vehicles traveling on Chestnut Street have declined by 50 percent (from 14 to 7). While this trend is in the right direction, the decline in the number of vehicles traveling on Chestnut Street (pre- and post-mall) was much larger (down about 95 percent). Finally, there is an increase in pedestrian accidents occurring on the mall between intersections from 4 to 10. Because no pre-transitway pedestrian counts exist, it is not possible to calculate any change in the ratio of pedestrian accidents to pedestrian volumes. While it is widely held that pedestrian acitivty has increased since the Chestnut Street Transitway opened, it is doubtful that this alone could explain the size of the increase in these pedestrian accidents, especially since accidents have not increased at intersections. Moreover, any stability or possible decline in the ratio of pedestrian accidents to pedestrian volume must be weighed against the clear increase in the ratio of pedestrian accidents to traffic (now only buses) volume.

Table 6-5 allows between-street comparisons of pedestrian injuries in Minneapolis. There are a number of similarities between Minneapolis and Philadelphia. The major similarity is in the case of non-intersection pedestrian accidents and injuries. Table 6-4 shows that Chestnut Street saw a rise from 4 to 10 in the number of such accidents; Table 6-5 shows that non-intersection injuries on the Nicollet Mall outnumber those on Marquette or Second Avenues by 8 to 5. The Minneapolis and

TABLE 6-4. PHILADELPHIA TRANSITWAY PEDESTRIAN ACCIDENTS
(6th to 18th Streets*)

	Pre-Transitway (May, 1974-April, 1975)			Post-Transitway (June, 1976-May, 1977)		
Traffic Direction	Intersection	Non-Intersection	Total	Intersection	Non-Intersection	Total
On Chestnut	14	4	18	7	10	17
Crossing Chestnut	7	NA	7	7	NA	7
Total	21	4	25	14	10	24

*Excluding accidents at intersections with 6th and 18th Streets.

TABLE 6-5. MINNEAPOLIS PEDESTRIAN INJURIES
(Washington Avenue to 19th Street**)

Traffic Direction	Intersection	Non-Intersection	Total
On Nicollet Mall	2	8	10
Crossing Nicollet	13	NA	13
Total	15	8	23
On Marquette Avenue	14	5	19
Crossing Marquette	6	NA	6
Total	20	5	25
On Second Avenue	9	5	14
Crossing Second	6	NA	6
Total	15	5	20
On Hennepin Avenue	25	10	35
Crossing Hennepin	17	NA	17
Total	42	10	52

**Excludes intersections at Washington Avenue and 10th Street.

Philadelphia data raise the same question. Pedestrian volumes are much heavier on the Nicollet Mall than on the comparison streets. Similarly, pedestrian activity appears to have increased on Chestnut Street since the transitway opened. These changes might explain the relatively high number of accidents. On the other hand, the probability of a pedestrian being hit by a vehicle is lowered on transit malls due to the reduction in traffic volumes. This problem will be examined further in later paragraphs.

Another similarity between the cities appears in analysis of pedestrian accidents and injuries involving mall vehicles at intersections. Such injuries are only about one-fifth as common on the Nicollet Mall as at intersections on Marquette and Second Avenues. Thus both the between-streets comparison in Minneapolis and before-after comparison in Philadelphia reveal an interesting split: pedestrian accidents involving vehicles (now mostly buses) on the malls appear low at intersections but high between intersections.

A possible difference between the cities is found in the case of pedestrian accidents and injuries due to cross-street vehicles at intersections. In Philadelphia, we find the number of such accidents unchanged since the Chestnut Street Transitway opened. In Minneapolis, however, such injuries are twice as common on the Nicollet Mall as on the comparison streets of Marquette and Second Avenues. Cross-street traffic appears to have risen only slightly in Philadelphia, and in Minneapolis it is only slightly heavier at the Nicollet Mall than at intersections with the comparison streets. The most likely answer is that the difference in pedestrian volumes between the Nicollet Mall and Marquette and Second Avenues is considerably greater than the suspected increase in pedestrian volumes on the Chestnut Street Transitway.*

*Pedestrian volumes on the Nicollet Mall are about double the volumes on either Marquette or Second Avenues. In Philadelphia, judging from secondary indicators such as the stability in accidents between pedestrians and cross-street vehicles, and the modest change in retail sales, it is doubtful that the before-to-after change in pedestrian volumes is anywhere near the between-street differences in Minneapolis.

Much of the discussion in the preceding paragraphs has assumed a relationship between accidents and pedestrian and vehicle volumes. Because considerable pedestrian and traffic count data are available in Minneapolis, it is possible to convert these counts to "exposure rates" (defined below) and compare these to the accident data already presented for that city. Table 6-6 shows this relationship. Ignoring, for the moment, such influences as roadway width, sidewalk design, and the like, the number of accidents involving only vehicles (i.e., non-pedestrian accidents) should be a function of traffic volume. The number of accidents involving pedestrians should be a function of both traffic (or bus) and pedestrian volumes. The product of these two volumes is the "exposure rate." Table 6-6 indicates the proportional split of non-pedestrian and pedestrian accidents between the Nicollet Mall, Marquette and Second Avenues "expected" from the exposure rates. Hennepin Avenue is not included in this analysis because of inadequate data.*

Considering the roughness of this methodology and the likelihood of error due to the relatively small number of accidents, the degree to which the "expected" split of accidents among the streets predicts the actual split is remarkable.** The Nicollet Mall's share of non-pedestrian accidents at intersections was expected to be 21 percent; the actual percent share is 23 percent. The mall's expected share of non-pedestrian accidents between intersections was 4 percent; the actual share is identical. The mall's expected allotment of pedestrian injuries at intersections was 31 percent; its actual share is 30 percent. However, the

*Pedestrian and traffic count data in Minneapolis stop after the PM rush hour period, and in the case of Hennepin Avenue, it is not at all realistic to ignore this limitation or the width of the street.

**A Chi-squared test comparing expected and observed accidents shows no significant deviation from the expected distribution for incidents at intersections (10% significance level). The small number of accidents between intersections makes the Chi-squared test inapropriate there (and in table 6-7).

TABLE 6-6.

EXPECTED AND ACTUAL MINNEAPOLIS ACCIDENTS

a) Volumes for Computation of Exposure Rates and Expected Distribution of Accidents and Injuries

Street	Vehicles/ Block/Hour	Pedestrians/ Block/Hour	Vehicles/ Intersection/Hour	Pedestrians/ Intersection/Hour
Nicollet Mall	71	1,078	835	1,730
Marquette Ave.	936	556	1,691	1,141
Second Ave.	771	463	1,452	933

b) Expected and Actual Distribution of Accidents and Injuries

Type and Location	Street	Expected Incidents		Actual Incidents	
		Proportion	Number	Proportion	Number
Non-Pedestrian Accidents at Intersections:	Nicollet	21%	13	23%	14
	Marquette	43%	27	31%	19
	Second	37%	23	47%	29
Non-Pedestrian Accidents Between Intersections:	Nicollet	4%	2	4%	2
	Marquette	53%	27	56%	28
	Second	43%	22	40%	20
Pedestrian Injuries at Intersections:	Nicollet	31%	16	30%	15
	Marquette	41%	21	40%	20
	Second	29%	15	30%	15
Pedestrian Injuries Between Intersections:	Nicollet	8%	1	44%	8
	Marquette	55%	10	28%	5
	Second	37%	7	28%	5

Nicollet Mall was expected to account for only 8 percent of pedestrian injuries between intersections; it actually accounted for 44 percent. While pedestrian volumes on transit malls may have increased or are heavier than on nearby streets, vehicle volumes are much lower proportionally, and should have led to lower pedestrian injuries between intersections. This did not happen on the Nicollet Mall, nor did it happen in Philadelphia (see Table 6-4 and 6-5). If the increase in non-intersection accidents on Philadelphia's Chestnut Street Transitway were simply due to an increase in pedestrians, then it should follow that there would be an increase in pedestrian accidents at transitway intersections as well. Yet pedestrian accidents with cross-street vehicles at intersections were unchanged and pedestrian accidents with transitway buses at intersections actually fell by 67 percent (although the decline in transitway vehicles was greater, about 94 percent).

Most pedestrian injuries between intersections on all three Minneapolis streets (Nicollet Mall, Marquette and Second Avenues) are caused by accidents with buses. Calculation of expected and actual pedestrian accidents with buses only in Table 6-7 shows that pedestrian-bus accident rates do correspond more or less to expectations based on the known pedestrian and bus volumes. It appears that buses on the Nicollet Mall and in the contraflow lanes on Marquette and Second Avenues have a much higher accident rate than general traffic between intersections.

TABLE 6-7. EXPECTED AND ACTUAL MINNEAPOLIS PEDESTRIAN INJURIES FROM ACCIDENTS WITH BUSES

		Expected Injuries		Actual Injuries	
Location	Street	Proportion	Number	Proportion	Number
At Intersections:	Nicollet	65%	5	38%	3
	Marquette	19%	1	38%	3
	Second	16%	1	25%	2
Between Intersections:	Nicollet	70%	9	62%	8
	Marquette	16%	2	8%	1
	Second	14%	2	31%	4

To summarize, buses on Philadelphia's Chestnut Street Transitway appear to be involved in more pedestrian accidents than anticipated; certainly this is true between intersections and possibly at intersections as well. In Minneapolis, buses on the Nicollet Mall may be involved in more pedestrian accidents than expected, but only between intersections. If true, this may be a characteristic shared by buses in the contraflow lanes on nearby streets. The more detailed analyses which follow will help identify the extent and cause of transit mall accidents.

6.3.3 Factors Influencing Bus-Pedestrian Accidents

There are several variables which may explain the increase in bus-pedestrian accidents: (1) a change in the direction of flow of buses on transit malls, (2) an increase in illegal or careless pedestrian crossings, (3) bus speeding or other unsafe bus driving habits, and (4) design factors such as physical obstructions to vision. All four factors have been mentioned by local officials and others in Philadelphia. In Minneapolis, the frequency of jaywalking and bus speeding have been mentioned.

To observe the influence of these variables, more detailed cross-tabulations were run of the accident data presented earlier. However, because accidents represent only one type of "conflict," though the most serious, and because the small absolute number of accidents increases the probability of chance fluctuations in the data, two additional studies were conducted. As part of the On-Bus Measurements Study, observers were asked to record instances of "clear" conflicts between buses and pedestrians by category of conflict (see Appendix B). The second study consisted of jaywalker counts in Philadelphia and Minneapolis. Also included are pedestrian counts performed by local staff in Philadelphia.

6.3.3.1 Direction of Flow - In both Philadelphia and Minneapolis the mall roadways contain one lane for buses in each direction. Prior to the mall, Nicollet Avenue carried two lanes of general

traffic in each direction. Chestnut Street, however, was one-way eastbound prior to the transitway. Several transitway merchants surveyed by the DVRPC (Ref. 6-2) suggested that the addition of a westbound bus route, plus the relative infrequency of buses in this direction, causes pedestrians to be careless because they are used to one-way streets in the downtown area and previously on Chestnut Street itself. Experiences in other cities suggest that changes in direction are associated with an increase in accidents, and that this effect may continue for six months or longer.

That this change in the direction of bus flow has had a negative impact on pedestrian safety appears confirmed by available data. Table 6-8 shows that fully two-thirds of post-mall pedestrian accidents involving transitway vehicles (12 of 17) were with westbound vehicles, although only about one-quarter of transitway buses are westbound. This is true both at and between intersections. The bus-pedestrian conflict data for Philadelphia presented in Table 6-9 support this finding. Observers on westbound buses recorded a higher average number of conflicts per run than those on eastbound buses for each time period studied.*

While it has not been an issue in Minneapolis, the two-directional factor was also examined in that city. The data in Table 6-10 show there is no difference in pedestrian injuries at intersections by direction for vehicles on the Nicollet Mall. However, the between-intersection figures show all pedestrian injuries to involve northbound buses. These accident figures are surprising, not only because the direction of flow was not thought to be an issue in Minneapolis, but also because the northbound direction on Nicollet Mall is dissimilar from the westbound direction on the Chestnut Street Transitway in key respects. In Minneapolis, there was no change in the direction of bus flow and bus volumes are equal in both directions.

The only apparent difference between north and southbound buses on the Nicollet Mall is that most northbound buses tend to deliver passengers, while southbound buses pick them up. This

*Small sample sizes make none of these differences statistically significant.

TABLE 6-8.

TRANSITWAY* PEDESTRIAN ACCIDENTS, BY VEHICLE DIRECTION

	Pre-Transitway (May,1974-April,1975)	Post-Transitway (June,1976-May,1977)
Vehicle Direction At Intersections		
Cross Street Vehicles	7	7
Transitway Eastbound	12	1
Transitway Westbound	1**	6
Total	20	14
Vehicle Direction Between Intersections		
Transitway Eastbound	1	4
Transitway Westbound	1**	6
Total	2	10

TABLE 6-9.

TRANSITWAY* PEDESTRIAN CONFLICTS, BY BUS DIRECTION AND TIME OF DAY

Time and Direction	Number of Runs	Number of Conflicts	Average Conflicts/Run
7-9 AM			
-Eastbound	6	11	1.83
-Westbound	4	17	4.25
12-2 PM			
-Eastbound	9	93	10.33
-Westbound	2	29	14.50
4-6 PM			
-Eastbound	9	55	6.11
-Westbound	4	29	7.25

*Eastbound buses travel the entire length of the mall from 18th to 6th streets. Westbound buses are only on the mall from 7th to 17th streets. For purposes of comparison by direction, only accidents and conflicts between 7th and 17th streets are included in Tables 7-7 and 7-8.

**Illegal direction.

TABLE 6-10.

MINNEAPOLIS PEDESTRIAN INJURIES BY VEHICLE DIRECTION

Street and Direction	At Intersections	Between Intersections	Total
Nicollet Northbound	1	8	9
Nicollet Southbound	1	0	1
Marquette Northbound	10	0	10
Marquette Southbound (contraflow lane)	4	3*	7
Second Northbound (contraflow lane)	3	4	7
Second Southbound	6	1	7
Hennepin Northbound	13	4	17
Hennepin Southbound	12	6	18

*There were 5 between-intersection accidents on Marquette Avenue, but in two cases vehicles were reported moving in one direction other than north or south (possibly emerging from driveways).

difference could make the northbound buses more accident prone. Pedestrian street crossing for the purpose of getting on a bus tends to occur over a gradual period of time, often when no bus is on the block. Even if a "pickup" bus appears while a pedestrian is crossing to catch it, such a bus would be in the far lane for the pedestrian. This allows a relatively clear field of vision to see the bus coming and also time and space to avoid it. By contrast, unloading passengers arrive at the bus shelter at the same time. This increases the likelihood of a pedestrian crossing while a bus is present. Moreover, those who do so are immediately in front of the bus and may not even be aware that it is about to move.* Detailed analysis of the eight pedestrian accidents with northbound buses reveals that seven of these involved pedestrians stepping off the curb into the northbound lane. Only one was hit by a northbound bus while crossing from the far side of the street. Interestingly, there is also a directional factor apparent on Marquette and Second Avenues, where pedestrian injuries tend to occur in the general traffic lanes at intersections but cluster in the contraflow lanes between intersections.

Despite the greater exposure of debarking passengers to a moving bus, in Philadelphia it is the westbound buses which primarily load passengers that are the most accident prone. The location of bus shelters is the most likely explanation of the different pattern in the two cities. On the Chestnut Street Transitway, bus shelters are immediately beside the corner crosswalks. The crosswalk and signal provide debarking passengers added protection when crossing in front of a bus. On the

*It should be noted that bus-pedestrian conflict data not shown indicate no significant directional difference on the Nicollet Mall. However, the type of conflict described above is probably underestimated in this study. At the moment a bus is about to depart, the observer was often busy recording the loading time that had expired. Also, pedestrians immediately in front of a bus are usually not visible to a seated observer.

Nicollet Mall, however, bus shelters are generally between 25 and 30 feet from the crosswalk (see Figure 3-15). This fact, plus the semi-enclosed nature of shelters and presence of large decorative structures between the shelters and crosswalks, encourages debarking passengers to jaywalk directly in front of the buses. Also, bus movement is more difficult to predict on the Nicollet Mall, since even with a red light buses may move forward to wait at the crosswalk.

The relatively high rate of bus-pedestrian accidents in Minneapolis' contraflow lanes deserves special note. First, as in Philadelphia, the contraflow lanes represent a change in direction. Moreover, with three lanes of general traffic going in the opposite direction, the phenomenon of pedestrians not looking in the direction of on-coming buses would seem more likely to continue over a long period of time than may be the case in Philadelphia. Second, buses in the contraflow lanes generally discharge riders at mid-block locations. This raises the same potential danger as noted above for shelter location on the Nicollet Mall.

