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Land Use Impacts of Rapid Transit

Implications of Recent Experience

FINAL REPORT
August 1977

Prepared for
Office of the Assistant Secretary for Policy, Plans, and International Affairs
U.S. DEPARTMENT OF TRANSPORTATION

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16. Abstract

This report reviews evidence of land use impacts of recent major rapid transit improvements and draws conclusions concerning the extent and nature of such impacts and the conditions under which they have occurred. Transit improvements studied are primarily post-World War II in origin. American and Canadian examples are stressed, although European experience is treated briefly. Virtually all major modern American and Canadian rapid transit investments are included, covering conventional rapid rail, commuter rail, light rail and bus/busway. In addition to conclusions on general patterns of land use impact and causes, research recommendations and Federal policy implications are drawn.

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PREFACE

This is the final report prepared by De Leuw, Cather & Company for the Department of Transportation under Contract DOT-OS-60181, a review of land use impacts of recent major rapid transit improvements in the United States and Canada. Other products of the study include an Executive Summary (available from DOT in December 1977) and a separate version of this report's extensive bibliography. This bibliography has been reproduced by the Council for Planning Librarians (CPL #1377, October) for the convenience of other researchers.

Principal Investigator was Robert L. Knight, and Lisa L. Trygg shared responsibility for the study. Robert L. Bishop and Bruce Horowitz also contributed to the analysis, and Alice Sgourakis assisted in data collection, cataloguing, editing and report production. Richard J. Solomon of Harvard University provided original research on pre-World War II transit and land use in New York. Vukan R. Vuchic of the University of Pennsylvania contributed important insights into transit and land use relationships in Europe.

We are indebted to DOT's project monitors, Edward Weiner and Helen Doo, for their many helpful comments and suggestions. We also wish to thank other De Leuw Cather staff members, particularly James W. Schmidt, for their thoughtful critiques and contributions.

A panel of independent advisors reviewed the study's progress and products for accuracy and objectivity. We gratefully acknowledge the active involvement and insight of these advisors, including David E. Boyce of the University of Illinois (then of the University of Pennsylvania), William L. Garrison of the University of California, and Vukan R. Vuchic of the University of Pennsylvania.

Finally, we are particularly indebted to the many knowledgeable persons throughout the United States and Canada whom we interviewed during the study. Their generous sharing of their own documentation as well as their time in interviews and reviews of our resulting drafts made this study possible. All their names, we hope, are acknowledged in the Appendix.

Despite the able assistance of these many persons, the authors affirm their responsibility for the accuracy of the findings and interpretations reported herein. All opinions expressed in this report are theirs and do not necessarily reflect the views or policy of the U.S. Department of Transportation. This report does not constitute a standard, specification or regulation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (continued)

LIST OF ILLUSTRATIONS (continued)

Chapter I
INTRODUCTION AND SUMMARY

This report seeks to display available evidence on the extent to which recent (post-World War II) major rapid transit improvements in the United States and Canada have influenced urban land use. From this compilation are derived several types of conclusions. The factors governing the size and nature of land use impacts of transit are determined; implications for appropriate Federal policy are drawn; and specific needs for related future research are identified. The report's intended use is as a resource for those involved in the planning and evaluation of possible improvements in urban transit systems.

BACKGROUND AND ISSUES

Very high levels of public investment are involved in decisions to build rapid transit systems. Given other pressing needs for this money, those responsible must have the greatest possible assurance that hoped-for benefits will actually occur. However, for benefits of land use impact the level of assurance has tended to be low, particularly in relation to the high degree of impact sometimes predicted.

One result of this has been an oversimplification of the subject. Extreme positions are often taken; according to some, a new rapid transit system will almost automatically lead to a major restructuring of the city, while others contend that transit's effect is too small to have any significant effect on land use today. The truth is almost certainly somewhere in the middle, with impact depending on a number of factors including some which may be controllable by appropriate policy.

This report's major objective is to help improve understanding of the land use effects which modern transit improvements may have, and the conditions under which they may occur. Its mandate is a conservative one: it is limited to a description and analysis of the observable effects of existing modern transit improvements. Several fundamental issues are addressed, among them the following:

- *Can a major transit improvement increase the overall economic or population growth of a metropolitan area relative to competing ones?*

- *Can a major transit improvement lead to an increased concentration of residences and activity, particularly in such a way as to create land use patterns more favorable to transit?*

- *Can a major transit improvement strengthen the Central Business District and subsidiary business districts in the neighborhoods of stations?*

- *What role do public land use policies, such as zoning or tax incentives, play in this process both as contributory causes of impact and as results of transit improvements?*

- *Are land use impacts limited to conventional rapid transit, or are other modes such as light rail, commuter rail and bus/busway capable of such effects?*

- *In sum, how do major rapid transit improvements seem to interact with land use?*

APPROACH

In this study, land use impact is defined as a difference in land use with a major transit improvement versus conditions which would have prevailed without that improvement. A conventional location-theory model is assumed, according to which the developer of land assesses the viability of a particular site based on many factors, including transportation access in general and possibly access specifically by transit as well. The key point is that many factors are involved.

Some of these factors are no doubt unique to individual decisionmakers or situations. However, this study's thesis is that many are widely applicable and can be identified for use in impact prediction and planning. To date, the common factors in this calculus have not been identified or specified in detail, either in theory or in applied models of land use change.

Within this framework, the present study has sought to discover what other factors are consistently important, how they interact, and how powerful transit improvements are in comparison with other factors. Such concerns are not well suited to quantification, although specific studies of numerical indicators are useful as tools in the search. This study has therefore emphasized a search for an interpretation of a wide variety of evidence, of many types and from many sources.

A major effort was devoted to the assembly of available literature relevant to the study's objectives, including historical, descriptive, hortatory, policy and analytical sources. Based on review of this literature's strengths and weaknesses, further information on impact was sought through site visits, interviews with local officials and developers, and additional descriptive statistical data. In these efforts emphasis was placed on identifying first the nature and extent of new development potentially influenced by a given transit improvement, and then the strength of influence of the various factors involved.

As dictated by the complexity and variety of the specific situations studied, the analysis of the broad range of information which had been found ultimately relied upon informed but necessarily subjective judgments. The resulting case descriptions and interpretations were checked for accuracy and objectivity by submitting draft versions to review by the local experts interviewed in each city. In addition, both the initial literature review and the full final report were subjected to review by a panel of independent researchers.

ORGANIZATION OF THE REPORT

First (Chapter II) is presented a review of pre-World War II experience in the interaction between transit development and land use. Next is a series of three chapters in which evidence of land use impacts of post-World War II transit improvements is presented.

The first of these (Chapter III) focuses on the new rail rapid transit systems of Toronto, Montreal, and San Francisco, the largest and best-known of the postwar North American transit improvements. The second chapter in this series (Chapter IV) describes evidence of impact of other recent rapid rail improvements in Philadelphia (Lindenwold), Boston, Washington, Chicago, New York and Cleveland. The last of this series (Chapter V) deals with rapid transit modes other than conventional rapid rail: commuter rail, light rail, and busway systems are included. Evidence of impact is presented for a variety of recent system improvements in some nine cities in the United States and Canada.

For perspective, Chapter VI presents a brief description of some of the major ways in which the postwar European experience differs from the American. This is followed by the derivation of conclusions from the findings of Chapters II through VI, emphasizing the identification of factors consistently important in the generation of land use impacts and the needs for future research (Chapter VII). The last chapter (VIII) presents policy implications derived from the findings and conclusions for consideration by Federal and local governments.

Following the text an extensive original bibliography is provided. This is a major product of the study in view of the substantial but previously scattered nature of the literature on this subject. An appendix also lists the persons interviewed during the study.