It cannot be concluded from the above discussion that a one-way transit mall is to be preferred over a two-directional mall. In both cities it is not the second direction per se which creates a safety problem but the interaction of direction with other factors, i.e., pedestrian unfamiliarity with two-directional flows, the infrequency of westbound buses, and the location of bus shelters. The recent completion of the Portland Mall, with one-way flow on each street, may provide a future test case. However, the presence of one lane of general traffic plus the location of bus shelters some distance from the crosswalks (necessitated by the "platooning" strategy which will bring two buses to a shelter at the same time) add uncertain variables to Portland's case as well. However, common sense suggests that a two-directional mall may be slightly more dangerous, if only because it necessitates pedestrians looking both ways before crossing.

6.3.3.2 Pedestrian Carelessness - It is a common pre-mall supposition that transit malls might encourage pedestrian carelessness and jaywalking; that the combination of relatively light bus traffic and the pedestrian atmosphere, typified by mid-block crossings, would encourage pedestrians to treat the mall roadway as an extension of the sidewalk. In the planning stages of transit malls, such pedestrian use is often hoped for by merchants and others unreconciled to bus use. Typically, proposals are put forward for electric "zoo trains" or mini-vehicles of various sorts to run on the mall, sometimes without a defined roadway. In the cities under study, however, the realities of transit service and operations have compelled the presence of standard buses on curbed roadways. Nevertheless, conditions favorable to jaywalking continue to exist, and this raises an issue of pedestrian safety.

Table 6-11 presents the results of illegal pedestrian crossings on two blocks of the Chestnut Street Transitway. Also shown are pedestrian counts taken by the Philadelphia Department

TABLE 6-11. CHESTNUT STREET TRANSITWAY ILLEGAL PEDESTRIAN CROSSINGS

Time Period	13th to Broad Streets		15th to 16th Streets	
	Illegal Crossings Per Hour	Pedestrian Count Per Hour	Illegal Crossings Per Hour	Pedestrian Count Per Hour
11AM-2PM	3,854	8,151	1,581	7,138
3:30PM-5:30PM	2,165	5,624	1,067	3,949

of Public Property. Due to measurement differences, the pedestrian and jaywalker counts are not directly comparable. The heavy pedestrian volumes on both blocks clearly contribute to the jaywalker counts, however. It should be mentioned that the transitway blocks between 13th and Broad Streets and 15th and 16th Streets place first and second in the number of observed bus-pedestrian conflicts.

Other blocks on the transitway probably have fewer jaywalkers as well as pedestrians. There is no known standard for judging the volume of illegal pedestrian crossings. Nevertheless, the amount of such behavior is clearly substantial. Approximately 33 percent of the illegal crossings between 13th and Broad Streets and 20 percent of those between 15th and 16th Streets occur against the signals at crosswalks or mid-block crossings. It would be an exaggeration, however, to infer that transit mall roadways are treated by pedestrians as mere extensions of sidewalks. Most pedestrians continue to use the sidewalks even if no buses are visible.

Observation of the Nicollet Mall in Minneapolis indicates a similar tendency for a higher rate of jaywalking than on neighboring streets, but continued preference by most mall pedestrians for the sidewalk (see Figure 6-2 below). An illegal crossing count on the Nicollet Mall between 7th and 8th Streets found 1,070 pedestrian violations during the peak hour (12-1 PM); pedestrian volume at this time was approximately 1,500.

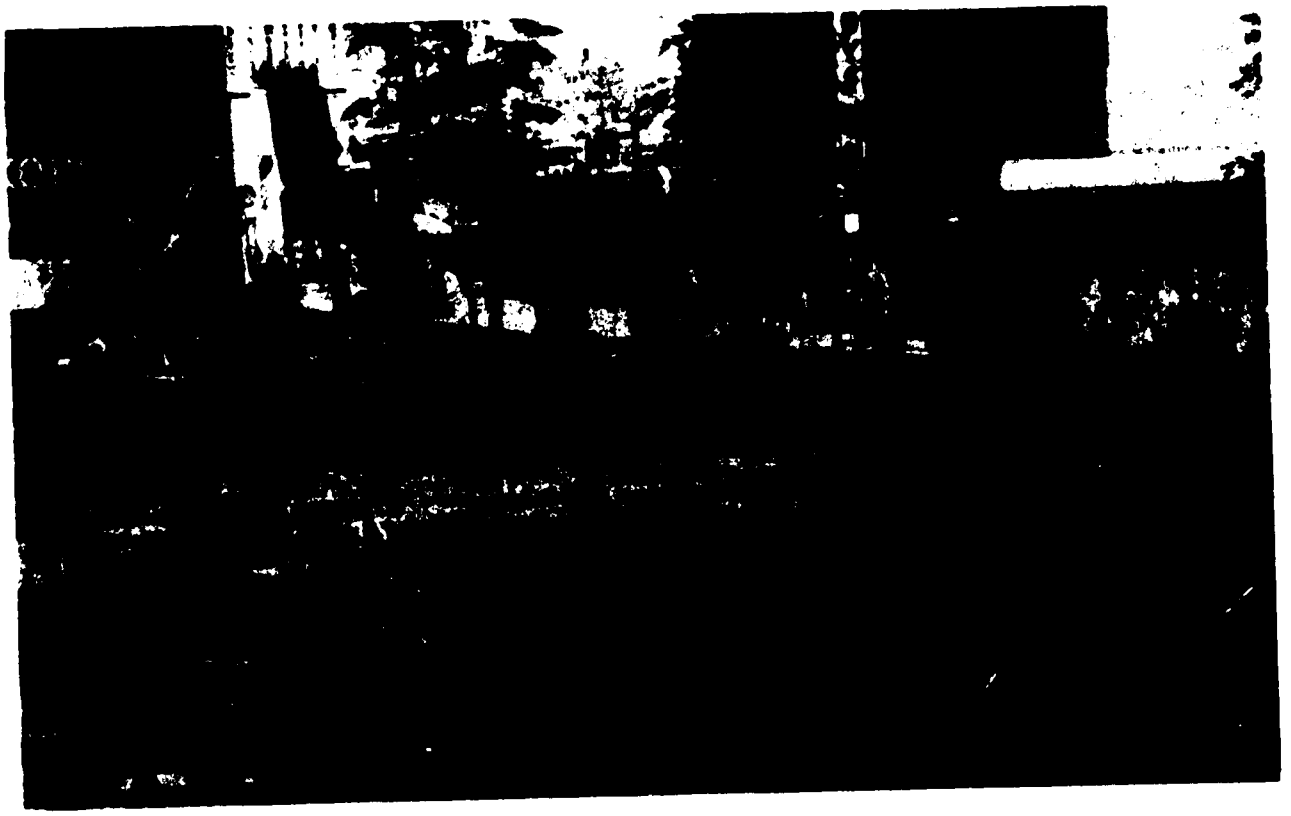

FIGURE 6-2. CROSSING THE NICOLLET MALL (MINNEAPOLIS)

During the construction of the Portland Mall, an increase in both jaywalking and pedestrian accidents was reported (Ref. 6-9). As the mall began operation in early 1978, jaywalking continued to be a problem, particularly noticeable on the narrow (two-lane) buses-only blocks. In response to this problem, the City of Portland began a pedestrian safety program in April, 1978. Stickers reading "DON'T BE A JAYBIRD, WAIT FOR THE WALK LIGHT" were placed on every Portland Mall crosswalk. At the same time, police began a well-publicized effort to enforce anti-jaywalking laws. Portland had long had a reputation for enforcing pedestrian laws, but had become somewhat lax in this area in recent years. The City reinstituted its Pedestrian School, a safety course to be taken in lieu of a $5 fine for jaywalking. Although the crosswalk stickers were removed when they became scuffed up, police continue issuing citations at the rate of 60 per month in the downtown area. Observation of the Portland Mall seven months after its opening indicates that the safety program has been very successful. Very few jaywalkers were observed. Indeed, most pedestrians wait for the "WALK" signal even if no vehicles are approaching in either direction.

A higher incidence of illegal pedestrian crossing appears related to lowered pedestrian safety, independent of the impact of bus direction examined earlier. Table 6-12 compares overall bus-pedestrian conflict rates between transit malls and nearby comparison streets. Statistical analysis indicates that the transit malls are more likely to have conflicts between buses and pedestrians, and that these differences are significant beyond the .01 level of confidence. More detailed breakdowns (not shown) indicate that even in the less dangerous transit mall bus directions (i.e., southbound in Minneapolis, eastbound in Philadelphia), the number of conflicts easily exceeds those on comparison streets. While pedestrian volumes are higher on the transit malls studied than on comparison streets, this too does not seem to explain the different conflict rates. For instance, while pedestrian volumes on the Nicollet Mall are about twice those on Marquette and Second

TABLE 6-12.

BUS-PEDESTRIAN CONFLICTS

MINNEAPOLIS

Street	Number of Runs	Number of Conflicts	Average Conflicts/ Run	Standard Deviation
Nicollet Mall	49	84	1.71	2.36
Marquette/ Second Aves.*	45	7	0.16	0.42
Hennepin Ave.	48	18	0.38	0.84

Statistical comparison using the t-test:

Nicollet Mall vs. Marquette/Second Avenues

t = 4.52, significant difference beyond .001 level (2-tailed test)

Nicollet Mall vs. Hennepin Avenue

t = 3.71, significant difference beyond .001 level (2-tailed test)

Marquette/Second Avenue vs. Hennepin Avenue

t = 1.61, no significant difference at .05 level (2-tailed test)

*Marquette and Second Aves. are combined to form a north/south pair. The Nicollet Mall is also significantly different from each one taken separately.

PHILADELPHIA

Street	Number of Runs	Number of Conflicts	Average Conflicts/ Run	Standard Deviation
Transitway (7th to 17th Streets)	34	246	7.24	5.32
Walnut Street (westbound only)	17	35	2.06	2.11

Statistical comparison using the t-test:

Transitway vs. Walnut Street

t = 4.95, significant difference beyond .001 level (2-tailed test)

Avenues, the average number of conflicts per bus run is over ten times higher on the transit mall. The Nicollet Mall does not seem to have reached a sidewalk congestion threshold which might itself cause abnormal levels of illegal pedestrian use. Such a level is reached at the lunch hour on certain blocks of the Chestnut Street Transitway. However, this occurs too infrequently to significantly affect the results in Table 6-12.

Detailed analyses of pedestrian accidents (not shown in Table 6-12) also confirm the impact of illegal pedestrian crossings. At intersections on Minneapolis' Nicollet Mall, 47 percent of pedestrian accidents were due to pedestrian fault. At intersections on nearby Hennepin, Marquette, and Second Avenues, the percent of accidents due to pedestrian fault ranged from 20 to 33 percent.* In Philadelphia, before the transitway was built, about 38 percent of pedestrian accidents at intersections were due to pedestrian violations. Since the Chestnut Street Transitway opened, this percentage has risen to 64 percent. On Walnut Street, parallel to the transitway, the portion of pedestrian accidents at intersections caused by pedestrian violations has remained at a fairly constant level of 10 to 20 percent.

6.3.3.3 Mall Design and Pedestrian Safety - The physical design of a transit mall may interact with other factors to reduce pedestrian safety. It was noted earlier that the placement of Nicollet Mall bus shelters away from the crosswalk, along with shelter walls and sidewalk amenities which block the natural walking path of discharging bus riders, may create a dangerous situation when buses unload.

The mid-block pedestrian crossings on the transitway in Philadelphia may also contribute to pedestrian accidents. Although in theory they provide a safe path for between-intersection crossing, accident data presented earlier (see Table 6-4) show an increase in between-intersection pedestrian accidents.

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*Since mid-block pedestrian crossing is illegal in Minneapolis, all between-intersection pedestrian accidents on the Nicollet Mall and the comparison streets were due to pedestrian fault.

This trend includes increases in accidents caused by both pedestrian and bus violations. Although pedestrian violations may have increased mainly due to reduced traffic flows and a narrowed roadway, the mid-block crossings may contribute to a casual atmosphere that encourages pedestrian use of the roadway. In the case of violations by buses, the actual operation of the mid-block signal may be a factor. The signal is triggered by passage of an approaching bus over a detector at either end of the block. Although a bus is often forced to slow down to meet a green light, it seldom has to stop. Occasionally, pedestrians have not cleared the crossing by the time the bus arrives (from 10 to 15 seconds after the detector is triggered). Moreover, although drivers have come to expect the light to change, this is not always the case. After a bus passes through a crossing there is a short pre-emption for pedestrian use. The light will not change for another bus arriving during this interval.

The density and placement of amenities may also influence pedestrian carelessness. As discussed previously, the malls in Minneapolis and Portland have a high density of amenities which form a loose barrier between the sidewalk walking space and roadway. Large or elongated facilities, such as benches and small walls, are particularly effective in limiting pedestrian access (see Figure 6-3). Due to the factors of cost and a narrow right-of-way, facilities on Chestnut Street are fewer in number and generally smaller; they do not form a barrier between pedestrian and curb (see Figure 6-4) except, oddly, at the mid-block crossings. In addition, a transit authority official in Philadelphia noted that the narrow right-of-way and sidewalks forced the placement of bus shelters, telephone booths, and other amenities too close to the curb, encouraging pedestrians to step onto the roadway without looking.

The design of the Chestnut Street Transitway between Broad and 13th Streets, with Juniper Street intersecting the transitway in place of a mid-block crossing, deserves special note. In the most recent year, this block accounted for 5 of the 10

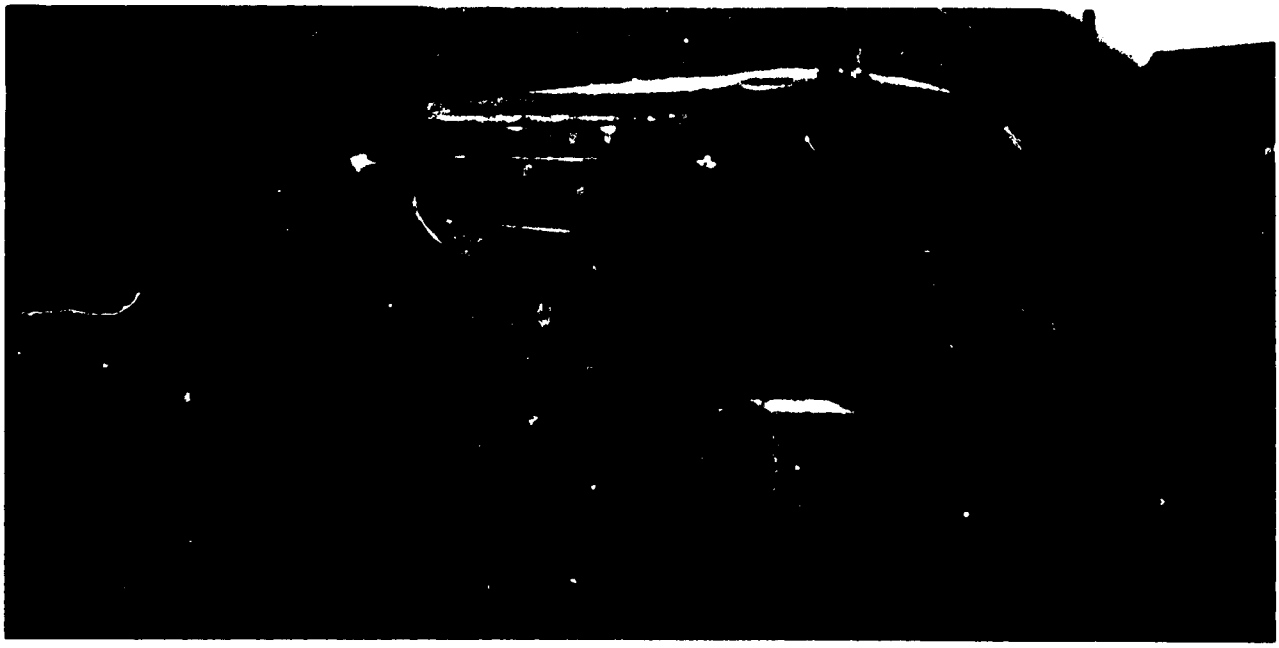


FIGURE 6-3. JAYWALKER BARRIERS ON THE NICOLLET MALL (MINNEAPOLIS)

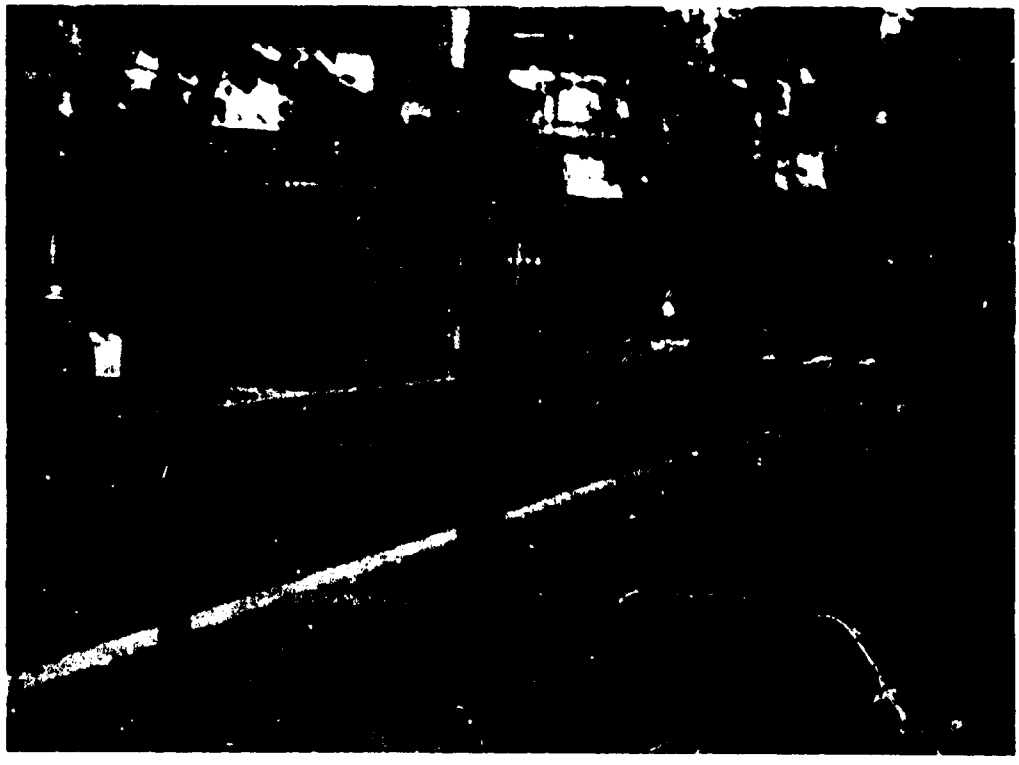


FIGURE 6-4. LACK OF BARRIERS ON CHESTNUT STREET TRANSITWAY (PHILADELPHIA)

between-intersection pedestrian accidents, and Juniper Street itself accounted for 2 of the 14 intersection pedestrian accidents. The block has the heaviest volume of illegal pedestrian crossings (more than double the number between 15th and 16th Streets nearby) and was responsible for nearly one-fourth of all bus-pedestrian conflicts observed on the Chestnut Street Transitway. The block is located near the center of the transitway in the area of the most intensive land use, which includes several office buildings. The heavy mid-block crossing can be attributed to the presence of two large department stores on diagonal corners of Juniper Street. The "axis" created by these stores encourages considerable crossing of the transitway at, and on either side of, Juniper Street. Juniper Street is of alley width, allowing only one lane of traffic with no parking and very narrow sidewalks. The "street" appears to play a minimal role in downtown traffic circulation. Nevertheless, traffic on the street presents a hazard, since drivers have little visibility of approaching pedestrians (many of whom ignore the lights and walk in front of the autos), and the cars are sometimes trapped in the intersection after the light has changed (occasionally blocking oncoming buses).

The safety problem between 13th and Broad Streets could be partially relieved by a chain or other, more decorative barrier erected to prevent illegal crossings. In addition, Juniper Street could be closed and converted to a mid-block crossing. These suggestions are not likely to solve the problem entirely, however, since the expected heavy pedestrian traffic on a newly-created mid-block crossing would continue to pose a problem for passing buses. Noon hour crowds cannot be expected to entirely obey a mid-block signal, especially with a low volume of transit vehicles.

6.3.3.4 Bus Speeding - Although bus speeds are generally slightly higher on transit malls than on comparison streets, the charge that excessive bus speeds are responsible for increased pedestrian accidents is not substantiated by observation or available data.

The average actual speed of Chestnut Street buses is 11.5 mph; the highest recorded was 14.4 mph over the 12-block distance. At 11.9 mph, the average moving speed on the Nicollet Mall is virtually identical to Philadelphia's figure. The highest moving speed recorded in Minneapolis was 18.5 mph over the 8-block distance. These figures include variations in speed both within blocks and from one block to another. However, at no time during the evaluation were buses seen to be clearly exceeding the speed limit. On both transit malls buses usually stop at each block for loading purposes; this is probably the most important limiting factor on speed. In addition, the curved roadway in Minneapolis and particularly the mid-block signals in Philadelphia act as constraints on bus speed. It is possible that the large size of the buses adds to the impression of speed, and accounts for frequent pedestrian complaints.

6.3.4 Bicycle Safety

Bicycles have been permitted on the Nicollet Mall since it opened. In Philadelphia, bicycles were banned for the first year and a half of operation, but in the spring of 1977, bicycles were officially permitted on the transitway pending UMTA approval. UMTA rejected this change and bicycles were again banned in the fall of 1977. Observations of the Chestnut Street Transitway by the evaluators occurred during the period when bicycles were legal. Although the number of bicycles on the malls is small,* they pose a safety problem in two ways. First, transit vehicles

*A 1975 cordon count around the Minneapolis CBD shows that 0.5 percent of those persons entering or leaving the downtown area were on bicycles. At the cordon station on Nicollet Avenue, two blocks south of the mall, about 1 percent of all persons entering or leaving were on bicycles, and represented just over 5 percent of all vehicles crossing this point. The number of bicycles on Nicollet Avenue at 12th Street is from three to five times the number on Hennepin, Marquette, or Second Avenues. The proportion of bicyclists on the Nicollet Mall itself is probably even higher, since some of those on the comparison streets may cross over at 10th Street to make use of the mall. Bicycle traffic on the Chestnut Street Transitway is lighter than in Minneapolis, but appears heavier than on nearby streets in Philadelphia.

present a danger to bicyclists similar to the one for jaywalkers. Second, bicyclists themselves present a danger to pedestrians. Table 6-13 shows the number of bicycle accidents and bus-bicycle conflicts in Philadelphia and Minneapolis. Generally, a bus-bicycle conflict occurs when a bus must brake or slow down for a bicycle and then either pass the bicyclist (if the latter is riding close to the curb) or continue to follow the bicycle at a pace set by the bicycle (if the bicyclist is riding in the middle of the lane.

TABLE 6-13.

BICYCLE ACCIDENTS AND CONFLICTS*

PHILADELPHIA

Chestnut Street Transitway**		Walnut Street	
Bicycle Accidents (June, 1976-May, 1977)	2	Bicycle Accidents (June, 1976-May, 1977)	2
Bus-Bicycle Conflicts	3	Bus-Bicycle Conflicts	0

MINNEAPOLIS

Nicollet Mall		Marquette Avenue	
Bicyclist Injuries (January, 1974-June, 1977)	2	Bicyclist Injuries (January, 1974-June, 1977)	2
Bus-Bicycle Conflicts	13	Bus-Bicycle Conflicts	0
Second Avenue		**Hennepin Avenue**	
Bicyclist Injuries (January, 1974-June, 1977)	3	Bicyclist Injuries (January, 1974-June, 1977)	1
Bus-Bicycle Conflicts	1	Bus-Bicycle Conflicts	0

*Source: On-Bus Measurement Studies

**No Accidents were reported in the year preceeding the Chestnut Street Transitway. Both post-transitway bicycle accidents occurred in the spring, 1977, when bicycle use was briefly permitted.

While the number of bicycle accidents is small, they represent about 10 percent of the vehicle-pedestrian plus vehicle-bicycle accidents in both cities. Bus-bicycle conflicts are more common on transit malls than on unimproved streets, probably due to the greater volume of bicycle traffic on transit malls. From observation, however, it appears that it is safer to bicycle on transit malls than on unimproved streets, just as it is safer to jaywalk on a transit mall.

Bicyclists also represent a danger to pedestrians on transit malls, particularly jaywalkers. Because accident counts are limited to motor vehicles, and because most bicycle-pedestrian accidents are probably too minor to report, bicycle-pedestrian accident data are unavailable. However, numerous near-misses were observed on the malls.

6.3.5 Effect of Pedestrian Behavior on Bus Operations

Bus drivers were unanimous in expressing their irritation with illegal pedestrian crossings on transit mall roadways. In informal interviews with drivers, terms such as "crazy" and "wild" were commonly used to describe pedestrians who would step off the curb without looking or, in some instances, pedestrians who would look directly at a bus and yet walk in front of it. In Philadelphia, drivers still felt that the transitway was a "slightly" easier route than Walnut Street, largely because of the even more irritating behavior of auto drivers (particularly when pulling away from on-street parking spaces). Bus drivers in both cities agreed that they drove slower than was necessary due to the need to stop quickly in case of a jaywalker. Because of the constraints on bus speed, such as mid-block signals and passenger loading on each block, it is not likely that bus driver safety-consciousness significantly affects overall trip times.

6.4 BUS-PEDESTRIAN COMPATIBILITY

A transit mall does produce conflicts between buses and

pedestrians: buses reduce the space available for walking and amenities and add to the air and noise pollution problem, while pedestrians contribute to a bus-pedestrian safety problem. How, then, do pedestrians feel about a transit mall compared to a full pedestrian mall? When asked if they favored restricting Philadelphia's Chestnut Street Transitway to pedestrians only, 47 percent of nearby employees agreed while 38 percnet disagreed (Ref. 6-2). However, among those who reported that the mall encouraged them to ride buses more often, only 29 percent agreed while 56 percent opposed banning buses. Among those who stated the mall did not encourage them to ride transit more often, 56 percent favored removing the buses and 37 percent opposed the idea.

Since a major rationale for removing buses is to improve the atmosphere for shopping, Nicollet Mall pedestrians were asked if a ban on buses would encourage them to shop more on the mall. Overall, 28 percent responded positively (a "great deal" or "somewhat"), 48 percent said it would not affect their shopping, and 22 percent said it would discourage them from shopping. Among those who used a bus on the mall on the survey day, only 19 percent favored banning buses and 47 percent opposed the change. Among those who did not ride a mall bus, 30 percent said they would shop more if there were no buses, while 19 percent would shop less (See Appendix D).

Overall these results seem to support the idea of a transit mall. There does not appear to be an overwhelming demand to remove the buses, even among those who do not actually use them. Among those who do ride buses on the malls, there is strong sentiment for keeping the buses. When the total Philadelphia sample was asked if they favored keeping the transitway "as it is," 40 percent said yes, 40 percent said no. Thus, the basic idea of a "compromise" between buses and pedestrians appears to have surprising support, given the fact that there <u>are</u> conflicts between the two uses.

6.5 SUMMARY OF FINDINGS - IMPACT ON PEDESTRIANS

1. There is no firm evidence that transit mall improvements have increased pedestrian volumes, although many local observers (particularly in Philadelphia) believe this happened and limited survey data support this positive view. Transit malls may halt future declines in pedestrian volumes.

2. Pedestrian circulation is improved by an increase in the sidewalk walking area. This increase may be small (as little as one foot in Philadelphia) depending on how far the sidewalks are widened and the size and quantity of new sidewalk amenities. An increase in pedestrian volumes can nullify the gain in walking area. Sidewalk congestion was identified only at peak periods on a heavily used block in Philadelphia, or where sufficient waiting space was not provided bus patrons. Pedestrian circulation is also improved by easier street crossing (legal or illegal), ramps for wheelchairs, and by moving waiting bus patrons out of the walking path. In Minneapolis, the transit mall is part of an emerging downtown pedestrian circulation system that includes an enclosed skyway network. So far, however, integration of different types of pedestrian walkways is generally poor.

3. Pedestrian amenities are well-used, particularly benches (especially by the elderly and lunch time crowds) and trash receptacles. Survey data suggest that landscaping and other amenities significantly improve the mall atmosphere, despite the presence of buses. Malls are frequently used by those who are simply walking for pleasure.

4. Transit malls result in a sharp reduction in CO levels on the malls, with a concurrent increase on other streets unlikely. In Portland, where bus volumes on the mall have greatly increased, there is evidence that noise and NO_2 levels have increased. In this case, there may be a compensating decline in noise and bus fumes on other downtown streets, although planners are concerned that "hotspots" may have developed where noise or air pollution exceeds acceptable standards.

5. Non-pedestrian accidents decrease sharply on transit malls, with no evidence of increases on nearby unimproved streets.

6. Total pedestrian accidents appear stable, with an increase relative to exposure rates (based on pedestrian and vehicular volumes). Bus-pedestrian conflicts other than accidents are much higher on transit malls than on

unimproved streets. Factors related to pedestrian accidents include:

a) In Philadelphia, a change from a one-way street to a two-way bus flow appears to have caused confusion and carelessness on the part of pedestrians.
b) Illegal pedestrian behavior, particularly jaywalking, resulted in more accidents in which pedestrians are at fault. Jaywalking is partly encouraged by a low volume of buses. A pedestrian safety and enforcement program in Portland appears to have effectively reduced jaywalking.
c) Mall design, including narrow roadways, lack of any barrier to jaywalkers such as might be created by placement of amenities, and the placement of certain amenities used by pedestrians (such as phone booths) too close to the curb can encourage jaywalking. The construction of bus shelters away from crosswalks may encourage discharging bus riders to cross the roadway under a hazardous situation. Mid-block pedestrian crossings may cause the entire roadway to be viewed in a casual manner by pedestrians, and operational problems may contribute to accidents.
d) Although some people feel that speeding buses, encouraged by freedom from general traffic, are dangerous to pedestrians, in fact there is no evidence of bus speeding.

7. Bicycle accidents are relatively common, probably due to the number of bicycles on transit malls where they are legal. Bicycles sometimes interfere with the movement of buses on the malls and were observed to pose a hazard to crossing pedestrians. The speed and low visibility of bicycles, as well as illegal behavior by bicyclists, contribute to the hazard.

8. Survey results indicate that there is no strong demand to remove buses from the malls, with bus riders opposed to a full pedestrian mall. Thus, despite conflicts between bus and pedestrian uses (reduced space for sidewalk amenities, bus noise and fumes, pedestrian accidents), the concept of a transit mall is endorsed by many pedestrians.

7 IMPACT ON ECONOMIC CONDITIONS

7.1 INTRODUCTION

7.1.1 Objectives

The most common motivation for building transit malls, pedestrian malls, and related projects is the hope that the completed facility will stimulate growth in downtown areas. This growth may take the form of increased retail sales, greater private or public investment, lower vacancy and turnover rates, and more jobs. An overview of pre-mall economic conditions is provided in Chapter 3. The number of downtown office jobs has increased in each of the cities in this study and they are making strides toward increasing the supply of downtown housing opportunities; these facts may have generated optimism about the future of the core in general. With some justification, Minneapolis and Portland advertise that their downtowns "lack the typical ills" associated with urban centers. At least in the area of retail sales, however, all of the CBD's were clearly falling behind their suburban competitors, and all had experienced a period of declining sales, if measured against inflation, before the transit malls were built. It was this trend which local officials and merchants wished to contain or reverse. None of the mall projects could proceed until merchants and property owners were convinced they would be good for business.

7.1.2 Issues

In spite of the general notion that a transit mall will enhance the downtown business climate, the decision to build a transit mall also raises a number of concerns. The most immediate concern is, What will be the imput of the construction period? Merchants fear that a prolonged construction

phase or one which severely limits customer access will cause a sharp short-term loss, which most small operations are unable to afford, and may possibly have a negative long-term impact if customers develop the "habit" of shopping elsewhere.

The question of the long-term economic impact of the mall focuses on several economic indicators. Chief among these is the volume of retail sales. Most merchants expect, of course, that sales will increase. Others simply hope that the long-term decline in sales will be halted or slowed, perhaps providing some "breathing room" before more substantial downtown redevelopment plans are implemented. Merchants who depend on a wide geographic market (e.g., a furniture store) may expect business to decline due to reduced customer access by automobile. Another controversial indicator is the impact of the malls on business turnover. Some observers welcome a high turnover rate as this might bring in higher quality stores and national chains. However, new stores can also provide stiff competition for some existing merchants or force them to change their line of merchandise. Of particular interest to property owners is whether vacancy and rental rates will improve. At least in theory, these should improve as retail sales increase. A final economic indicator is the amount of new public or private investment in the mall vicinity. The transit mall may prove to have value as a "symbol of commitment" by the sponsoring group (usually local government) which may encourage property owners to make a similar commitment. Finally, there is a general question of the interrelationship between transit mall development and other redevelopment efforts.

7.1.3 Data Sources

The economic evaluation employs three main data sources: interviews with local officials and businessmen; locally-conducted surveys of merchants, employees or pedestrians; and quantitative data on retail sales, value of renovations and similar economic indicators.