SUMMARY OF FINDINGS

Pre-World War II Experience

Urban transportation in the past century has been characterized by a series of technological innovations ranging from horsecars through modern subways and beyond to the private automobile operating on high-speed roadways. Each succeeding wave of innovation has permitted an almost explosive expansion of the city. Behind this, throughout the latter half of the 19th century and into the 20th when most of these improvements were made, the country's urban population was growing rapidly through immigration as well as rural-urban migration. All of this was

fueled by a rapidly expanding and industrializing economy built on natural resource exploitation.

The consequence of these urban growth pressures, the subsequent transit innovations, and the lack of competition from more effective methods of travel such as the later auto was a shaping of urban growth along transit lines. In older cities many of these patterns persist today, as ever more effective methods of movement have replaced their predecessors in the same corridors. However, forces other than transit were also important. In addition to those already noted, the geographical restraints and inducements of ethnic groupings, natural topography, prior development and its value, and early land use controls and taxation policies all had significant effects along with transit.

This situation was different from the current one in at least one very important way. Today's transit improvements usually do not provide the kind of drastic improvement in overall accessibility which was typically associated with earlier transit improvements. The auto provides a superior competitive alternative for many travelers. Consequently in today's world the lesson of the past seems to be that the potential for transit-induced land use impact can be expected to reach pre-war proportions only in two ways: first, through now-unforeseen innovations which create major improvements in accessibility, and second, through increased coordination of transit with other complementary forces.

Modern Rapid Rail Improvements

Recent improvements in conventional rail rapid transit in the U.S. and Canada vary widely in their potential as well as actual land use impact. In general, recent experience in cities such as Toronto, Montreal, San Francisco, Boston, and Philadelphia demonstrates that significant impacts on land use have occurred. Typically where such impacts have occurred, they involve increases in intensity of use of land near transit stations. These land use effects have ranged in size from nil to dramatically large. A careful study of experience in each city indicates that successful cases have been those in which transit and a variety of other complementary factors were present together. These factors included land availability, its ease of assembly, the social and physical characteristics of the area, general economic conditions, community support, and public land use policies. Conversely, when these forces were absent or weak, few land use impacts were found.

Land use impacts of new full-scale systems in Toronto, Montreal and San Francisco tended to be substantial in facilitating downtown high-rise office development. Except in Toronto, impacts elsewhere along the new transit lines have generally been small. In Toronto, intensive high-rise apartment and mixed-use development has occurred at many (but not all) outlying stations. These differences in impact appear to stem from the strong support given transit's impact potential by other forces in Toronto, notably zoning incentives and historical economic and social forces. In contrast, negative forces such as community composition and opposition, physical constraints, and lack of demand for new development appear to have dominated the positive potential of the San Francisco

(BART) and Montreal (Metro) system in suburban areas.

Impacts of smaller system, new lines and extensions have also been mixed. Substantial transit-related intensification of development has been experienced, notably at some stations along Philadelphia's Lindenwold Line and Boston's Red Line extension to Quincy. A particularly interesting example of coordinated development is found in New York's Roosevelt Island and the Crosstown Subway, now under construction. Conversely, virtually no effects are apparent for the Cleveland system and its airport extension as well as for the line extensions of Chicago's rapid transit system. Here again the difference is found in other factors, especially the attractiveness of the station site, zoning encouragements or hindrances, and overall demand for new intensive development.

Other Transit Modes

Commuter rail system improvements in coverage as well as quality of service were reviewed in all cities in which such improvements were substantial. One all-new system, Toronto's "GO", was also studied. It was found that such improvements varied greatly both in their own magnitude and their land use effects. Such effects were generally weaker than those observed with conventional rail transit, and depended heavily on the same factors.

Particularly at downtown terminals, evidence indicated substantial impact potential in cases of downtown core expansion. Notably in Chicago, the service improvements and the resulting consistently high patronage on lines using the Union and Northwestern stations were apparent encouragement to the high-rise development of nearby areas outside the Loop. Likewise, in Philadelphia the prospect of the yet-unbuilt Center City Commuter Connection has been a factor in redevelopment now taking place in the Market Street East area.

The recent light rail improvements available for study in the U.S. and Canada are inadequate to provide a proper indication of this mode's potential. Major improvements now in progress in Edmonton and San Francisco are not yet in operation and evidence of early impact is inconclusive. Other improvements involve only restoration or minimal upgrading of old systems, as in Chicago (Skokie Swift) and Boston (Green Line). Consequently no evidence of impacts was found.

Busway improvements have had no discernible impacts on land use to date. Here again, however, the cases studied were characterized by an absence of consideration of land use impact potential in their original planning, and were implemented in situations in which few if any complementary factors existed to enhance the potential for such impacts. Consequently, as with light rail improvements, the American experience to date is not sufficient to allow firm conclusions on land use impact potential.

The European Experience

The planning of transit improvements and urban land development is much more coordinated in most European countries than in the U.S. However, it is not often controlled so absolutely as commonly believed in this country. Most often the guiding force is suburban land development with active participation by the metropolitan government. Transit access to the city is often a complementary feature, amounting to a classic joint development process. Examples of such efforts can be found in most European countries.

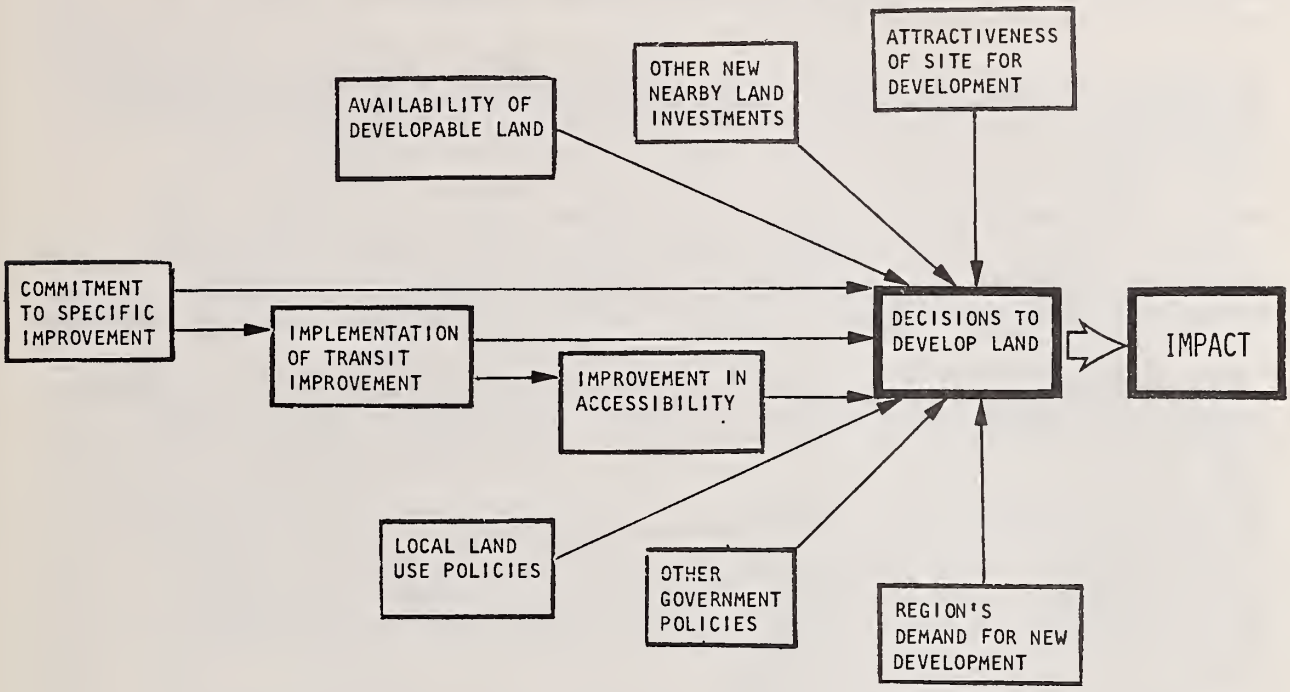
The government often has more influence on such development than is the usual case in the United States. However, the usual approach is inter-agency and public-private coordination of land development, which could be applied in this country as well. The key difference between the American and European approaches resides not simply in irreconcilable philosophical differences regarding governmental prerogatives; more basic is the European's higher level of expectations and stronger preferences for public transportation services. These attitudinal differences may be based on differences in the degree of experience with effective modern rapid transit between the typical American and European, and suggest that American attitudes may change as experience with high-quality transit increases.