7.2 IMPACT OF CONSTRUCTION

While merchants often foresee long-term economic benefits from transit malls, they are also faced with short-term loses during the construction phase. The transit malls in Philadelphia and Portland provide good case studies. The construction of the Philadelphia transitway took about six months, despite a three-week strike which halted work. Completion by the beginning of the Christmas shopping season was the deadline promised Chestnut Street merchants, and this was met. Local officials attribute this short timetable to relatively little utility work and careful phasing of construction. The phasing of construction was also designed to maintain the best possible access to Chestnut Street stores.

Portland faced a more difficult task as construction was to proceed on two main streets, and extensive utility work was required. The entire transit mall took slightly under two years to finish. Again, "careful phasing" was the key phrase. Because the mall roadway was to be lowered to allow sloping sidewalks, underground utilities had to be relocated as the first step. This was followed by reconstruction of the street and curbs. During these phases, pedestrians used the old sidewalks. When work moved to sidewalk construction, pedestrians were moved to a temporary walkway at the center of the street, with connecting "bridges" to store entrances (see Figures 7-1 and 7-2). Vehicle circulation was also a concern. At intersections on the mall, cross-street traffic was narrowed to one lane, but at no

FIGURE 7-1. PORTLAND MALL WALKWAY

FIGURE 7-2. PORTLAND MALL "BRIDGES"

more than four intersections at any one time. Because general traffic was banned on these two major streets throughout the entire construction period, local planners thought it was necessary to keep buses operating on the mall streets. The result was a unique construction schedule which allowed normal bus service (see Figure 7-3).

Despite careful phasing, however, there is some evidence that construction had a negative impact on pedestrian use and retail sales. On Philadelphia's Chestnut Street Transitway, retail sales declined 18 percent, in constant dollars, during the construction year 1975 (Ref. 7-1), and it is probable the decline was greater during the six months of actual construction. In Section 6.3, it was noted that pedestrian accidents on the Chestnut Street Transitway also fell in 1975 (before going back up in 1976) and this decrease was interpreted as evidence of a decline in pedestrian use. Philadelphia accident data also suggested that pedestrian use may have increased on nearby Walnut Street during this period.

No retail sales figures during the construction period are available in Portland. However, pedestrian counts taken before and during construction do show a change. During construction on Fifth Avenue in 1976, pedestrians per blockside during two off-peak half-hour periods dropped from 637 in 1975 to 520 in 1976. Comparable figures for Sixth Avenue, which was not under construction at the time of the counts, show an increase from 444 to 768 persons per blockside.* Thus, based on indicators of pedestrian volumes in both cities, the impact of construction appears to be limited to the immediate vicinity of the construction. Merchants on nearby streets, rather than those in suburban shopping malls, may be the major short-term beneficiaries of shoppers discouraged from using streets under construction. If true, this should be encouraging to mall merchants, since it is probably easier to "recapture" patrons lost to nearby stores than to stores in outlying locations.

*These counts also show an increase in the total number of pedestrians counted on all downtown Portland streets (Ref. 7-2).

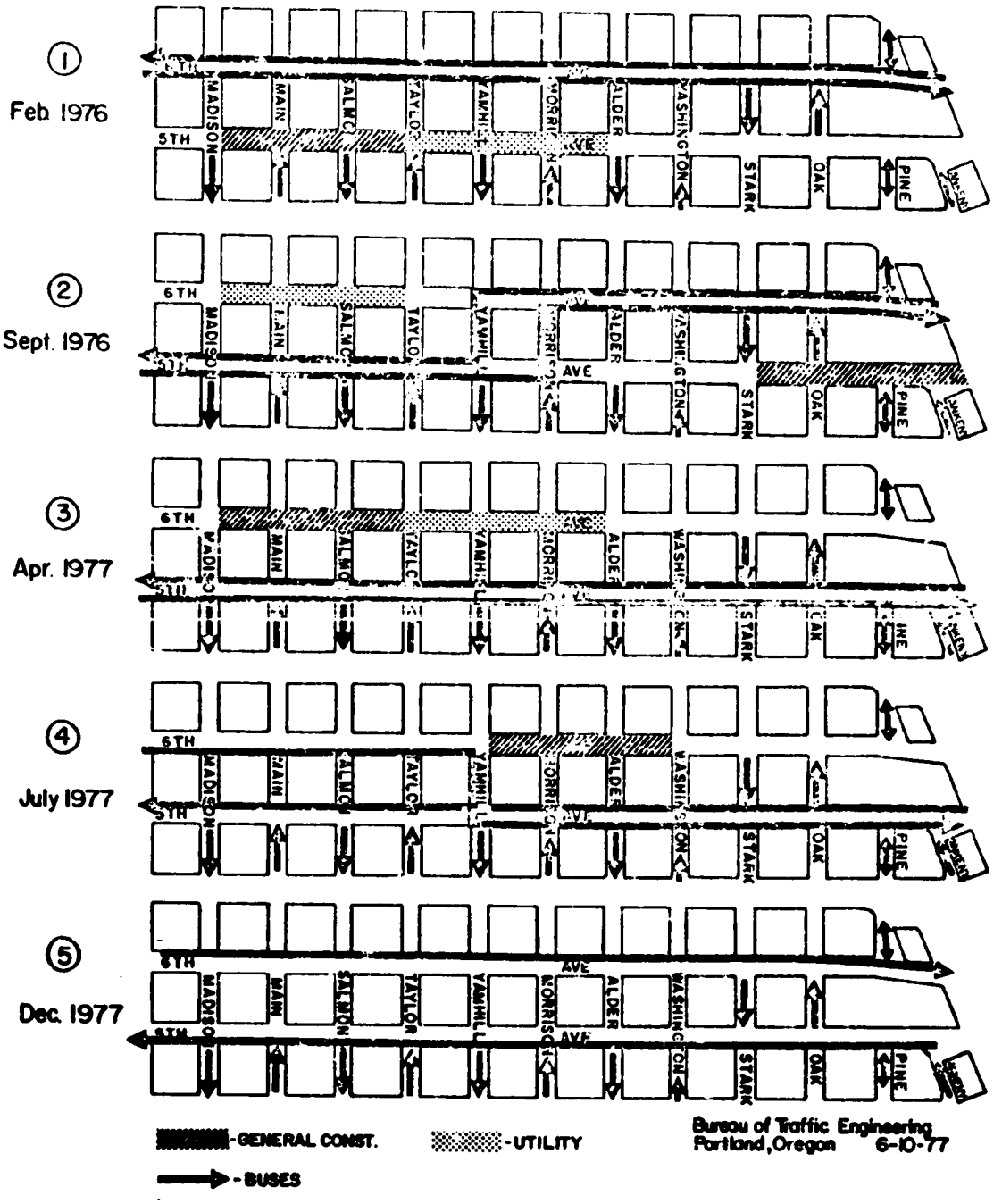


FIGURE 7-3. PORTLAND MALL CONSTRUCTION PHASES

Officials in both Philadelphia and Portland report that there was no noticeable increase in store turnover during the construction period. They attribute this to the basic economic strength of the streets in question as well as the careful phasing. These officials caution, however, that where merchants are already on the brink of failure, a sharp decline in sales, even temporarily, can result in permanent closing.

7.3 IMPACT ON RETAIL SALES

Merchants consider the volume of retail sales to be the most important indicator of economic conditions on the transit malls. As noted earlier in this report (see Section 3.7), downtown retail sales were declining, in constant dollars, in all three cities prior to the opening of the malls. Many merchants hoped that the transit malls would reverse this trend. Others simply hoped that the long-term decline would be halted or slowed, perhaps providing some "breathing room" before more substantial public and private redevelopment plans could be implemented. Due to the very recent opening of the Portland Mall, the impact on retail sales will only be examined in Minneapolis and Philadelphia.

Minneapolis retail and department store sales are presented in Figures 7-4 and 7-5. In constant dollars, Nicollet Mall department store sales show a slightly sharper decline after the mall opened. City-wide department store sales show the same pattern of decline. By comparison, metropolitan area department store sales show a steady rise. This may be influenced by the fact that numerous new department stores have opened in suburban locations during these years. Sales per store, on a metropolitan-wide basis, have probably risen more slowly.

Figure 7-5 compares the retail sales of about 75 specialty stores on the Nicollet Mall, excluding stores with other outlets in the city, to all retail sales in Minneapolis. Only post-mall figures are available. Both the Nicollet Mall and the city as

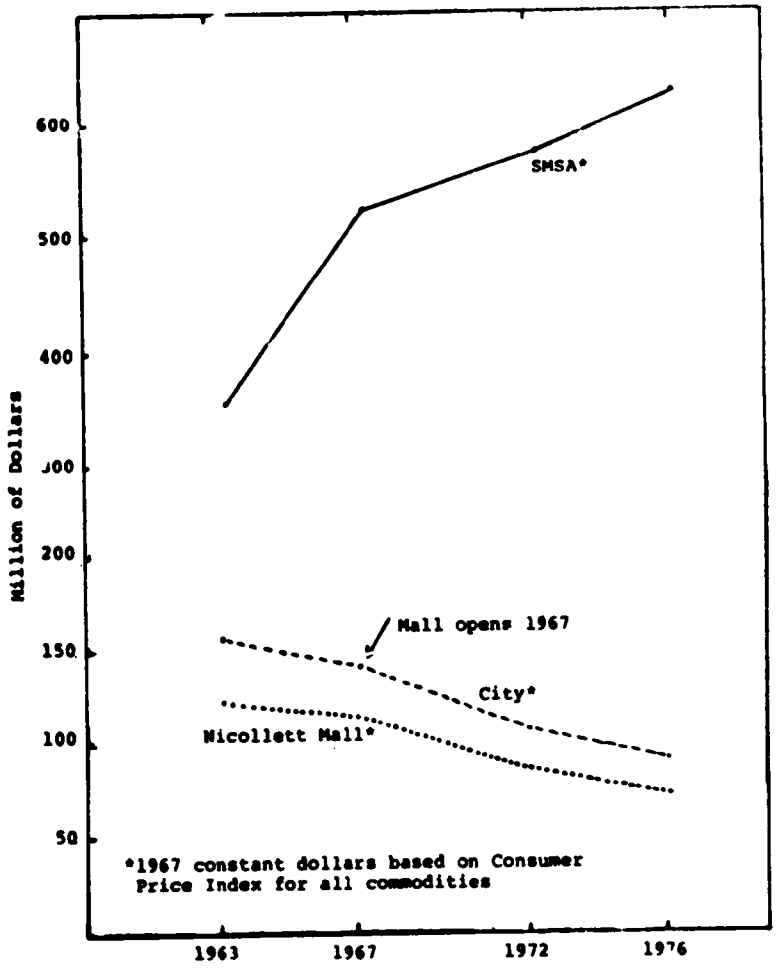


FIGURE 7-4. MINNEAPOLIS DEPARTMENT STORE SALES

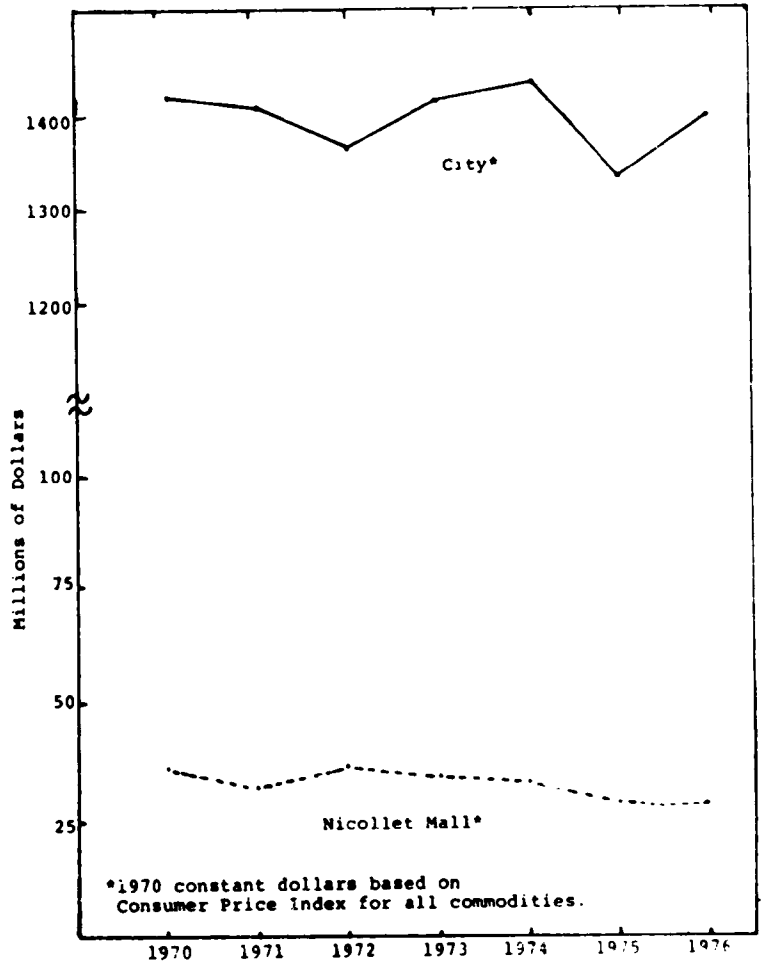


FIGURE 7-5. MINNEAPOLIS RETAIL SALES

Source: Gladstone Associates (Ref. 7-1)

a whole show a very slight long-term decline in sales. Although exact figures are not available, most observers believe total retail sales in the metropolitan area have risen. Thus smaller retail stores on the Nicollet Mall appear to show a more stable sales trend than do department stores. As noted above, downtown department store sales have been hurt by suburban competition. Specialty shops on the mall may carry a "one-of-a-kind" line of merchandise, or depend on spending by downtown workers, and thus may be less susceptible to competition from outlying shopping centers.

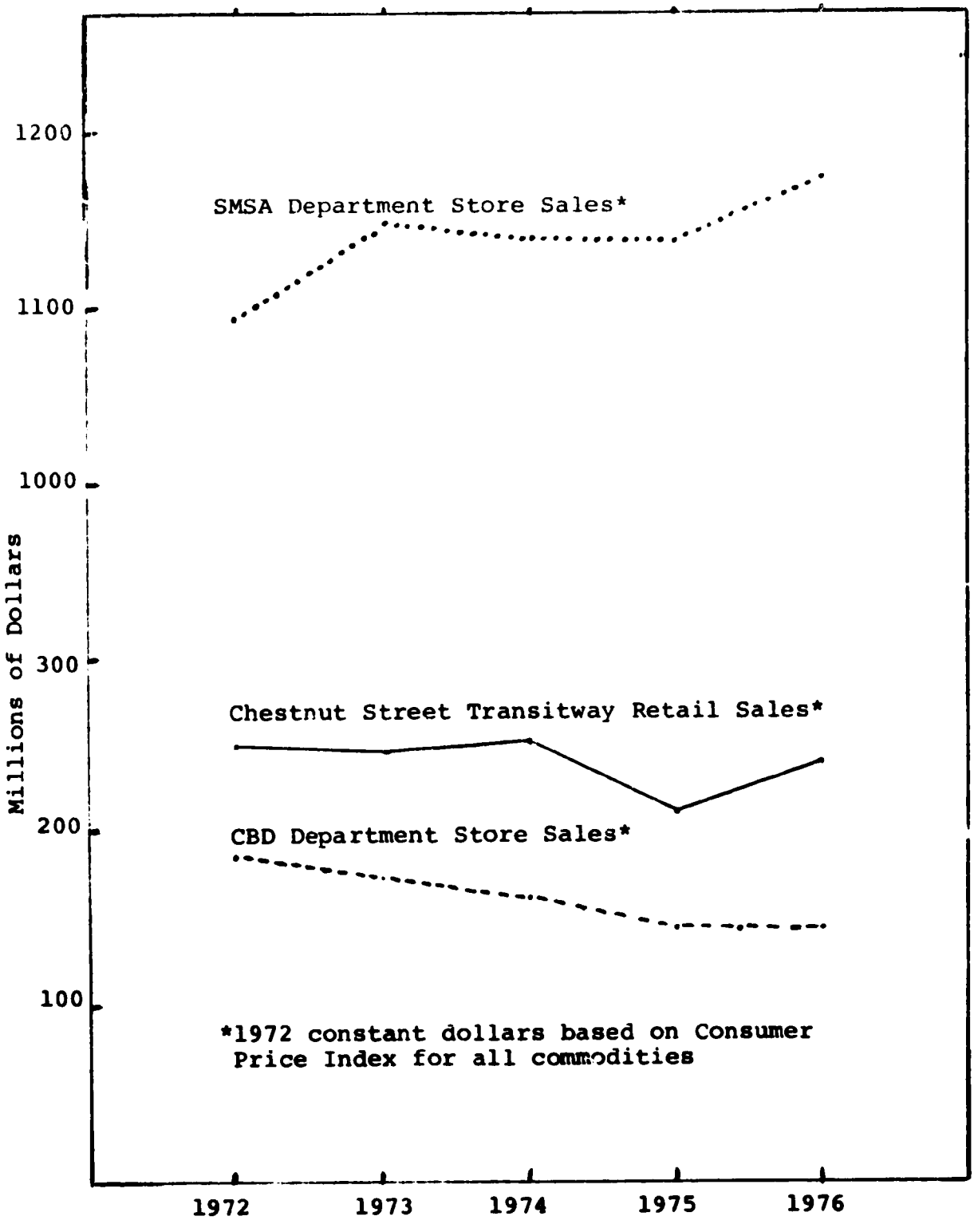
The declining popularity of the Nicollet Mall as a shopping center for the entire metropolitan area is substantiated by several surveys conducted by a local newspaper (Ref. 7-3). In the two years prior to the mall's completion, 1965 to 1967, the percentage of metropolitan area residents who "shopped downtown within the past month" fell from 48 to 42 percent. In 1969, two years after the mall opened, the percentage fell still further, to 33 percent. A more recent survey (1973) shows that the percent of residents who shop downtown has stabilized and may even be rising. In light of the initial post-mall pattern, it would be difficult to attribute this recent stabilization to the mall itself. However, it is possible that the mall has interacted with other factors, such as the skyway system and new retail developments, to improve the climate for retail sales.

It should be noted that a strong Nicollet Mall sponsor, Donald Dayton of Dayton's department store, reports that his Nicollet Mall store has shown the strongest sales performance in a nationwide chain of twenty department stores. Dayton's carries the highest quality line of merchandise on the mall, among the highest quality in the nation for its type of operation, and draws many of its customers from the upper-midwest region outside of the Minneapolis area. Dayton's positive opinion of the mall's impact is widely shared among larger, well-established firms. A locally-conducted survey of 17 firms which have long been located on Nicollet Avenue (eight had

been at the same location for at least 50 years and five more for at least 25 years) showed that all but one thought the mall was a "good financial investment" and 12 reported that the mall was a "major reason for staying at this location" (see Appendix E.) This is evidence that the mall has at least had a "stabilizing" influence on sales and that declines in retail sales might have been much worse without the mall.

The experience of Philadelphia's Chestnut Street Transitway merchants is generally consistent with the data presented above for Minneapolis. Philadelphia retail trends, in constant dollars, are shown in Figure 7-6. Metropolitan Philadelphia department store sales show a generally upward trend, 1972-1976, with a strong gain in 1976. Downtown department store sales, including several stores not on the Chestnut Street Transitway, show a generally declining sales trend, although sales stabilized in 1976. The retail sales figures for the Chestnut Street Transitway show that prior to the transitway, 1972-1974, retail sales were stable in constant dollars. As noted earlier, during the construction year of 1975 there was an 18 percent drop in retail sales. Sales rebounded in 1976, but remained about 6 percent below the 1974 pre-transitway level.

Two factors may have influenced the results on the Philadelphia transitway. First, firms established since 1972 are not included in the study. Newer stores, particularly those which opened since the transitway opened, are reported to be branches of national chains, generally regarded as superior in quality and sales volume to older Chestnut Street stores. This would suggest that if such stores were included, total sales on the transitway are more positive than those shown in Figure 7-6. On the other hand, some of the increase in 1976 sales over 1975 may be explained by general economic trends - evidenced by strong CBD and SMSA department store sales in 1976. These two factors probably neutralize each other, leaving "no change" as the net effect of the transitway on retail sales.



Source: Gladstone Associates (Ref.7-1)

FIGURE 7-6. CHESTNUT STREET TRANSITWAY RETAIL SALES (PHIDADELPHIA)

There have been two surveys of Chestnut Street Transitway merchants; both tend to confirm the Philadelphia retail sales figures presented above. A June 1977 survey of 40 merchants by a local newspaper indicated that nearly all reported increased sales, usually between 10 and 15 percent (Ref. 7-4). However, these increases are not adjusted for inflation and it appears that some merchants may have made a comparison to the construction year of 1975 rather than the last pre-transitway year of 1974.

A more extensive survey in the spring of 1977 by the Delaware Valley Regional Planning Commission (DVRPC) received responses from 70 percent of Chestnut Street Transitway merchants (Ref. 7-5); Tables 7-1 through 7-5 show the responses of 158 firms responding to the survey that had been in business before the transitway was built and could, therefore, compare their pre- and post-mall business activity. The twenty-one new firms established after the mall was completed are added to the tallies in Table 7-6.

Table 7-1 shows that opinions regarding the effect of the transitway on business activity are evenly divided: 35 percent said their business activity had increased, 35 percent said it stayed the same, and 30 percent said it had decreased. Only about half of those who reported greater business activity attributed this to the transitway, while three-quarters of those reporting business activity had decreased said the transitway was responsible.

TABLE 7-1. EFFECTS OF CHESTNUT STREET TRANSITWAY ON BUSINESS ACTIVITY

	Business Activity			
Change Attributed to Transitway?	Increased	Same	Decreased	TOTAL
Yes	29	6	35	70
No	23	8	8	39
Not indicated*	4	41	4	49
TOTAL	56(35%)	55(35%)	47(30%)	158(100%)

*This group of merchants did not indicate whether changes were attributable to the transitway.

Table 7-2 indicates there is a strong association between those merchants reporting a change in their business activity (since the transitway) and their perception of how easily customers can now get to their store. Only 7 percent (4) of those with increased business activity said customers had more difficulty getting to their store now, while 74 percent (35) of those with decreased business thought the transitway made customer access difficult. Overall, one-third of the merchants tended to find that accessibility had worsened.

TABLE 7-2. EFFECTS OF CHESTNUT STREET TRANSITWAY ON CUSTOMER ACCESSIBILITY BY BUSINESS ACTIVITY

	Business Activity			
Accessibility	Increased	Same	Decreased	TOTAL
Less Difficult	25	5	0	30
Same	26	37	12	75
More Difficult	4	13	35	52
Not Indicated*	1	0	0	1
TOTAL	56	55	47	158

*Did not indicate whether accessibility changes were attributable to transitway.

When reported ease of customer access is shown by business type, (Table 7-3) around one-third of all business establishments except banks report that customer access is more difficult since the mall was completed.

TABLE 7-3. EFFECT OF CHESTNUT STREET TRANSITWAY ON CUSTOMER ACCESSIBILITY

By Type of Business

	Business Type						
Accessibility	Wearing Apparel	Furniture	Eating/ Drinking	Misc. Retail	Banking	Other	TOTAL
Less Difficult	9	0	4	11	4	2	30
Same	26	6	7	22	10	5	76
More Difficult	20	4	7	18	2	4	55
TOTAL	55	10	18	51	16	11	161*

*Indicates three merchants not categorized in other tables.

Table 7-4 shows that reports of decreased business activity are more common among firms with fewer than 25 employees than those with more than 50 employees.

TABLE 7-4 EFFECTS OF CHESTNUT STREET TRANSITWAY ON BUSINESS ACTIVITY

By Number of Employees

	Business Activity			
Number of Employees	Increased	Same	Decreased	TOTAL
More than 50	6	6	1	13
25-50	25	21	14	60
Less than 25	25	28	32	85
TOTAL	56	55	47	158

When reported change in business activity is cross-tabulated with type of business (Table 7-5), the figures show that eating and drinking establishments are the most dissatisfied, i.e., they are most likely to feel the mall has decreased their business activity.

TABLE 7-5. EFFECT OF CHESTNUT STREET TRANSITWAY ON BUSINESS ACTIVITY

By Type of Business

Business Activity	Wearing Apparel		Furniture		Eating/ Drinking		Misc. Retail		Banking		Other		TOTAL
	n	%	n	%	n	%	n	%	n	%	n	%	
Increased	21	40	3	30	5	28	18	35	5	31	4	36	56
Same	19	37	4	40	3	17	16	31	10	63	3	27	55
Decreased	12	23	3	30	10	56	17	33	1	6	4	36	47
TOTAL	52		10		18		51		16		11		158

However, the data in Table 7-6 show that these two categories (eating and drinking establishments) have the largest proportion of new business that have been established since the transitway opened. Thus, increased competition may be one explanatory factor for the reported decrease in business activity.

TABLE 7-6. CHESTNUT STREET TRANSITWAY BUSINESS TYPES

By Date Established

Date Established	Wearing Apparel		Furniture		Eating/ Drinking		Misc. Retail		Banking		Other		TOTAL	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Before Transitway	52	91	10	91	18	78	51	84	16	100	11	100	158	88
After Transitway	5	9	1	9	5	22	10	16	0	0	0	0	21	12
TOTAL	57		11		23		61		16		11		179	

Both available retail sales data in Minneapolis and Philadelphia, and extensive survey data in Philadelphia seem to support the conclusion that there is no noticeable increase in retail sales after a transit mall is constructed. This may vary for particular types of firms. In Philadelphia, larger stores and those dealing in wearing apparel report increased sales. In Minneapolis, smaller speciality shops show a better sales performance than department stores, although department store owners remain the strongest mall supporters. A real or alleged reduction in customer access is strongly associated with reduced sales.

However, before concluding that transit malls have no overall effect on retail sales, two major caveats should be mentioned. First, the sales data reviewed in this section are limited to firms that existed both before and after mall construction. Turnover of lower quality shops to higher quality outlets may cause total sales to rise. Competition from new stores may also explain some of the negative sales reports from existing firms. Second, it is possible that conditions would have become much worse if the malls had not been built. In the introduction to this chapter, it was noted that some merchants hoped that the transit malls would provide "breathing space" until more substantial downtown redevelopment projects are completed. The generally stable sales trends would appear to offer this extra time for new developments to take place.

7.4 IMPACT ON OTHER ECONOMIC INDICATORS

Although retail sales trends are of prime importance to transit mall merchants, other signs of commercial vitality deserve attention. Several are more important than sales to property owners, as distinct from merchants who often lease their stores. Chief among these other economic indicators are turnover, vacancy, and rental rates and the amount of new investment on the transit mall.

Depending on circumstances, a high turnover rate may be either a positive sign of change or an indicator of unstable conditions. In Philadelphia, the turnover rate is widely regarded as a positive indicator. Just under 15 percent of the firms in the DVRPC survey had moved to the transitway in the year and a half since it opened. This appears to be a higher turnover rate than existed before the mall opened. Nearly 40 percent of these new firms said the transitway was a major reason for their selecting a Chestnut Street location (Ref. 7-5).

New retailers on the Chestnut Street Transitway tend to be national chains, particularly fast-food outlets, stereo shops, and men's clothiers. There has been a distinct shift from stores that appeal to upper-income customers to stores which cater to the young, middle-income customer; however, a number of these new outlets are thought to be superior in quality to those which they replaced. Minneapolis' Nicollet Mall has also attracted high quality national chains, although the street is dominated by traditional, locally-owned stores. However, these stores also tend to be of high quality with an up-to-date line of merchandise. New fast-food outlets and business support services have tended to move into the skyway system.

Rental rates are reported at least stable on both the transitway and the Nicollet Mall, with many Chestnut Street merchants reporting increases. Vacancy rates are very low on both malls. Between 1955-1965 property assessments declined by 13.1 percent on Chestnut Street (Ref. 7-6), but have since stabilized. Local officials believe property values are actually rising but that this is not yet apparent due to over-assessment of property in past years.

Investments in new commercial buildings and renovations of old ones are important signs of economic vitality. Many observers feel that the most important economic contribution of the transit malls has been to improve the "climate" for

investment by signaling local government concern and establishing a history of cooperation between government and business. Significant new investment has already occurred or is planned in the vicinity of the transit malls in Minneapolis, Philadelphia, and Portland.

About $400 million of new private construction has been invested in the Nicollet Mall vicinity since the mall was completed. Prominent additions to the Nicollet Mall include the 51-story IDS Center (with a two-story retail arcade surrounding an enclosed court), the Midwest Federal Building (also with a retail arcade), and a Sheraton Hotel. The planned City Center project will include office towers, a hotel, a retail arcade, and a new building for one of the existing department stores. Merchants report that extensive remodeling occurred during and shortly after mall construction. Public investment has also been heavy, notably an ultra modern Federal Reserve Building and a new branch of the Minneapolis city library. Public and private investment off the mall has also been extensive. The new Gateway redevelopment project is at the northern end of the mall. The four block extension of the Nicollet Mall to the south, scheduled to be completed in 1979, will connect the mall to the new, privately-financed Orchestra Hall, YWCA, and a hotel. It will also place the mall in the middle of the Loring Park residential redevelopment project now under construction.

Annual investment on Philadelphia's Chestnut Street Transitway has risen from about $475,000 in 1974-1975 to $780,000 since the completion of the transit mall (see Table 7-7). The actual level of investment remains small, however, given the value of the property, and much of the post-transitway increase may be attributed to postponement of normal investment due to the recession in 1974-1975 and mall construction in 1975 (Ref. 7-1). A one-story retail complex replaced a parking lot; however, surrounding multi-sotry structures suggest more intensive land use. The most important new construc-

tion is a block-long hospital building with retail stores on the first floor. The vacant Federal Reserve Building is to be occupied by an insurance company. Both developments are located on the eastern portion of the transitway and should help conditions there. Despite hopes that the transitway would "extend" the retail core eastward, the DVRPC survey indicated that merchants in this area had the highest level of dissatisfaction with the transitway.

TABLE 7-7. BUILDING IMPROVEMENTS 400-2000 BLOCK OF CHESTNUT STREET* 1974-1977

Year	Number of Permits Issued*	Value of Permits	
		Current Dollars	Constant 1974 Dollars
1974	10	$ 590,100	$ 590,100
1975	19	397,550	364,230
1976	26	614,400	532,220
1977 (Jan-July)	12	728,885	600,450
TOTAL	67	$2,330,935	$2,087,000

*Transitway extends from 6th Street to 18th Street. An Additional two blocks at either end were included, under the assumption that these peripheral areas might have experienced some impact from the Transitway.
**For alterations to retail establishments only.

Source: Department of Licenses and Inspection, City of Philadelphia, courtesy of Gladstone Associates.

The most important new commercial development in Philadelphia is the "Gallery" complex one block north of the transitway on Market Street. The complex includes two department stores connected by an enclosed retail arcade, an 850 space parking garage, and an underground connection to commuter trains. The project opened in August 1977 and sales are said to be well ahead of projections. It is not yet clear whether the complex will attract new customers to Center City, some of whom may "spillover" on to the Chestnut Street Transitway, or whether it will compete for Chestnut Street shoppers. Because of the Gallery's success in its first six months, some observers feel it may be drawing customers from both the suburbs or outer areas of the city and from the transitway. However, a department store which fronts on both the transitway and Market Street reports that business has increased due to shoppers using the store to pass back and forth between the two retail centers.

The Portland Mall also appears to be attracting new investment. One department store has already moved into its new quarters near the mall, and its old building is now occupied by a brand new department store. The owner of the new operation cited both new parking ramps and the transit mall as reasons for moving to downtown Portland. Still another department store cited the transit mall as a reason for <u>not</u> leaving downtown Portland.

It seems that the secondary economic indicators of turnover, rental rates, and new investment offer much more positive conclusions than the data on retail sales. The most glaring example of this is Minneapolis, where retail sales figures showed a decline for Nicollet Mall department stores and a flat sales trend for the mall as a whole. Yet one department store owner reports sales to be the strongest in a twenty-store chain while another owner is investing in a brand new department store to replace his existing structure. Moreover, property owners in the entire assessment district are

paying for the four block extension of the Nicollet Mall. The situation in Philadelphia is less clear cut, although most secondary economic indicators on the Chestnut Street Transitway are also positive. In weighing the impact of transit malls on retail sales and other economic indicators, while giving consideration to the fact that changes in retail sales did not take into account the impact of new businesses, the overall effect of the transit malls appears moderately positive.

7.5 RELATION TO DOWNTOWN REDEVELOPMENT

Transit malls are often developed to complement or reinforce ongoing redevelopment efforts. None of the transit malls in this study was itself a redevelopment project and none are located in redevelopment areas. However, all three fill physical "gaps" between designated redevelopment areas and all three fill functional gaps in circulation between new activity centers.

Figure 7-7 indicates the relationship of the Chestnut Street Transitway to surrounding redevelopment areas and land uses. Extensive redevelopment has already occurred over much of the area. Independence Mall was largely redeveloped as part of Philadelphia's preparation for the bicentennial celebrations. The Washington Square area is the site of a new retail development catering to the young, higher-income population; and of Society Hill, a high-rise and high-income condominium development. There has also been extensive renovation of private townhouse neighborhoods in this area. Renovation of Philadelphia's traditional townhouses has also occurred in the vicinity of Rittenhouse Square. In the Penn Center area, Market Street, JFK Boulevard, and the immediate vicinity of City Hall are now lined with high-rise office structures.