CONCLUSIONS AND POLICY IMPLICATIONS

Recent major rapid transit improvements have been important inducements to intensified development near stations both in CBD's and in outlying areas, although only when supported by other favorable forces. In downtown areas, transit projects in cities such as Toronto, Montreal and San Francisco have enhanced accessibility by providing additional commuter capacity in some major congested radial travel corridors. However, the primary factor behind the intensification of land use in such areas has been the existence of a strong and effective demand for new office, retail, and apartment development.

Other key factors, as shown in Figure 1.1, have included local land use policies and other government policies, other nearby land investment, the availability of developable land at reasonable risk and cost, and the attractiveness of the site for development. Each of these factors is in turn influenced by several other determinants (shown in Figure 7.1, p. 204). *Federal policy must acknowledge these many forces and the need for their coordination in general urban development as well as transit planning. Impact-potential assessments for proposed transit improvements should include site-specific evaluations of the effects of these factors, and such evaluations should include knowledgeable real estate development perspectives.*

Figure 1.1
MAJOR FACTORS INFLUENCING LAND USE IMPACT



Some recent major commuter rail improvements were found to have led to significant land use intensification, but evidence on light rail and busways was inconclusive. Despite the shortage of direct evidence, policy implications are possible based on inference from other findings of the study. Since controllable factors other than the transit system itself were found to be so important in the generation of land use impact, it is possible that such factors could be coordinated with these other transit modes to generate land use change. Thus until more direct evidence is available, *Federal policy should not deny the possibility that fixed transit modes other than conventional rail could contribute significantly to urban growth-focusing.*

Recent experience provides no evidence that any rapid transit improvements have led to net new urban economic or population growth. This suggests that land use impacts are shifts from one part of the city to another. However, evidence of the lack of net regional benefits is sparse and not necessarily binding on future efforts in this direction. More detailed research is needed on this important issue, particularly in light of the innovative attempts now in progress in cities such as

Buffalo and Detroit. In the meantime, *Federal policy might reasonably support the use of major transit improvements as one element of a coordinated package of efforts to revitalize a declining urban economy and social order, but should not rely upon transit investment as the sole or primary tool for such purposes.*

The timing of land use impact seems largely dependent on general economic conditions. Where there was no demand or capital available for new development in a city or region, little if any land use impact took place around the transit system. Five years seems to have been a minimum wait for substantial impact in most cases; often it has been much longer, or never. Thus, *Federal policy toward rapid transit financing should not be based on a presumption of major early public revenues "captured" from such impacts to finance subsequent phases of system expansion.*

Local land use policy changes have often been instrumental in facilitating transit's land use impacts. Land use policy was found to be one of the most important factors in the generation or prevention of impact. Zoning near stations, in particular, must usually allow intensification of use if any significant impact is to occur. Other local policies concerning factors such as provision of needed infrastructure to sites have also been important. When these policies work at cross purposes, a crucial source of impact encouragement is lost. *Federal policy should urge the rationalization of land use and other local policies with transit-related land use impact objectives.*

The transit improvement itself has often led to changes in land use policies. Experience indicates that major transit improvements often act as catalysts in the process of land use change, coalescing support for previously contentious policy changes. This appears to have been based largely on a widely-shared belief in the likelihood of impact which the transit investment instills in decisionmakers and the general public. This indirect influence may in fact be one of rapid transit's most powerful means of generating land use impacts. It is not always positive; fear is often the motivation and downzoning the outcome when transit stations are placed within established residential neighborhoods. In view of the size of transit investments, this is a substantial threat to the achievement of a justifiable level of societal benefit. *Federal policy should not depend on the appearance of favorable local land use policy after the transit investment is made, but should stress the need for its advance demonstration as well as assurance of stability over time where possible.*

Chapter II
LESSONS FROM THE PAST

The purpose of this chapter is to look at the experience of several American cities during the 50 - 100 years which preceded World War II and to evaluate the rapidly changing technology of rapid transit during that time as to its effect on land use development. This will allow a judgment as to whether these early American experiences have any relevance to transit planning in today's American cities: what has been learned and what is useful now?

As part of the extensive literature search performed for the overall study, attempts were made to locate all relevant documentation of a historical nature. However, most earlier literature deals with the transit systems themselves and not with effects on land use. There are exceptions to this, however; among others, the works of Spengler (1930) in New York, Warner (1968) in Boston, and Hoyt (1933) in Chicago are informative. (See the Bibliography for a more complete listing.) Because of the lack of documentation for many cities, telephone interviews were done with many authorities, including some of the authors of works on the subject. Although a few dates and details may be in error because of the verbal transmission of information, the qualitative picture obtained is useful in providing a background for this study.

TYPE AND TIMING OF TRANSIT

During the last half of the 19th Century, American cities were expanding rapidly due largely to industrialization and immigration from Europe as well as migration from rural areas of this country. The rate of this expansion, which continued well into the 20th Century, was of an unprecedented scale and is unlikely to be approached again. Coincident with this expansion was the development of increasingly better modes of urban travel. Each development brought about a quantum change in access, convenience and reliability.

Before 1850, people depended primarily on horse-drawn cars traveling on dirt roads. Railroads came into use after 1830 but they were limited primarily to inter-urban movement; their use as "commuter" vehicles did not begin until much later (around 1860 in New York, and even later before their widespread use in cities). With the advent of the omnibus or horsecar (horse-drawn cars on rails), to a very limited extent in 1832 in New York, but more generally after 1850, the ride was more comfortable and cars did not get bogged down in ruts or mud. However, routes were often circuitous in any kind of hilly terrain since sufficient power was not available to

traverse the hills directly. Moreover, the effective range for most urban routes was about three to four miles because of the slow speed.

In the early 1880's cable cars became economically feasible to run, and opened up previously inaccessible hilltop areas such as in San Francisco and Seattle. They also began to be used along level areas in some cities, notably Chicago. However, their popularity was short-lived; the greater speed, economy and feasibility of electric streetcars was demonstrated in 1888 and they rapidly came into predominant use. This was yet another major expansion of the range of intra-urban travel and the area of accessible land for urbanization.

For longer distances and in greater density, the elevated steam railway was an independent development, first used in New York in the 1860's. This was followed by the subway around 1900 (although 1850 in London) with its higher speeds. These high-capacity modes came into use only later, if at all, however, in most cities according to the demands of density and growth.

By the 1920's, autos and buses were technologically advanced enough to be reliable for everyday use. This signaled the end of dependence on fixed routes, allowing transit vehicles access wherever there were roads. Autos were yet another leap; they made possible the independent movement of individuals at far higher speeds than ever before.

Transit and the General Land Use Pattern

Along with these transit developments, a general land use pattern seems to have emerged in many cities. The overall situation is first considered, followed by specific experiences in several cities. Before the 19th century most present American cities were either nonexistent or tightly-clustered settlements located on waterways of some sort. Smaller settlements began to develop in other locations for various reasons, primarily along the major trails as the West opened to settlers. In the early 19th century, railroads came into being and as their routes were laid out across the country and large overland shipments of goods and supplies became possible, the early settlements grew and others developed in areas along the way.

Within the large settlements, emerging then as cities, horsecars moving on rails became the first truly practical transit systems to be used extensively. It was the first intra-urban system which had a somewhat fixed configuration, i.e., an appearance of permanence. Homes and businesses developed along the rights-of-way. As cable cars (and in New York, elevated steam railways) were introduced, extending transit distances and overcoming hills as barriers to movement, this same type of development occurred with increasing density, usually commercial strip development along the line and residential development on adjacent streets.

Illustration 2.1
Horsecar on Centre Street,
Jamaica Plain Village,
(Boston), 1883
(Source: Warner, S.B., Streetcar Suburbs)

The advent of the electric street railways in the 1890's and underground rapid transit a decade or two later greatly extended possible route distances because of their speed and capacity. Initially streetcar routes fanned out radially from the center of the city. As population moved out along the lines, crosstown routes were established. If rapid transit (either subway or elevated) lines were installed at a later date, the streetcar routes were often replaced or began to serve as feeder lines, not running the complete route. This led to changes in the linear pattern of development, with nodes of intensive activity developing around the transit stations.

As Middleton (1967) states in his historical work on electric streetcars in American cities: "More than any other development, the electric railways contributed to the growth of the metropolitan suburbs. Population growth followed car lines, and a new trolley line extension invariably increased land values. Not infrequently, real estate syndicates built electric railways just to promote their development." (p. 77) This was true almost everywhere. Because street railways were so often lucrative, many independent companies rushed to construct new lines, frequently duplicating service in some areas.

However, a process of consolidation inevitably began, with the usual result that well before World War I the many street railway properties in a city had been unified into a single system, typically increasing the effectiveness of service. Street railway expansion during the early 20th Century is exemplified by the case of Philadelphia, where 65 separate railway companies were amalgamated into the Philadelphia Rapid Transit, which then experienced a period of major growth. By 1923 there were 3,000 cars operating over 700 miles of track and transporting 900 million passengers/year.

When the automobile and buses became reliable and more popularly used, spaces where transit had not reached before became accessible. This "filling of spaces" and expansion outward was more a continuation of what was already occurring with the extensive streetcar service than a drastic change in trend. However, the independence it allowed individuals began the decline of the streetcars as well as a tremendous increase in road and highway construction and use. The lack of dependence on transit that the automobile brought seemed to change the nature of the relationship between transit and corresponding land use development.

Before the automobile the consistent patterns were streetcar lines with linear development along the right-of-way and rapid transit with cluster development around the stations. With the advent of the auto, development began to occur in a more diffused way. Rapid transit continued to play a role, but it was no longer as simplistically predictable. However, the extent of the automobile's impact did not become obvious until after World War II, when the auto truly took precedence over transit. This is the subject of following chapters, where experiences in several major American cities are discussed.

The remainder of this chapter presents some of the details of transit-land use interaction in specific cities during the early years of rapid transit development prior to World War II. New York, Boston, and Chicago are considered along with several smaller cities. These are not exhaustive histories, but each city contributes a useful illustration.

The New York experience is treated in some detail because of its value in understanding the present situation in that city. Boston illustrates the interaction of early transit development with the travel and housing needs of different socio-economic classes. Chicago provides an example of the dramatic effect of an elevated rail system extension into a previously inaccessible area during a period of rapid growth. Specific aspects of transit and land use development in other cities provide additional perspective.

NEW YORK*

The size, age and complexity of New York's transit system and its impact on land use cannot be covered comprehensively in this report. Nonetheless a brief even though incomplete history is useful in gaining an understanding of the possible impacts of modern improvements.

Nineteenth Century Transit and Urban Development

Although the first transit line appeared in lower Manhattan in 1832, the first of the city's four periods of intensive transit development did not begin until around 1870 with the building of the early elevated railways. At that time the city occupied only the southern end of Manhattan Island north to 14th Street. Brooklyn was a separate smaller city on Long Island; the remainder of present-day Manhattan, Brooklyn, and all of Queens, Staten Island and The Bronx were wilderness and farms.

Illustration 2.2
New York Subway Construction with Elevated Line Above - 6th Avenue North of 36th Street, September 1937.
(Source: San Francisco Municipal Railway)

*Material for this section was researched and provided to the study by Richard J. Solomon of Harvard University.

Three early elevated ("El") lines were extended up the east side of Manhattan Island (one as far as 129th Street) in the late 1870's, opening this area to settlement. The only competition at that time were horsecars, ferries, and walking, so the elevated lines represented a quantum leap in speed. The other modes served as feeders to the Els, but most residential development occurred within two or three blocks of the main lines. However, since the structures were noisy and sooty, only the lowest-income residents lived on the streets on which the Els ran, and few new buildings were built on these streets.

Gradually other Els were built up the center and west side of Manhattan, as the west side piers and Grand Central railroad yards and associated industries developed. Most of the remainder of Manhattan, north of Harlem, was vacant until penetrated by the first subway in the early 1900's. To the northeast, a branch of Vanderbilt's New York Central made several stops from Grand Central through Manhattan and into The Bronx, in a calculated effort to develop this "suburban" territory. This corridor developed quickly; tenements and brownstones identical to those in lower and midtown Manhattan could be found in the central Bronx by the 1890's. Several elevated lines also extended into the Bronx, and in 1895 the Bronx Borough was annexed to New York City.

The separate city of Brooklyn was laced with a system of surface steam railroads from 1865 to the 1880's. These were soon followed by elevated lines and eventually subways along the same routes. The first El opened in Brooklyn in 1885, and by 1893 five lines built by three different companies had been extended to the limits of the then-urbanized districts of the city. At these elevated terminals the lines continued on the surface into the rapidly developing suburbs.

Frederick Law Olmsted, the designer of Central Park, was commissioned to lay out a system of grand parks and boulevards in Brooklyn in the late 1880's. These boulevards opened up large sections of Brooklyn for development, and the first homes were large mansions occupied mostly by doctors, lawyers and other professionals. Many of these were replaced by apartments after 1910 when subways were built under two of the three parkways and allowed much faster access into the city.

In summary, by 1895 32 miles of double-tracked elevated railways served all of Manhattan south of 155th Street. Most residential and commercial districts were within a quarter mile of an elevated stop. About 95 miles of Els and surface extensions had been built in Manhattan, The Bronx and Brooklyn by 1899. Most of these were electrified at the turn of the century. The 95 miles of elevated and surface rapid transit routes built in the 19th Century determined the shape and development of most of Manhattan, the central part of the Bronx and about half of Brooklyn.

Twentieth Century Developments

About half of the older elevated and surface lines have been abandoned since the turn of the century. Most of these were in Manhattan. The other half,

primarily in Brooklyn, were either integrated into the present subway system or completely rebuilt on the same rights-of-way.

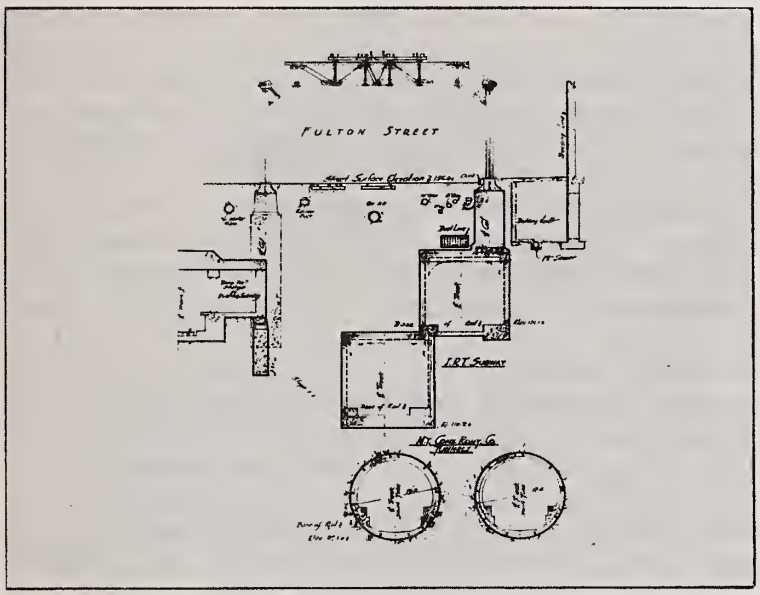


Illustration 2.3
Five Levels of Traffic at Borough Hall, Brooklyn, date unknown
(Source: Chicago Transit Authority)

The first of the city's three periods of major subway construction began in 1899 with the start of a central north-south line on Manhattan. Due to financial problems which are fascinating but irrelevant to this study's purposes, the city could not raise enough capital to build a subway and instead contracted with a private group (headed by August Belmont and backed by the Rothschild family of France) to build and operate the system at an agreed rate of return, with any excess profits it might generate reverting to the city.