The Chestnut Street Transitway serves or could serve a number of roles in this development process. First, it provides a local shopping center for the higher income populations moving into the Washington Square and Rittenhouse Square areas. Second, it serves the lunch hour shopping needs of new office workers north of the transitway. Third, it hopes to attract the "tourist trade" which in the past has centered on the portion of Chestnut Street east of Independence Hall. Fourth, it provides a transportation corridor between new residential and office developments and between tourist attractions east and northwest of the mall. Finally, the transitway provides an aesthetic link between the developments in the Rittenhouse Square and Washington Square/Independence Hall areas.

In its actual design and operation the Chestnut Street Transitway has made some progress toward filling these roles. The increase in higher quality clothing, furniture, and stereo shops should prove attractive to the Society Hill residents, while the increase in fast-food outlets should bring more office workers to the street at lunch hour. Attracting visitors from the Independence Hall area historical sites is made difficult by the fact that most tourist-oriented parking is located east or north of Independence Mall (while the transitway is to the southwest) and by the fact that the last block of the transitway (abutting Independence Mall) is not well-developed for retail use. This creates a break in the continuity from transitway shops to tourist attractions. Transportation links between the transitway and other areas are provided by the "Cultural Loop" bus, which connects Independence Mall to the Philadelphia Museum at the northwestern edge of Center City, and by the two regular bus routes (the D and 42 lines) using the transitway. These lines do not enter the Washington Square neighborhood, but with fairly minor rerouting they could provide a strong link to retail and resi-

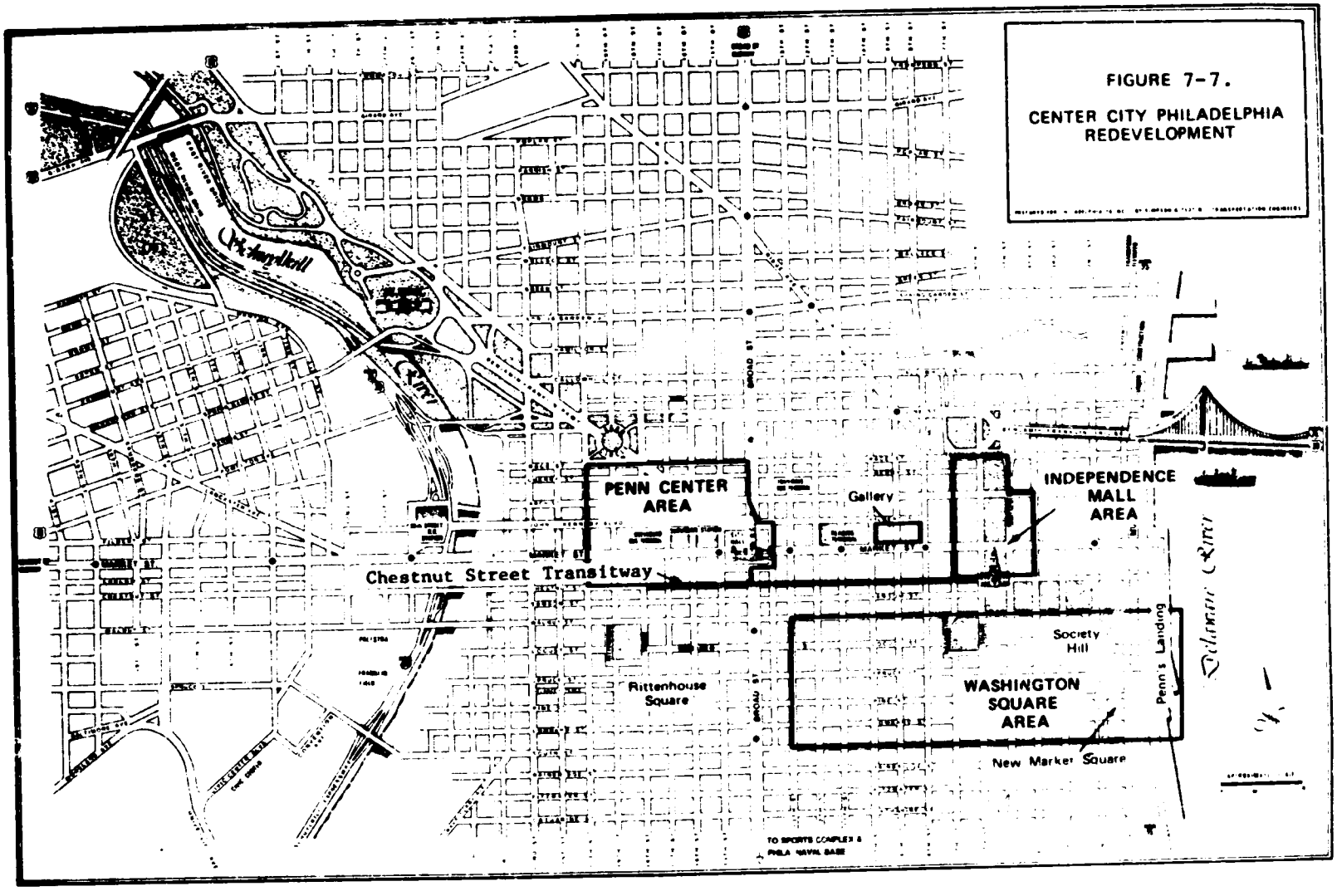


FIGURE 7-7.

CENTER CITY PHILADELPHIA REDEVELOPMENT

dential developments in that area. In terms of unity of design, the transitway differs from developments near both of its end points in that it follows contemporary lines rather than an "early American" theme. On the other hand, this design extends the modernistic flavor of the new office buildings and parks in the Penn Square/City Hall area north of the transitway. The bricked sidewalks on the transitway provide the one strong link to the new and renovated brick structures to the east, west, and south of the transit mall.

Figure 7-8 shows the relationship of the Portland Mall to recent downtown construction and sites identified for possible redevelopment. Most new or proposed development is located along the waterfront. New building has also concentrated south of the Mall, with potential sites scattered north and west of the mall. There has been relatively little development within the central area. Except for the waterfront zone, new development in Portland is less focused than in Philadelphia or Minneapolis. The transit mall on 5th and 6th Avenues and a planned transit mall on Adler and Morrison Streets clearly "fill in" the development picture, and the concentration of transit service on these streets helps provide a functional "focus" to the downtown that is now lacking. The development of transit malls is a key part of Portland's "Downtown Guidelines Plan," adopted by the City Council in late 1972. In addition to emphasizing reliance on transit service, the plan outlines limitations on automobile flow and parking, controls on building heights and area coverage, and extensive new residential development in the downtown area.

Figure 7-9 outlines the designated redevelopment area in downtown Minneapolis. Minneapolis' downtown is smaller than in Philadelphia or Portland. The Nicollet Mall is the area's retail "spine," with the vast majority of retail space located within a block of the mall. Thus the mall's primary function is to shuttle shoppers from store to store. In a like manner,

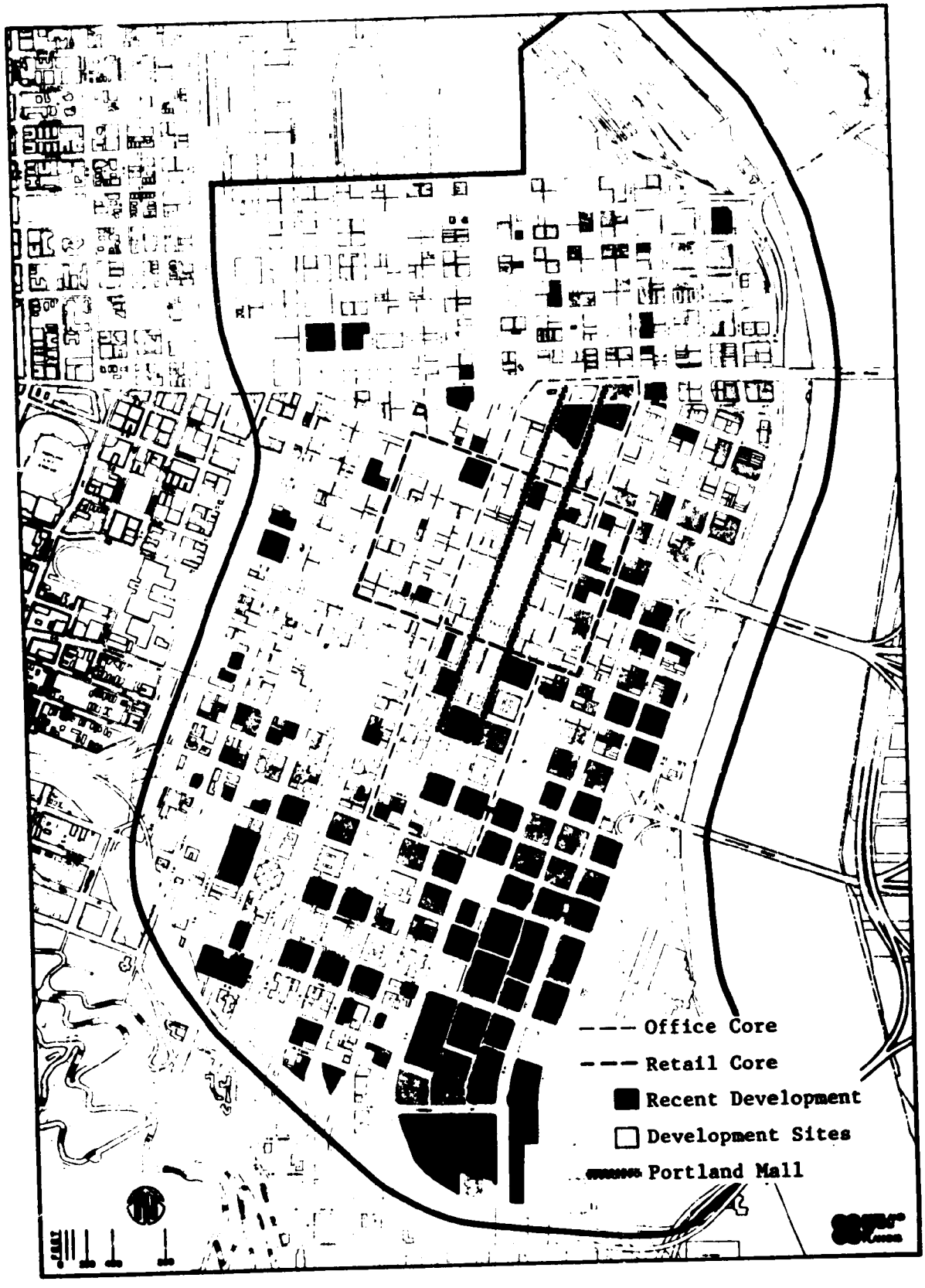


FIGURE 7-8. DOWNTOWN PORTLAND DEVELOPMENT

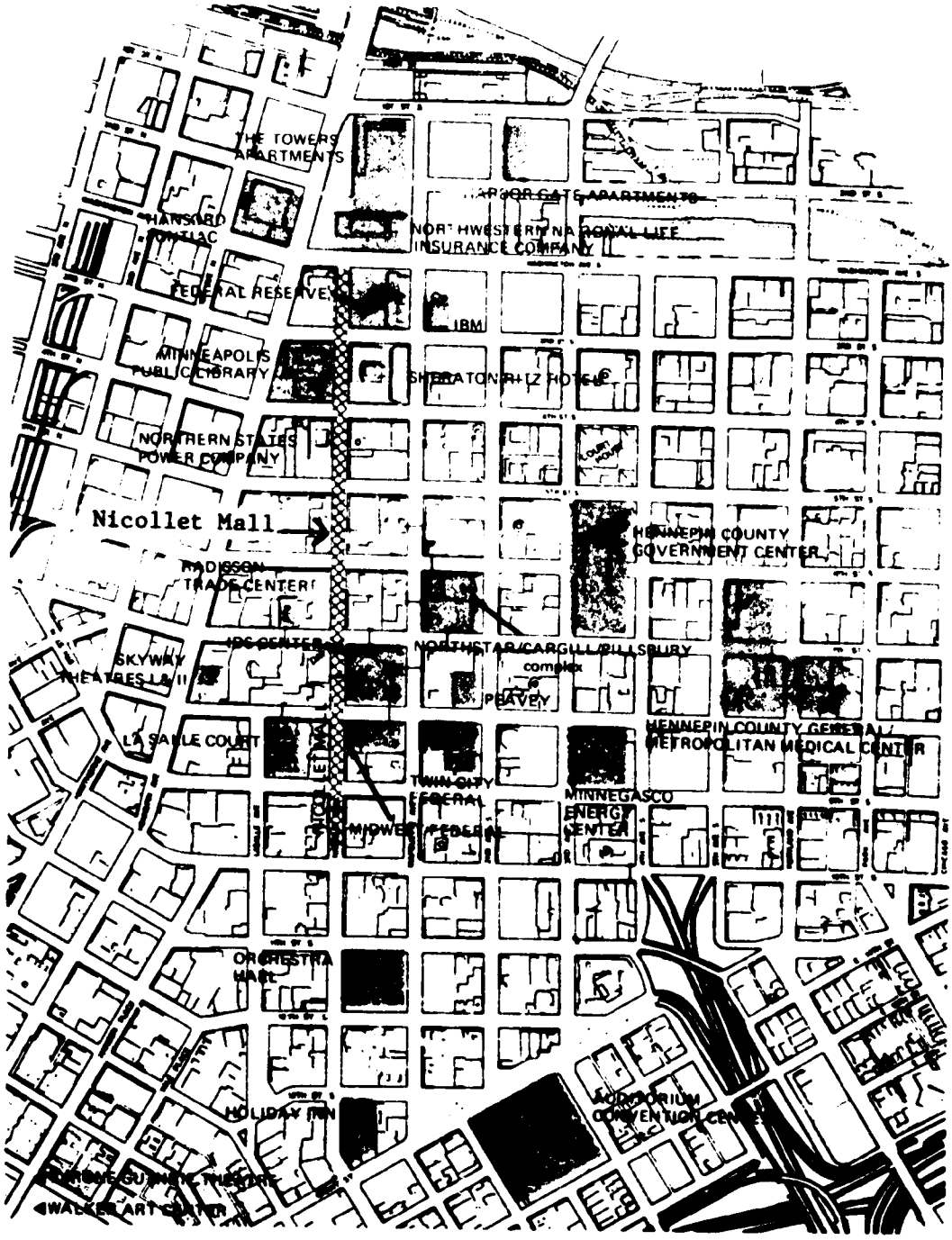


FIGURE 7-9. NEW BUILDINGS IN MINNEAPOLIS

Source: Downtown Council of Minneapolis

Hennepin Avenue is the "spine" of the entertainment district and Marquette Avenue is the "spine" of the office core. Beyond these three streets structural density falls off rapidly. The Nicollet Mall acts as a functional link in two ways. First, large redevelopment projects are located at either end of the mall. Second, and more important, the mall plays an important role in the overall pedestrian circulation system. Eventually, virtually all of downtown Minneapolis will be connected by the second story skyway system. The Nicollet Mall is the one point where the pedestrian orientation is brought to the ground level. The Nicollet Mall also provides a needed "focus" for shopping, since the small retail outlets on the skyway system are not concentrated.

7.6 SUMMARY OF FINDINGS

The impact of construction was reviewed in Philadelphia and Portland. There is widespread agreement that construction went more smoothly than expected, with minimal interruption of business activity and traffic and transit flows.

1. Work in each city was completed on schedule, meeting Christmas season deadlines.
2. Minimizing utility work shortened the construction period.
3. Careful phasing of work minimized the interruption to business on any one block.
4. Special walkways and "bridges" provided pedestrian access to stores.
5. Cross-streets were kept open to traffic to the maximum extent possible.
6. The two-street transit mall in Portland allowed construction to be phased so that buses could operate on the mall through the construction period.

7. Pedestrian use declined in the affected areas, with increases noted on nearby streets.
8. Retail sales appeared to decline in the affected areas (at least in Philadelphia), but few if any business closings were attributed to construction and sales rebounded when construction ended.

The overall impression of local officials and business leaders is that transit malls have a positive impact on the local business climate. However, this opinion is not shared by all merchants, and most benefits appear in secondary economic indicators rather than retail sales.

1. There is no evidence of overall increase in retail sales, although the transit mall may have stabilized declining retail sales in Philadelphia and Minneapolis.
2. The turnover rate increased, with national chains and those oriented toward young, middle class customers moving in. This may increase competition for some existing firms and discourage higher-income customers from shopping at mall stores.
3. Vacancy rates are very low.
4. Rental rates are reported at least stable with many rates rising.
5. Public and private investment appears to be increasing.
6. Transit malls and other downtown developments are mutually supportive, with transit malls providing a retail focus and a transportation link between developments.
7. A new cooperative spirit between business and government is seen as a major benefit of transit mall development.