There was tremendous land speculation following the announcement of the agreement in 1899. The Belmont syndicate apparently not only profited from the construction and operation of the subway but also from such speculation. In 1908, the City Club of New York published a report (Folks and Wright, 1908) which asserted that the land values along parts of the line had doubled in the three years after the line's opening in 1904. The report stated that the rise in land value was due to the building of the subway, although the analysis simply measured the aggregate rise in value within a mile-wide district centered on the subway route.

Solomon (1976) compared these figures with value increases elsewhere in the city to illustrate the inaccuracy of the conclusion. However, he also pointed out that the Club's purpose was influenced by political aspects; more subways were needed, and they wanted the city to own and operate them this time. With the help of the report, their mayoral candidate was elected and they were influential in passing a state law permitting rapid transit to be built from special assessments on incremental land value increases on property to be benefited.* This early "value capture" legislation is still in effect.

Banks refused to issue bonds on this basis, however, so it was necessary to float a conventional bond issue. To do this the mayor reassessed real property in the city, in some cases three and fourfold, using the argument that the impact of future subway extensions would create windfall profits. This raised the city's valuation enough to allow the bond issue without exceeding the municipal debt limit. Arner (1922) later pointed out that land values had subsequently stagnated under this increased tax burden; that is, all profit had been taxed away in advance.

So commenced the second wave of subway construction, that of the Tri-Borough System. Political pressures apparently resulted in the division of this massive project into two parts (the so-called "Dual Contracts") with the private developers of the older Interborough (IRT) and Brooklyn (BRT) subways each given half to build and operate. The system was substantially completed by 1918 amid indications of blatant corruption as well as heavy involvement in land speculation by the builders of the lines. Particularly significant at this point was the Borough of Queens, which before the Tri-Borough Subway was essentially undeveloped and was opened to rapid growth by the new transit system.

A third system, the Independent Lines, was begun in the mid-1920's. It was twice as costly as the previous one. Owned by the city, it essentially replaced or duplicated existing routes, though its more modern design increased capacity somewhat. Its only "new" line was the Queens Line; yet even this line, which opened in 1933-37, did not penetrate new territory but rather paralleled other older lines.

In general, in contrast to the intense developmental impacts of the earlier elevated and subway systems, this post-Depression system has had little apparent effect. This is to be expected in view of its intent to ease congestion on older routes by parallel alignments. According to Solomon, the Queens Line area has shown the greatest growth in density (and probably land values) of all the post-Depression routes.

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*L. 1909 ch. 498, as amended; see New York (State) Rapid Transit Law, Article 34c.

Interpretations

Law (1935) studied land values and population growth around New York's transit lines. He found that between 1900-1935, the population within a half-mile of nine of the transit lines (a total area of 30 square miles) had increased from 50,000 to 1,160,000 residents. He also found that the average valuation of land within this same area was $1.89/square foot, which was seven times the value of the area outside of the half-mile zone. Law also found that land value does not always rise because of the extension of transit facilities; in fact, there was actually a decrease in land values along certain lines. He drew the general conclusion that a transit facility will not of itself increase the land values unless it is accompanied by competitive bidding for the areas which it made accessible.

Spengler's (1930) work on the role that transit facilities play in the fluctuation of land values was the most extensive study of its time. He drew several conclusions which disputed the then-prevalent belief that local benefits always result from urban transit improvements irrespective of other factors. Some of his more important conclusions follow:

- The building of subways in New York has been accompanied by shifts in land values from one part of the city to another. Shifts in location are apt to be accelerated by transit lines running in the same direction as the shift is going. This operates to transfer values rather than to increase values.

- Certain influences upon land values have frequently caused decreases which the opening up of new transit facilities was unable to overcome. In such cases, it is questionable to assert the existence of a resulting local benefit.

- Neighborhoods already clearly marked in their development for certain characteristic uses, usually fail to show any noteworthy increase in land values when transit lines are extended to them, provided, after the transit line has been opened, the areas continue to be employed for these same uses.

- Although new sections may be developed profitably only after rapid transit facilities have been extended to them, a great part of the resultant large increase in values arises out of subdividing operations.

- Rather than to be considered a cause of land value changes, a transit facility should more properly be regarded as a construction which permits or facilitates, under certain circumstances, an emergence of land values, the values being determined largely by other factors.

- Effects of rapid transit construction cannot be assumed to be uniform, and therefore no policy of special assessments can be equitably applied

if it seeks to make a mechanical levy according to some fixed formula for an area supposedly affected by new transit lines.

- Land along the course of transit routes shows changes in values which reflect the character of growth of the whole area through which these lines pass -- rising measurably in regions that show rapid expansion, changing little in somewhat "settled" areas, and dropping in those regions which have been undergoing a general decline.

- Transit lines which have become obsolete, such as certain elevated spurs, tend to keep down land values in sections which would otherwise rise.

Solomon also basically supports Spengler's findings of 40 years ago. He concluded that after about 1920, transit developments in New York had little additional effect on the region's overall land use pattern. In contrast, the impacts of New York's earlier transit construction were strong but even these effects were influenced by the timing of the transit improvements with respect to immigration pressures, competitive bidding for land, prior development in areas served and the vagaries of property tax assessment.

BOSTON

The most dynamic and prosperous period in Boston's history was the second half of the nineteenth century which saw a rearrangement of the physical form of the city itself. The period from 1870 to 1900 was one in which transportation improvements (i.e., the streetcar railways) had a profound effect on the structure of the metropolis itself. This was documented in Streetcar Suburbs by Sam Warner (1968). In 1850 Boston was a tightly clustered seaport and merchant city of 200,000 inhabitants. By 1900 it was an industrial metropolis sprawling over a ten-mile radius and containing 31 cities and towns. This period of time saw large numbers of immigrants come to Boston as well as to New York, Chicago and other large cities seeking a better way of life and a place in the burgeoning American economy.

The central area of the new metropolis, formerly the old walking city, became with few exceptions a region of cheap secondhand housing. There were reasons for continued inner-city tenement construction, not the least of which was the continuous immigration of cheap labor from Europe into the center of the city. Farther out from this area was the region of new suburban construction. Persons who could afford the new suburban housing as well as the travel cost tended to move out. Other forces also shaped urban development by influencing the decisions of individual builders. Conditions such as topography influenced transportation and utility routes. In addition, property speculation was influenced by proximity to waterways and the presence of old manufacturing clusters. Finally, the tenacity of older patterns such as a strong neighborhood influence retarded the general flow of classes.

Although it is clearly the combination of such forces which developed Boston, the impact on land use could not have occurred without the transit system, most notably the street railways. In a very basic way the street railway service and suburban house building were linked. The early horse-car lines (in the 1870's) and subsequent electric streetcars which ran out to small villages were clearly in advance of active building. The general pattern discussed earlier began to emerge along with transit expansion. As opposed to quarter-mile or greater intervals between railroad stations, streetcars provided an unbroken line of service from their suburban terminals to downtown. In this way each line opened a continuous strip of land for building instead of isolated areas around each station.