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APPENDIX A
MINNEAPOLIS TRIP TIME STUDY

The Minneapolis Trip Time Study was conducted using six hired observers on Tuesday, August 2, 1977. The survey was limited to the length of the Nicollet Mall (Washington Avenue at the north end and 10th Street at the south end) and the same distance on adjacent Hennepin and Marquette Avenues. Buses were recorded heading in both north and south bound directions on Hennepin Avenue and the Nicollet Mall, but only in the southbound direction in the Marquette Avenue contraflow lane. Periods of observation were 7-2 AM, 12-2 PM, and 4-6 PM.

The study procedure had one observer stationed at each end of Nicollet, Hennepin, and Marquette Avenues who recorded the route, direction, and vehicle I.D. number of each passing bus. The study boundaries were the crosswalks at the intersections at the end of each street. A bus entered the survey area when the light changed and the bus proceeded across the intersection and reached the first crosswalk line. A bus left the survey area when the light changed and the bus moved across the crosswalk. The time the bus entered or left the survey area was recorded to the nearest minute. Observers synchronized their watches at the start of each period.

The total number of buses recorded at both ends of the survey area was 807 on the Nicollet Mall, 589 on Hennepin Avenue, and 591 on Marquette Avenue. Of these, 7.3 percent on the Nicollet Mall, 15.1 percent on Hennepin Avenue, and 6.2 percent on Marquette Avenue were recorded at one end of the survey area but not the other. The major reason for this was that workers were instructed to start/stop observing strictly at the beginning and end of the time periods. Thus a bus would be recorded entering a street at 8:58 AM, but was not recorded at the other end because it would arrive after 9:00 AM (When the worker had completed observation). Also some observations were missed or incorrectly recorded, particularly at times when a high volume of buses passed in both directions. Matching bus times at the beginning and end of the survey area was also made difficult by the fact that some buses change their route I.D. between the two survey stations.

As a result of the missing observations, the calculation of trip times (the time it took a bus to get from one end of the survey area to the other) is actually a very large sample of completed runs within a two-hour period rather than a complete count. In calculating headways at the beginning and end of the survey areas (time between buses in the order they arrive at either end), only buses which were recorded at both ends were included.

ON-MALL BUS TRIP TIME STUDY

DATE: _____

OBSERVER LOCATION: _____ WEATHER: _____

	BUS LINE	DIRECTION	VEHICLE NO.	TIME (MIN.)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
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APPENDIX B
ON-BUS MEASUREMENT STUDIES

The On-Bus Measurement Studies were conducted in Philadelphia, July 13-14, and in Minneapolis, August 3-4. Procedures and forms (except for street names) were nearly identical in the two cities. One pair of observers was placed on each bus surveyed. They would board at least one block before the survey area and deboard one block past the survey area. Survey periods were 7-9 AM, 12-2 PM, and 4-6 PM.

The survey areas in Philadelphia were Walnut Street from 6th to 18th Streets (westbound), the transitway from 18th to 6th Streets (eastbound), and the transitway from 7th to 17th Streets (westbound). The boundaries in the last case were two blocks shorter because the only westbound line, the 42, diverts from Walnut Street to the transitway at 7th Street and back from the transitway to Walnut Street at 17th Street. Two pairs of observers were used in Philadelphia. They were instructed to board the first bus to arrive at their starting point. One pair began each time-period at the eastern end of Walnut Street, boarding a westbound bus, and one pair began at the western end of the transitway, boarding an eastbound bus. Upon finishing the run, each pair would walk one block to pick up a bus at the beginning of the other street. If a pair boarded a westbound 42 bus on Walnut Street, they generally stayed on the bus until it had returned to Walnut Street, although measurements were only taken while the bus was on the transitway.

In Minneapolis, survey areas were Washington to 10th Streets on each of the following streets: Hennepin Avenue, Nicollet Mall, Marquette Avenue, and Second Avenue. Three pairs of observers were employed. Each pair was assigned a particular street (the contra-flow lanes on Marquette and Second Avenues formed one two-way assignment). It was decided not to switch pairs among streets because familiarity with the location of bus stops and the physical appearance of survey boundaries were necessary. As in Philadelphia, observers boarded the first bus

to appear at the starting point. The starting points in both cities were at least one block from the survey area boundaries in order to give observers time to find a seat and record preliminary data on the bus route and I.D. numbers and number of passengers on the bus when it reached the survey area.

The On-Bus Measurement Studies can be broken down into two main substudies: a trip-time component/boarding and alighting study and a bus-pedestrian conflict study. For the trip-time component/boarding and alighting study, procedures were the same in both cities. As noted, two observers were placed on each bus. One sat at the front of the bus on the door side and used a stopwatch to record loading time. "Loading time" ran from time of arrival at the bus stop until, in the observer's judgment, the bus could proceed were it not for a stop light or other blockage. Observers generally stopped the watch after the door had been shut and the driver had finished making change or giving transfers and appeared ready to go. This observer noted the loading time for each block separately, along with the number of passengers on/off at the front door. A second observer sat toward the rear of the bus close to and on the same side as the rear door. For each stop this observer recorded the on/off count at the rear door. On entering and leaving the bus, this observer also counted the total number of passengers on the bus at the beginning and end of the run. Finally, this observer used a stopwatch to record "moving time"—the actual time the bus spent moving forward. This was a cumulative count for the entire run on the mall or comparison street. Movement was judged by observing the bus relative to the background of objects viewed outside the window. Both observers noted the times, to the nearest minute, the bus entered and left the mall or stretch of comparison street. The difference represents "trip time." By subtracting the sum of loading times and moving time from trip time, we get "idle time" or time spent stopped for reasons other than loading.

The bus-pedestrian conflict measurement procedures were also identical in both cities. This portion of the study was performed by the person sitting at the front of the bus. Observers were asked to record "clear" instances of conflicts between buses and pedestrians by block and category: bus stops, bus brakes, bus honks, bus slows, or pedestrian reaction, usually by appearing to see a bus and then scurrying off the roadway. Each conflict was recorded only once, under the most severe category. One incident involving two or more pedestrians was recorded as one conflict. Inter-observer consistency in making observations was about 75 percent during the training period. Results indicate that observers were conservative in making judgments. For instance, figures presented at the end of this appendix show that in Philadelphia the number of cases of buses braking or honking exceed cases of buses slowing or only a pedestrian reaction. In reality, cases of buses slowing or pedestrians reacting to the approach of a bus are probably the most common form of conflict but are difficult to determine clearly. In Minneapolis, the pattern is less clear, particularly comparing bus braking to slowing. This is probably due to the fact that the relatively severe forms of conflict are much rarer in Minneapolis.

Because of the difficulties involved in making the on-bus measurements, careful selection and training of observers was necessary. In Philadelphia, all observers held at least a master's degree, and all had had experience with scientific observation. In Minneapolis, several observers had at least some college education and all were well-known to local staff as reliable workers. At least half a day in each city was spent in on-the-bus training.

Following are two sample forms used by one pair of observers in Philadelphia. As noted, the forms in both cities were identical except for street names. Also included is a tabulation of results for the bus-pedestrian conflict portion of the study by category of conflict.

ON-MALL BOARDING COUNT, RUNNING AND DELAY TIME, AND
ILLEGAL PEDESTRIAN CROSSING STUDY

DATE 7/13 LINE D DIRECTION W VEHICLE #6109 WEATHER Sunny - Hazy

TIME DEPART WALNUT/6TH 8:35 # ON BUS AFTER 6TH ST. STOP 8

TIME DEPART WALNUT/18TH 8:47 # ON BUS AFTER 18TH ST. STOP 53*

TOTAL RUNNING TIME (Secs.), 6TH ST. STOP TO 18TH ST. STOP 5:12

	#ON	#OFF	LOADING TIME	ILLEGAL PEDESTRIANS				
				BUS SLOWS	BRAKES	STOPS	NO BUS ACTION	Horn
WALNUT/7TH	2		6					
WALNUT/8TH	4		13					
WALNUT/9TH	14		30					
WALNUT/10TH	10		23					
WALNUT/11TH	2		7					
WALNUT/12TH	10		21					
WALNUT/13TH	2		11					
WALNUT/BROAD	18		50	1	1			
WALNUT/15TH	2		18					1
WALNUT/16TH	3		10					
WALNUT/17TH	2		8					
WALNUT/18TH	2		15					1

REMARKS AND OBSERVATIONS:

* determined by subtracting # of empty seats

ON-MALL BOARDING COUNT, RUNNING AND DELAY TIME, AND
ILLEGAL PEDESTRIAN CROSSING STUDY

DATE 7-13 LINE D DIRECTION W VEHICLE #[illegible] WEATHER sun

TIME DEPART WALNUT/5TH 8 35 # ON BUS AFTER 6TH ST. STOP 5

TIME DEPART WALNUT/18TH 8 47 # ON BUS AFTER 18TH ST. STOP 53

TOTAL RUNNING TIME (Secs.), 6TH ST. STOP TO 18TH ST. STOP [illegible]

	#ON	#OFF	LOADING TIME	ILLEGAL PEDESTRIANS			
				BUS SLOWS	BRAKES	STOPS	NO BUS ACTION
WALNUT/7TH		0					
WALNUT/8TH		0					
WALNUT/9TH		0					
WALNUT/10TH		0					
WALNUT/11TH		0					
WALNUT/12TH		0					
WALNUT/13TH		0					
WALNUT/BROAD		5					
WALNUT/15TH		5 9					
WALNUT/16TH		5					
WALNUT/17TH		0 5					
WALNUT/18TH		9					

REMARKS AND OBSERVATIONS:

Number of people on at one 64- empty seats

BUS-PEDESTRIAN* CONFLICTS BY CATEGORY OF CONFLICT

	No. of Runs	Bus Stops	Bus Brakes	Bus Honks	Bus Slows	Pedestrian Reaction	Other**
Transitway Eastbound	(24)	5	33	31	31	31	4
Transitway Westbound	(10)	3	18	25	14	16	1
Walnut St. Eastbound	(17)	2	10	8	8	7	0
Nicollet Northbound	(26)	0	7	18	17	4	0
Nicollet Southbound	(23)	1	3	20	21	6	0
Hennepin Northbound	(20)	0	1	0	2	3	0
Hennepin Southbound	(21)	2	1	0	5	5	0
Second Northbound	(23)	2	0	1	1	0	0
Marquette Southbound	(23)	1	0	1	2	0	0

*Including conflicts with bicyclists.

**Buses swerved to avoid pedestrians.

APPENDIX C
ILLEGAL PEDESTRIAN COUNTS

Illegal pedestrian counts were conducted in Philadelphia and Minneapolis in August 1977. In Philadelphia, observations were made on two Chestnut Street Transitway blocks, 13th to Broad Streets and 15th to 16th Streets. Counts were made during the midday (11 AM - 2 PM) and late afternoon (3:30 PM - 5:30 PM) periods. Results were tabulated for each 15 minute period. Observers focused on the center line of the roadway and counted all persons crossing against red lights at crosswalks or midblock crossings, as well as those crossing outside of designated areas at any time. Observers were asked to make a judgement on the relative proportions of illegal crossings inside and outside of designated crossing zones. Persons walking on the roadway but parallel to the sidewalk, common if the sidewalk was congested, were not counted in this study.

In Minneapolis, a count was conducted on the Nicollet Mall between 7th and 8th Streets. The observer was stationed in an elevated skyway located at the middle of the mall block, and illegal crossings were only recorded for one-half of the block (figures within this report represent a doubling of the actual count in order to approximate crossings for the full block). The count was conducted between 12 and 1 PM. The procedure used was identical to that in Philadelphia. In both cities, records were kept in notebooks rather than on a standardized form.

APPENDIX D
NICOLLET MALL PEDESTRIAN SURVEY

The Nicollet Mall Pedestrian Survey was designed with the assistance of the Minneapolis Department of Public Works and the Downtown Council of Minneapolis. The mailback questionnaires were handed to pedestrians walking on the Mall. The questionnaires were hand-distributed by two college-age female workers, each located on a different block of the Mall.

Between 7th and 8th Streets, questionnaires were handed out at mid-block in front of the largest office building in Minneapolis across the street from the city's largest department store. The 1,850 questionnaires were distributed on this block between the hours of 10-11 AM (300 questionnaires), 12-1 PM (600 questionnaires), 2-3 PM (500 questionnaires), and 4-6 PM (450 questionnaires). The 1,850 distributed questionnaires represent a very high proportion of actual passersby. A pedestrian count taken on the same day, in 1976, found 4,900 pedestrians per block side during the survey hours, which would mean that nearly 38 percent of passersby took a questionnaire. Since many individuals may be counted more than once in a pedestrian count, but will take a questionnaire only once, the actual proportion of passersby accepting the questionnaire may be higher.

The second block selected was 4th to 5th Streets. This is a block with mixed commercial uses, including a large utility company headquarters building and the side entrance to a department store. The survey worker was located near the department store entrance. The 1,504 questionnaires were distributed between the hours of 10-11 AM (300 questionnaires), 12-2 PM (600), 2-4 PM (400), and 4-6 PM (204). The 1,504 questionnaires would represent 42.5 percent of the passersby, based on the previous year's pedestrian count.

The total number of questionnaires distributed on the two blocks was 3,304; 1,160 completed questionnaires were received by the evaluation contractor, a response rate of 35.1 percent. Following are the questionnaire form, reduced from its legal-sized original, and a tabulation of results.

FIRST CLASS
PERMIT NO. 13042
MINNEAPOLIS, MN.

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

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DEPARTMENT OF PUBLIC WORKS
TRAFFIC ENGINEERING DIVISION
ROOM 211, COURT HOUSE
MINNEAPOLIS, MN 55415

4105

The City of Minneapolis is conducting this survey to assist a U.S. Department of Transportation study of the Nicollet Mall and similar malls in other cities.

PLEASE HELP PLAN FOR YOUR TRANSPORTATION NEEDS

1. HOW DID YOU GET **DOWNTOWN** TODAY? (Check as many as you need.)

(1) ○ AUTOMOBILE (3) ○ BICYCLE (5) ○ WALKED
(2) ○ BUS (4) ○ TAXI (6) ○ OTHER: _____

2. WHAT WAS THE REASON FOR YOUR WALK(S) ON THE **NICOLLET MALL** TODAY? (Check as many as you need.)

(1) ○ TO SHOP OR PATRONIZE A BUSINESS WITHIN A BLOCK OF MALL
(2) ○ TO GET TO OR FROM WORK PLACE WITHIN A BLOCK OF MALL
(3) ○ TO USE A BUS STOP ON MALL
(4) ○ JUST TO GET TO A PLACE MORE THAN A BLOCK FROM MALL
(5) ○ WALKING FOR PLEASURE
(6) ○ OTHER: _____

3. HOW OFTEN DO YOU SHOP ON THE NICOLLET MALL? (Check only one.)

(1) ○ DAILY
(2) ○ ONCE A WEEK OR MORE
(3) ○ ONCE A MONTH OR MORE
(4) ○ A FEW TIMES A YEAR
(5) ○ SELDOM OR NEVER

4. HERE'S A QUESTION WE'D LIKE YOU TO ANSWER ABOUT A POSSIBLE SITUATION.

Suppose you were working or shopping at the IDS Center, had an hour or two to kill, and you wanted to leave IDS to take a walk, or perhaps browse in a few stores. The weather is nice. To which of the following places would you be most likely to walk? (Please rank your choices from 1 to 4, with 1 = most likely, 4 = least likely.)

☐ Marquette Avenue ☐ Nicollet Mall ☐ The Skyways ☐ Hennepin Avenue

5. TO WHAT EXTENT WOULD THE FOLLOWING CHANGES ENCOURAGE YOU TO SHOP ON THE NICOLLET MALL?

	A Great Deal (1)	Somewhat (2)	No Effect (3)	Would Discourage Me From Shopping (4)
More frequent buses	○	○	○	○
Remove all buses from the Mall	○	○	○	○
Lower bus fares	○	○	○	○
More express buses	○	○	○	○
Enclosed arcade over sidewalks	○	○	○	○
Skyway connection from parking ramps to Mall	○	○	○	○

Other (please describe): _____

6. DO YOU WORK DOWNTOWN? (1) ○ YES (2) ○ NO

IF YES, PLEASE NAME THE STREET AND CROSS STREETS WHERE YOU WORK:

ON _____ (street), BETWEEN _____ (cross street) AND _____ (cross street).

7. ABOUT HOW FAR FROM DOWNTOWN DO YOU LIVE?

(1) ○ LESS THAN 1 MILE (3) ○ MORE THAN 5 MILES
(2) ○ 1-5 MILES (4) ○ OUTSIDE METROPOLITAN AREA

THIS INFORMATION IS CONFIDENTIAL AND FOR STATISTICAL PURPOSES ONLY.

Please remove protective covering, fold, seal, and drop in mailbox. No Postage necessary.

Mode to Downtown Today

Auto	381 (33.1%)	Bicycle	22 (1.9%)	Walked	168 (14.6%)
Bus	710 (61.6%)	Taxi	5 (0.4%)	Other	3 (0.3%)
NA	7 (0.6%)				

Reasons for Being on Mall Today

Shopping	661 (57.4%)	Get to place off Mall	188 (16.3%)
Work	274 (23.8%)	Walking for pleasure	483 (41.9%)
Bus stop	188 (16.3%)	Other	54 (4.7%)
NA	8 (0.7%)		

Frequency of Shopping

Daily	175 (15.2%)	A few times a year	159 (13.7%)
Once a week or more	496 (43.1%)	Seldom or Never	62 (5.3%)
Once a month or more	259 (22.5%)	NA	9 (0.8%)

Street for Walking/Browsing

Rank =	Most Likely (1)	(2)	(3)	Least Likely (4)	N/A
Marquette	14(1.2%)	196(16.9%)	733(63.2%)	210(18.1%)	7(0.6%)
Nicollet	989(85.3%)	108(9.3%)	47(4.1%)	9(0.8%)	7(0.6%)
Skyway System	111(9.6%)	513(44.2%)	452(39.0%)	77(6.6%)	7(0.6%)
Hennepin	20(1.7%)	103(8.9%)	433(37.3%)	597(51.5%)	7(0.6%)

Changes to Encourage More Shopping

	A Great Deal	Somewhat	No Effect	Would Discourage Me From Shopping	N/A
More frequent buses	142(12.3%)	171(14.7%)	623(53.7%)	123(10.6%)	101(8.7%)
Remove all buses from the mall	143(12.3%)	142(12.3%)	492(42.4%)	241(20.8%)	142(12.3%)
Lower bus fares	234(20.2%)	233(20.1%)	561(48.4%)	8(0.7%)	124(10.7%)
More express buses	150(12.9%)	123(10.6%)	687(59.2%)	40(3.4%)	160(13.8%)
Enclosed arcade over sidewalks	183(15.8%)	309(26.6%)	384(34.4%)	155(13.9%)	129(11.1%)
Skyway connection—parking ramps to mall	154(13.3%)	276(23.8%)	574(49.5%)	12(1.0%)	144(12.4%)

..ork Downtown

Yes	738	(63.6%)
No	411	(35.4%)
N/A	11	(0.9%)

Downtown Work Location

Within one block of Mall	543	(73.6%)
More than one block from Mall	195	(26.4%)

Distance from Downtown to Home

Less than 1 mile	136	(11.7%)
1-5 miles	419	(36.1%)
More than 5 miles	431	(37.2%)
Outside metropolitan area	165	(14.2%)
N/A	9	(0.8%)

APPENDIX E
NICOLLET MALL MERCHANT SURVEY

The Nicollet Mall Merchant Survey was designed with the assistance of the Downtown Council of Minneapolis, a businessmen's group. The Downtown Council conducted the survey in September 1977 by hand-delivering the questionnaire to merchants on the mall. Merchants returned the questionnaire by mail. After two weeks, merchants were called to remind them to return the questionnaire. Twenty-three completed questionnaires were received. There are about 145 retail stores on the mall, including perhaps 24 located in indoor retail arcades or the portion of the skyway system within a block of the mall. These were not surveyed. Of the remainder, 50 firms were surveyed for a 46 percent rate of return. Following are the questionnaire form and tabulation of results.

DOWNTOWN COUNCIL OF MINNEAPOLIS
5 SOUTH 5TH STREET, MINNEAPOLIS, MINNESOTA 55402 • TELEPHONE 338 3907

September 16, 1977

Dear Nicollet Mall Merchant:

Transit Malls such as ours on Nicollet Avenue have become increasingly popular around the country. Unfortunately, there have been no formal studies to assess the actual impacts of such Malls. In order to help the Federal Department of Transportation to study some of these impacts, the Downtown Council is conducting this brief survey. You are not asked to sign this form, so your responses will be completely private. Thank you for your cooperation.

O. D. Gay
Executive Vice President

ODG/ip

Attachments

NICOLLET MALL RETAILER SURVEY

1. What type of business do you operate?

   __Department store __Clothing __Specialty shop

   __Other (please specify_____)

2. How many employees work for you at this location?_____

3. How long has your business been at its present location?

   _____.

4. Is the existence of the Nicollet Mall

   __A major reason for moving to or staying at this location?

   __A minor reason for moving to or staying at this location?

   __A factor that discouraged moving to or staying at this location?

   __Has no effect on location of my business.

5. If you were free today to choose any one location in the Minneapolis area for your business, where would you want to locate?

   __Suburban shopping center

   __In Minneapolis but outside downtown area

   __In downtown area, but off the Nicollet Mall

   __At a different location on or adjacent to the Nicollet Mall

   __Stay at present location

   __Other (please specify_____)

6. Do you feel the construction of the Nicollet Mall was a good financial investment?

   __Yes __No __Not sure __No opinion

   Please explain the response you checked:

7. Which of the following best describes your overall attitude toward maintenance of the Nicollet Mall?

__Well maintained

__Average maintenance

__Poorly maintained

__No opinion

Please explain the response you checked:

8. How would you characterize the cost of the maintenance?

__Too expensive

__About right

__Not very expensive

__No opinion

9. Since the Nicollet Mall opened, have you renovated your business at this location?

__Yes __No

10. Which of the following best describes your attitude toward bus service on Nicollet Mall?

__It benefits my business (by bringing in more customers, etc.)

__It is detrimental to my business (by detracting from the environment for shoppers, etc.)

__Bus service probably doesn't affect my business very much

__No opinion

Please explain the response you checked:

11. Which of the following best describes your overall attitude toward the Nicollet Mall?

__Favorable __Neutral __Unfavorable __No opinion

12. How would you rate the following ways of encouraging more shoppers on Nicollet Mall?

	Very Important	Important	Not so Important	Detrimental
More frequent buses on existing lines (Nos. 17, 18, 35)	____	____	____	____
Reroute additional bus lines onto the Mall	____	____	____	____
Remove all bus lines from the Mall	____	____	____	____
Lower bus fares	____	____	____	____
Create enclosed arcade over sidewalks	____	____	____	____
More street amenities (benches, trees, etc.)	____	____	____	____
Provide Skyway connection from Parking Ramps to Mall	____	____	____	____

Other (please spedify_____

Type of Business

Department store	2
Clothing	11
Specialty shop	8
Other	2

Number of Employees

0-9	6
10-24	6
25-49	4
50-99	2
100+	5

Years at Present Location

0-1	1
2-4	4
5-9	1
10-24	4
25-49	5
50+	8

Mall Effect on Business Location

Major reason for moving to/staying on Mall	15
Minor reason for moving to/staying on Mall	4
Discouraged from moving to/staying on Mall	1
No effect on location	2
No answer	1

New Location, If Free to Choose

Suburban shopping center	2
Minneapolis, outside downtown	0
Minneapolis downtown, off Mall	0
Different location on Mall	5
Stay at present location	13
Other	1
No answer	2

Mall a Good Financial Investment?	
Yes	22
No	0
Not sure	1
Mall Maintenance	
Well maintained	21
Average maintenance	2
Poorly maintained	0
Cost of Maintenance	
Too expensive	4
About right	9
Not very expensive	0
No opinion	10
Renovation Since Mall	
Yes	16
No	6
No answer	1
Attitude Toward Bus Service	
Benefits business	13
Detrimental to business	1
Doesn't effect business	8
No opinion	1
Overall Attitude Toward Mall	
Favorable	23
Neutral	0
Unfavorable	0
No opinion	0

Ways to Encourage More Shoppers

	Very Important	Important	Not So Important	Detrimental	N/A
More frequent buses on existing lines (Nos. 17, 18, 35)	2	6	7	3	5
Reroute additional bus lines onto the Mall	2	3	7	6	3
Remove all bus lines from the Mall	1	1	7	7	7
Lower bus fares	2	5	10	0	6
Create enclosed arcade over sidewalks	5	5	7	5	1
More street amenities (benches, trees, etc.)	6	4	8	0	5
Provide skyway connection from parking ramps to Mall	9	6	5	0	3

APPENDIX F
DVRPC EMPLOYEE SURVEY

The Chestnut Street Transitway employee survey was conducted by the Delaware Valley Regional Planning Commission (DVRPC) in January 1977. The survey was not carried out as a part of the TSC evaluation of transit malls. Results of the study are included in a DVRPC report, Auto-Restricted Zones in the Delaware Valley Region (August 1977). Additional tabulations of data were provided to the TSC Evaluator by the DVRPC. The questionnaire was delivered to 15,000 employees that worked within a block of the transitway, representing a 15 percent sample of all workers in that area. There was a 36 percent response rate, or 5,285 completed questionnaires.

DELAWARE VALLEY REGIONAL PLANNING COMMISSION

Penn Towers Building, 1819 J. F. Kennedy Blvd., Philadelphia, Penna. 19103 LOcust 7-5000

Dear Employee:

OFFICE USE 1-5

The Delaware Valley Regional Planning Commission, in cooperation with the City of Philadelphia and the Greater Philadelphia Chamber of Commerce, is conducting this survey of Philadelphia employees in order to evaluate the performance of the Chestnut Street Mall/Transitway (between 18th and 6th Streets). This confidential survey is part of a regionwide research project to improve mobility in activity centers. Please answer this questionnaire and return it to your public relations or personnel department.

Thank you for your cooperation.

Walter K. Johnson
Executive Director
Delaware Valley Regional Planning Commission

Robert Silver
Commissioner
Department of Public Property
City of Philadelphia

W. Thacher Longstreth
President
Greater Philadelphia Chamber of Commerce
Penjerdel Corporation

1) Has the development of the Transitway on Chestnut Street influenced you to use Chestnut Street more than other streets for: 6-10

	Yes (1)	No (2)
a. Shopping	☐	☐
b. Walking to reach a specific destination (other than shopping)	☐	☐
c. Walking for pleasure	☐	☐
d. Eating lunch	☐	☐
e. Riding public transportation	☐	☐

2) Do you think the Chestnut Street Transitway was successful in accomplishing the following goals: 11-15

	Yes (1)	No (2)
a. Preserve or improve the commercial vitality of the City	☐	☐
b. Improve the environmental (noise reduction/air pollution) and aesthetic quality of the City	☐	☐
c. Improve traffic conditions	☐	☐
d. Encourage use of public transportation and non-auto means of transportation	☐	☐
e. Create a more relaxed atmosphere for pedestrians	☐	☐

3) Which of the following recommendations do you think may improve the overall quality of the Transitway: 16-21

	Yes (1)	No (2)
a. Restrict use to pedestrians only (no buses)	☐	☐
b. Keep it as it is	☐	☐
c. Allow private autos after working hours	☐	☐
d. Open it to traffic again	☐	☐
e. Provide more parking facilities adjacent to Transitway	☐	☐
f. Other _____	☐	☐

4) Do you think cars should be banned or restricted on other downtown streets? 22

Yes (1)	No (2)
☐	☐

OFFICE USE

5) What type of transportation do you usually take to get to work? (Check as many as you need) 23-34

- ☐ Market-Frankford Line
- ☐ Broad Street Subway
- ☐ PATCO High Speed Line
- ☐ Commuter Train
- ☐ Walk
- ☐ Automobile
- ☐ TNJ Bus (Route #) ____
- ☐ SEPTA Bus or Trolley (Route #) ____

6) How much of your family shopping is done in Downtown Philadelphia? 35

1. ☐ Nearly all shopping
2. ☐ About half (1/2)
3. ☐ About one-fourth (1/4)
4. ☐ Very little

7) Rate the following advantages and disadvantages of Downtown Philadelphia as compared to other shopping areas: 36-45

a. Advantages	Very Important Advantage 1	Somewhat of an Advantage 2	Not Really an Advantage 3
1. More high quality stores	☐	☐	☐
2. Greater variety of merchandise and services	☐	☐	☐
3. Better public transportation	☐	☐	☐
4. Wide range of entertainment	☐	☐	☐
5. More things to do	☐	☐	☐

b. Disadvantages	Very Serious Problem	Somewhat of a Problem	Not Really a Problem
1. Farther from home	☐	☐	☐
2. More traffic congestion	☐	☐	☐
3. Less convenient and free parking	☐	☐	☐
4. Less safe environment	☐	☐	☐
5. Higher prices	☐	☐	☐

PERSONAL INFORMATION

8) Age:

1. ☐ Under 18
2. ☐ 18 - 24
3. ☐ 25 - 44
4. ☐ 45 - 64
5. ☐ 65 or over

9) Sex:

1. ☐ Male
2. ☐ Female

10) Number in family (including yourself) ____

11) Annual Family Income: 46-49

1. ☐ Under $5,000
2. ☐ $5,001 to $10,000
3. ☐ $10,001 to $15,000
4. ☐ $15,001 to $20,000
5. ☐ $20,001 to $25,000
6. ☐ Over $25,000

12) Number of cars in family:

1. ☐ None
2. ☐ One
3. ☐ Two
4. ☐ Three or more

13) Occupation: 50-51

1. ☐ Professional and Technical
2. ☐ Managers, Officials, and Proprietors
3. ☐ Clerical, Sales and Service
4. ☐ Craftsmen, Foremen, and Operatives
5. ☐ Others _____

14) Where do you live? _____ ☐☐☐☐☐ 52-56

Borough, Township or City — Zip Code

APPENDIX G
DVRPC MERCHANT SURVEY

The Chestnut Street Transitway merchant survey was conducted by the Delaware Valley Regional Planning Commission (DVRPC) in January 1977. The survey was not carried out as a part of the TSC evaluation of transit malls. Results of the study are included in a DVRPC report, Auto-Restricted Zones in the Delaware Valley Region (August 1977). Additional tabulations of data were provided to the TSC Evaluator by the DVRPC. Of 258 merchants on the transitway, 185 completed the questionnaire.

DELAWARE VALLEY REGIONAL PLANNING COMMISSION

Penn Towers Building, 1819 J. F. Kennedy Blvd., Philadelphia, Penna. 19103 LOcust 7-3000

OFFICE USE

1-3

1) What type of business do you operate? _____ 4

2) How many employees work for you at this location? _____ 5-8

3) How long has your business been at its present location? _____ (years) 9-10

If less than a year, was the Transitway a major consideration for moving? 11

1 ☐ Yes 2 ☐ No

4) Has the Transitway influenced you to renovate or make improvements to your store? 12

1 ☐ Yes 2 ☐ No

5) Since Chestnut Street was converted to a Transitway, do customers get to your store: 13

1 ☐ with less difficulty 3 ☐ with more difficulty

2 ☐ about the same

6A) How would you describe your business activity since the completion of the Transitway: 14

1 ☐ increased 3 ☐ decreased

2 ☐ the same as before 4 ☐ business opened after the Transitway

6B) If there has been a change in your business activity, would you attribute it to the implementation of the Transitway? 15

1 ☐ Yes 2 ☐ No

7) Since the Transitway was completed have deliveries (check as many as needed): 16-20

1 ☐ increased in cost due to additional delivery distance to your store

2 ☐ become more difficult as a result of a lack of rear access

3 ☐ remained about the same as before the Transitway

4 ☐ been altered to non-business hours (e.g., 10:00 PM - 7:00 AM)

5 ☐ other (specify) _____

OFFICE USE

8) Does your establishment offer free or reduced parking rates? 21

1 ☐ Yes 3 ☐ Not now, but may consider such an arrangement

2 ☐ No

9) Would you offer a transit fare rebate to customers using the Mid-City Loop or a modified shoppers' loop along Chestnut Street? 22

1 ☐ Yes 2 ☐ No

10) Which of the following best describes your overall attitude toward the Chestnut Street Transitway? 23

1 ☐ favorable 3 ☐ unfavorable

2 ☐ indifferent

11) How would you rate the following ways of improving customers' ability to reach the Transitway? 24-25

	Very Important 1	Important 2	Not so Important 3
a. Increase transit service along Chestnut Street	☐	☐	☐
b. Installation of more parking at or near the intersection of the Transitway and North/South Streets	☐	☐	☐

12) To make the delivery of goods/services to or from your store more convenient, what would you suggest? 26-27

_____

_____

_____

_____

13) What problems and/or benefits other than those mentioned about would you say have been a result of the Transitway? 28-29

_____

_____

_____

_____

APPENDIX H
REPORT OF INVENTIONS

Report of Inventions

Although a diligent review of the work performed under this contract has revealed that no innovation, discovery, or invention of a patentable nature was made, this report contains a considerable amount of new information about the impacts of transit malls in the United States. Although not a patentable innovation, transit malls are a relatively new form of downtown improvement in the United States, which may prove of value as part of downtowr redevelopment plans in many cities.

750 Copies

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