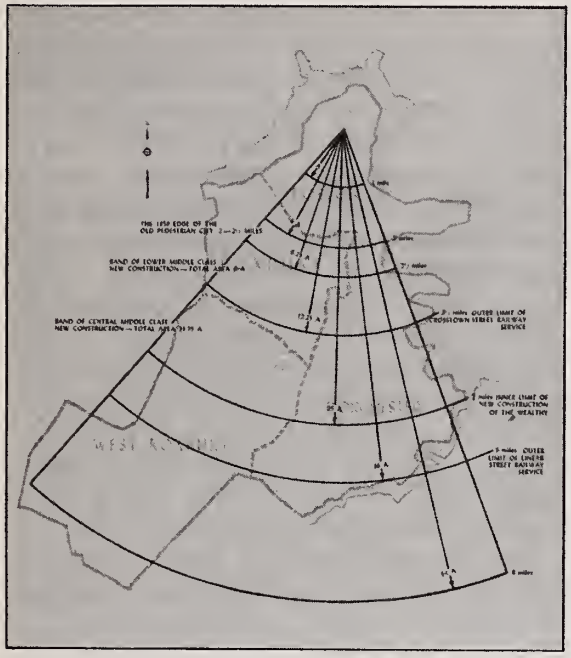


Illustration 2.4
Stages in Boston's Early Development with Transit
(Source: Warner, S.B., Streetcar Suburbs)

With streetcars, pioneering lines initially supplemented steam railroad service but when good linear service was instituted, there was a jump in the rate of building. However, the pattern was still restricted to following the streetcar lines. As land adjacent to lines filled up, crosstown lines and complementary connections of villages became profitable. According to Warner, when crosstown service began to be established, the extension of streetcar service ceased to be a predominant cause of house building. It became complementary; the building encouraged the crosstown expansion of streetcar service as well as vice versa.

Warner points out that the street railways interacted strongly with class building patterns in the upper income half of Greater Boston's population. During the period 1870-1900, the wealthy (upper five percent) took advantage of their leisure and greater control over hours of work and built homes basically wherever they chose. Sometimes they built at great distances from Boston, where railroad transportation was essential for access to the city, although other urban as well as suburban areas of highest amenity were also preempted by this group.

Another group, the "central middle class" (composing about 15 percent of Boston's population), owners of small downtown stores, lawyers, and teachers, had more rigid transportation needs, dictated by work hours and cost. However, their job location tended to be stable so their routes of travel were consistent and multiple employment was not a family necessity. Consequently good linear service was all they required.

The next lower class was the largest segment of Boston population that could purchase homes, and were especially dependent on transportation. This group, the lower-middle income class (about 30 percent of the total population), had somewhat unstable job locations, longer work hours and often multiple job situations. For such people to move beyond the range of good crosstown transit service would have increased the time consumed in getting through the city and limited their ability to make a living. Most of the remaining 50 percent of the population lived and worked downtown within walking distance, and apparently had little dependence on transit.

Metropolitan parks were established around greater Boston in the 1890's and streetcar lines were brought out to take advantage of Sunday traffic. This encouraged building on the outer edges of the metropolis; once linear service was established, the area through which it passed became a potential building area for the central middle class. However, as these radial lines grew longer, crosstown connections between them necessarily became too long for effective service into downtown. Consequently the growing lower middle class, which depended on the streetcars, became confined to the inner parts of the exapnding metropolis and received a smaller increment of land. Smaller lots and homes were built in these areas just outside the walking city where there were larger numbers of residential bidders as well as industrial and commercial land buyers.

By the turn of the century, the interaction of the growth of street railways and class building patterns had produced class segregated upper- and middle-class suburbs in the suburban Boston townships of Roxbury, West Roxbury, and Dorchester. Changes have occurred since then, but this was the most dramatic and well documented period of Boston's history in which the effect of transit and other related factors on land use was demonstrated.

CHICAGO

Chicago's development appears to have been molded to a significant degree by transit. The railroads, the horse and cable cars, and the electric street railways all seem to have played a major role. However, intracity and intercity modes affected land use in different ways.

Hoyt (1937) in his classic study on land values in Chicago concluded that the early railroads affected land values in two major ways: First, a direct demand for land for railroad rights-of-way, freight yards, etc. gave cash value to some land long laid dormant and changed the character of the use of other tracts. For example, slum areas in central Chicago were converted into "railroad" land about 1887 and thereby hastened the shift of slums southward. Second, new railways furnished a suburban commuter service and greatly increased the value of land near stations along that portion of their route that was within commuting distance from the city.

Fellmann (1957) found that there was a difference in the way early inter- and intracity rail transport affected land use. He noted that while intercity rail transportation lines exerted considerable influence on patterns of initial subdivision, they were ineffective in stimulating individual lot sales. Local mass transit on the other hand almost always came later than initial land subdivisions in Chicago, but were closely correlated with the timing and direction of individual lot sales. That is, the development of the early intercity railroads helped to make land accessible enough to justify its platting and subdivision, but settlement in these early outlying towns was slow. In contrast, Chicago mass transit lines (from horsecars to street railways) followed rather than led suburban land subdivision, but resulted in rapid sales and settlement in the newly-accessible tracts.

Even though San Francisco invented the cable car, Chicago became its biggest user. The first line was put in on Madison Street in the late 1870's and by 1894, 86 miles of cable and 450 cars were operational. The primary beneficiary of all this was the south side of Chicago, which grew spectacularly, especially along the cable lines (Mayer and Wade, 1969). In discussing the conversion of horse to cable cars in a company operating on the south side of Chicago, Miller (1941) said:

> "Within six months after the conversion of this company's lines from horse to cable power, property along those lines rose in value from 30 to 100 percent, and on adjoining and contiguous streets in amounts proportionate to its distance from the cable lines. So well established is this fact, that the mere announcement that this company was considering the construction of a cable line on any street in the city, would be sufficient to put values up at once."

He also quoted one of Chicago's earliest, most sucessful and best-known financiers, who had said, "Only let me know six weeks in advance where the City Railway intends building a cable line, and I will make an independent fortune every time."

The superiority of the transportation facilities on the South Side and their steady improvement during the period 1882-1890 were among the chief causes of an uninterrupted rise in land values. In addition, the cable lines downtown on Randolph and LaSalle Streets built during the same period were undoubtedly a factor in prompting the location of new skyscrapers on these streets, reversing the southward flow of business that had begun with the migration of the Board of Trade (Hoyt).

Prior to 1893 the South Side had by far the best transportation facilities, with four railroads providing good suburban service. The North and West sides not only had fewer railroads and cable lines, but they were further greatly handicapped by the barrier of the Chicago River, with its frequent opening and closing of bridges.

However, from 1890 to 1900 there was a revolutionary change in the city's internal transportation system. Elevated lines were constructed on the South Side, the West Side, and finally on the North Side, and these were at last linked together in an elevated ring of tracks around the central business district in 1900, which thereafter became known as the "Loop." From 1895 to 1897, many new electric streetcar lines were laid in the northwest section of the city. In addition, ship traffic on the river soon declined.

As a result, in the early twentieth century the North Side and the northwest portions of the city grew most rapidly. The South Side suffered from the aftermath of the World's Fair boom, the obsolescence of its buildings, and the spread of vice elements (Mayer and Wade). The entire North Side, in contrast, grew almost explosively after it was made accessible by the elevated rapid transit lines. Davis (1964), in a Ph.D. dissertation in Geography, studied the impact of the elevated system on the development of Chicago's North Side. Using an extensive array of statistics on population, residential development, land value changes and other factors, he reconstructed the pattern and pace of development. He concluded that the greatest amount of new building construction immediately following the first operation of the El took place in El station areas farthest from the CBD and previously ineffectively served by transportation. Settlement tended to occur as close to the El stations as permitted by land availability on all three branch lines in this period, with a consistent pattern of lower density occurring away from the El stations.

According to Davis, El areas (all blocks within one-half mile walking distance of stations) had almost three times as high a percentage of settlement of the area not previously built upon as did the control areas. This indicated to him that the elevated areas were built up at an unusually rapid rate during the El's maximum impact period. The greatest increase in land values immediately following the first operation of the El took place, as had the settlement, in the El station areas farthest from the CBD and previously inadequately served by transportation. Each of the El station areas had both higher land values than their control areas immediately after the first El operation and a greater increase in land values from the pre-El to the post-El period.

Illustration 2.5
Undeveloped Area During Elevated Construction in Chicago (Sheridan Station, 1897); Densely Developed by 1910
(Source: Chicago Transit Authority)

Davis also goes on to say that even though the El provided a striking impetus to growth in Chicago, its influence was soon diminished by other modes of travel, notably the automobile. Yeates (1965) also substantiated this in his study of factors influencing Chicago land values when he stated: "The evidence indicates that rapid transit representing a system of relatively low transport costs appears to have declined markedly since 1930 as a determinant of land values." However, the Chicago rapid transit system was essentially complete before the time period covered by Yeates (1910-1960), and only a few extensions have been added since. In the earlier period of Chicago's growth the system was clearly a powerful force in shaping the city's form, and continues to reinforce that early structure centered on the Loop.

Other Land Use Impacts

It is interesting to note one development-related factor which apparently continues to be unique to the Chicago system. Between 50 and 75 years ago when the elevated lines were first being constructed, some of the predecessor companies of the CTA decided to involve themselves in the real estate business. The companies invested in numerous remnants and parcels of property under the elevated stations and right-of-way, unattractive to most investors, and constructed station-oriented uses such as small shops and restaurants. These parcels and structures are still owned by CTA today, which is responsible for maintenance of the property and collection of rents. Most of the uses appear to be marginal now, partly because no further money has been spent on their improvement since the initial investment 50 to 70 years ago. However, this investment illustrates the potential for control, development, and return on transit-owned land which would have probably otherwise remained undeveloped.

OTHER CITIES

The three major cities just discussed provide general indications of the ways in which transit improvements influenced land development and use. In order to provide a broader perspective, however, a brief investigation of activities in other cities was undertaken. The lack of literature necessitated the identification and interviewing of individuals personally familiar with each city's history (see Appendix). Results of this probe are presented in the following pages, including information on Cleveland, San Francisco, Philadelphia, Los Angeles, Baltimore, El Paso, New Orleans and Toronto.

Cleveland is the home not only of a modern rapid rail line but also of the Shaker Heights Rapid Transit System, a line that figures prominently in one of the most ambitious suburban land development schemes the midwest has ever seen. In the early 1900's two brothers, Otis and Martin Van Sweringen, acquired large amounts of rural land near Cleveland and planned to develop it into a first-class residential community. They called it Shaker Heights since the land had been previously settled in 1822 as a religious community by the Shakers (Harwood, 1955).

They reasoned that their development could only be successful if it was able to provide transit service to downtown Cleveland that would be superior to a city streetcar line. It was the Van Sweringen's style to always try for the best, so since "rapid transit" had become popular with real estate developers at the time, the two brothers planned a line which would enter Cleveland entirely over its own reserved right-of-way and occupy its own terminal building fronting on the Public Square in the heart of the city. In addition, the Van Sweringens intended to build their railway so it could be expanded to include further extensions as their community built up. The town itself was to be planned for the maximum convenience and amenity possible, with the transit line laid out to serve quiet streets which did not have to cross the tracks. By a series of fortuitous events, they accomplished all of this and more.

Starting in 1913 with a short car line connected to the Fairmont Boulevard Branch of the Cleveland Railway, they soon acquired what they needed in the form of a joint right-of-way with the New York Central and eventual ownership of the Nickel Plate Railway system. This expanded to ownership of several other railroad companies into one huge conglomerate. The Shaker Heights-to-downtown service opened in 1920. However, the Van Sweringens now envisioned their Public Square Terminal in downtown Cleveland no longer as a simple trolley station but rather a large structure to serve all of Cleveland's railroads (several of which they owned by then) and interurban lines as well as providing facilities for a greatly expanded rapid transit system. The terminal was also to serve as the center of a new downtown high-rise development.

True to form, the terminal and high-rise office complex was built and opened in 1930 -- just in time for the Great Depression. The Van Sweringen empire

teetered and fell six years later with the death of the brothers, and the terminal did not go into full operation until 1954. The line itself was held by the bank until 1944, when it was taken over by the City of Shaker Heights and quickly developed into the modern, efficient operation it is today.

Shaker Heights is still considered a model upper class suburb; its value in terms of accessibility and resulting high land value is dependent upon the transit system which provides quick entrance to the center of the city. The transit system and street patterns in Shaker Heights, as designed by the Van Sweringen brothers, still exist in their tree-like feeder pattern to minimize the number of streets crossing the line and the street along which it runs.

San Francisco is a city in which transit improvements were the key in overcoming geographical obstacles to land development. For a long time, the very steep hills limited the development of much of the city, but the development of the cable car there by Andrew Hallidie in 1873 and its first installation on Clay Street began the development of what is now some of the most valuable real estate in the city.

Clay Street Hill R. R. Co. San Francisco
The first cable train - Photo taken September, 1873.

Illustration 2.6
Clay Street Hill Railway Company, San Francisco's First Cable Train, 1873.
(Source: San Francisco Municipal Railway)

The subsequent electric street railways, however, were even more important in the development of San Francisco, first as a key to the beginning of the Bay Area metropolis outside the city and second to open the area west of Twin Peaks within the city to development possibilities. The beginning of the Bay Area metropolis is discussed by Vance (1964):

> "So long as ferries provided the transport for local movement, the city was unified with the traditional core near Yerba Buena Cove

or, later on, the Ferry Building. But when trolley links were established among the East Bay cities, much economic activity could be carried on independent of San Francisco. At that point, we may date the birth of a Bay Area metropolis, as distinct from the entrepot and the Venetian confederation that was San Francisco during its first half century."

The expansion of the East Bay cities led indirectly to the opening of the three-mile Twin Peaks streetcar tunnel in 1918, with transit lines being extended out into what is now the Sunset and Parkside districts. Rather than potential land developers exerting pressure to expand the lines, however, it was the city fathers who wanted to see San Francisco grow and not be overshadowed by the East Bay development.

Illustration 2.7
Lincoln Way in San Francisco with Golden Gate Park to Left and Twin Peaks in Background, January 1906.
(Source: San Francisco Municipal Railway)

Coincident with the tunnel opening and because of pressure from a local group, the St. Francis Woods Association, West Portal Avenue (upon which the streetcars emerge west of the tunnel) was zoned for commercial use. In 1917 before the tunnel opened, there were initially no shops on West Portal, but within two years, all vacant lots were occupied by commercial entities. Also, within fifteen years (1920-1935) the new neighborhood of St. Francis Woods went from 800 to well over 5,000 homes constructed.

Illustration 2.8
Opening of San Francisco's West Portal Tunnel, 1917.
(Source: San Francisco Municipal Railway)

Amusement parks, a phenomenon of the late 19th and early 20th centuries in American cities, were often built in scenic places away from the mainstream of urban activity. These were usually accompanied by transit lines being extended out to them to take advantage of the Sunday traffic. Sutro Park in San Francisco was typical of this and Sutro himself built an extension of the Washington & Jackson line out along Clement to serve his park. Clement was then zoned for commercial use. This created the first shopping district in the emerging Richmond District.

Seattle has some similarities to San Francisco in that until about 1875 it was a milltown clustered around piers where waterlines were high enough to be navigable. After that time until 1890, cable car lines were constructed and coincidently development went up and on over the hills to Lake Washington. Also the amusement parks of Greenlake, Alke Beach and Luna Park all had transit lines extended out to them, with development following.

Philadelphia developed very much according to the general pattern discussed earlier in this study. However more than any other American city, commuter railroads played an important part in development. Except for the horse-

drawn Omnibuses, the railroads came first in Philadelphia starting with the Main Line in 1832. The inner stations of these interurban lines gradually developed along with later streetcars and rapid transit into a comprehensive system. The accessibility this created for suburbs such as Bryn Mawr and Villanova increased their value as upper class suburbs much as in Shaker Height in Cleveland. Also in the early 1900's, a transit line from downtown was extended out across the Schuykill River to the city limits. It helped to induce development in the western part of Philadelphia much as the transit lines through the Twin Peaks tunnel did in San Francisco, both helping to overcome geographical obstacles to development.

In Los Angeles around 1905 Henry Huntington sold the Southern Pacific railroad and began to build the Pacific Electric transit system by buying heavily into what was then the Los Angeles Railway started by Sherman and Clark. Before it was done there were over 1,000 miles of tracks laid in the greater Los Angeles area, making it one of the largest streetcar systems in the world. The system was unusual too in that at night at stopped serving as transit and was used for the movement of freight throughout the area.

Illustration 2.9
Pacific Electric Operated Streetcar - Burbank-Glendale Line, Los Angeles.
(Source: San Francisco Municipal Railway)

The scale of the system was made possible by land developers and owners of the transit system who either worked together to develop land or were the same people. Two practices were common which encouraged both land development and transit extensions: the giving of land to transit companies for rights-of-way, and the selling of lots one-on-a-block to make areas appear to be developed. All this was possible because of the general availability of land in the area. Single subdividers did much of the development of areas like Burbank, Beverly Hills, Azuza, Van Nuys, Canoga Park, etc. which were separated from downtown Los Angeles by large areas of agricultural land.

However, after 1920, automobiles became reliable and began to be used heavily. By the late 1930's Pacific Electric was giving up lines that had become unprofitable, and buses were taking over. In 1944-1945 the National City group (the so-called bus and tire interests connected with Firestone Tires and Standard Oil, etc.) bought out the street railway interests and replaced streetcars with buses wherever possible or discontinued operations. By 1960, all rail systems were abandoned.

Baltimore was a prototype streetcar city in which the street railways were specifically tied to the development of the city's park system (Farrell, 1973). The city fathers offered franchises to the railway companies in return for 20 percent of the gross profits, which were to be used to build city parks. Druid Hill and Patterson were two of the parks financed in this manner. Transit companies also built their own company parks, reasoning that if they were located properly, they would not only bring in a profit through the rental of concessions but would also lure passengers to places that were accessible only by the streetcars. Many parks including Riverside, "the Coney Island of the South," were created this way. In contrast with the dullness and uniformity of many of the early speculative real estate developments in the Baltimore area was Roland Park, which was intensively planned to include site design, land use and architectural control of common amenities, and provision for transportation facilities (Dorsey and Dilts, 1973). The transit system was an electric streetcar line that ran from City Hall to Roland Park; at its best, there were trips every four minutes 24 hours per day.

Illustration 2.10
Streetcar Traffic on Howard Street in Baltimore, date unknown.

El Paso, Texas started street railway operations in 1881, with service peaking in the 1920's with 103 cars and 64 miles of track. Buses and jitneys gradually replaced all lines until in 1947 only the Juarez line connecting downtown El Paso and downtown Juarez, Mexico, was left. The interesting thing about this now defunct line is that its commercial strip land use was built around the exchange of commodities from one country to the other. The system was a one-way loop separated by four blocks. Going into the Mexican side there were mainly wholesale operations and dentists (reflecting cheaper taxes and dental care on the Mexican side); on the way out of the Mexican side were found primarily curio and trinket shops, jewelry and liquor stores, and striptease establishments (reflecting the major tourist attractions of border towns). Entering the U.S. side, stores were primarily apparel, groceries, drug, furniture and merchandise (items that are only available or better made in the U.S.); leaving the U.S. side were mainly used clothing stores and wholesale outlets.

The transit industry in New Orleans originated with a horse-drawn line in 1834. Like many other American cities, it made the transition to electric streetcars in the late 19th century. Full control of seven separate streetcar lines was assumed by the New Orleans Public Service in the early 1900's. However, land use patterns had been more or less established in New Orleans by other factors (including use of waterways and geographical constraints) before the advent of transit facilities (Harlan Bartholomew, 1968). Thus transit routes were extended to serve the existing population centers and other generators of primary demand for transit services, with the focal point for service being the Central Business District around Coran Street and St. Charles Avenue. Because of this focus, many commercial establishments which had previously dotted the residential areas found it profitable to relocate into this central area. Since the streetcar routes followed previously established major street rights-of-way, no new areas were opened up for growth. As a result, transit lines actually maintained the compactness of urban development and the growth pattern set earlier by the local topography. Thus suburbanization of the region was restrained rather than promoted by the streetcar lines, although the city did spread out later with the advent of automobiles and buses.

One interesting social effect brought about by the streetcar lines was a change in the social composition of certain areas. By enabling workers to move further away from their places of employment, whites employed in the CBD moved further out and blacks providing domestic service in white homes gravitated back towards the CBD, thus facilitating segregation in a way previously not possible (New Orleans Regional Planning Commission, 1969.

Toronto has a long history of transit development beginning with horse-drawn car service in 1861 as the Toronto Street Railway. Growth and development were similar to that occurring in American cities; electrification occurred in the late 1800's and several competing lines were unified in 1921 into the Toronto Transit Commission (TTC), which immediately instituted a single fare system over the entire service area.

At the time the TTC was inauguarated, the city was expanding rapidly, and transit access was essential to most of the growing population. In order to facilitate access to and annexation of sub-municipalities, TTC agreed to build and operate transit lines into outlying areas at cost. This was facilitated partly by the low cost of electric service in Toronto because of its location near Niagara Falls and the ready availability of hydroelectric power.

However, the most interesting effects of transit on land use in Toronto occurred after World War II. These are discussed in the following chapter.

CONCLUSIONS

It is abundantly clear from these historical examples that public transit had a major impact on the development of American cities in the late 19th and early 20th centuries. Continual improvements in transit technology during this period took the urban traveler from the horsecar to the modern rapid transit subway within the space of a few decades; each new step dramatically increased the area which could be reached at a given cost and time of travel, and thereby the area in which the life and business of a city could be conducted.

This almost continual doubling and redoubling of accessibility was essential if the burgeoning populations of the cities were to be accommodated. During the time in question, the rate of migration into the cities was staggering, and the growth in the nation's increasingly urban, manfacturing-oriented economy equally great. The lack of adequate transportation in the cities was a continual threat to this economic development, and traffic congestion unparalleled today was a commonplace in the central areas of major cities.

Warner in Boston and Solomon in New York both pointed out that a large part of the population could not make use of transit because of its cost, at least in the early part of the period. These persons, often immigrants and rural migrants, were forced to live near their work. Even with transit, then, congestion both in downtown travel and the use of nearby land was extreme, particularly in larger Eastern cities; without it, however, the middle classes would have been added to the throng. Thus transit development needs fairly forced the emergence of the innovations which appeared.

Under such conditions, the inauguration of each new transit service almost inevitably resulted in rapid expansion of the city along its lines. This is amply documented in this chapter's examples. The resulting rises in property values created an active market in land speculation, including some abuses. Large fortunes in real estate were made, sometimes by "insiders" in transit development.

In New York, government attempted to respond with an early version of "value capture" through special property tax assessments. The stagnation which resulted should be taken as an indication of the need to develop more sensitive tools for today's applications of the value capture principle.

In other ways New York's experience is a special case, with limited applicability to other cities today. Most important, the need for improved transit in New York today is not founded on urban development objectives but rather on the overriding need to transport the millions of people who depend on it. As a result, the present thrust of New York transit improvements is essentially to parallel other overcrowded transit lines to serve existing concentrations, just as it was as long ago as the 1920's and 1930's with the construction of the Tri-Borough Subway System.

In the other cities studied, examples of rapid suburban development are numerous; some examples of successful transit-oriented "new town" development are also in evidence, such as Cleveland's Shaker Heights. To a substantial degree these were dependent on other factors in addition to a transit improvement, such as land availability, site amenities or disamenities (e.g., soot from the El), and the existence of effective demand for development. Underlying all of these examples, however, is the fact that they were made possible only by transit service which was far better than any other means of access at that time.

The standard interpretation of this is that since the auto's appearance, transit can no longer exert such a monopoly on access; the car is, after all, often much faster, more comfortable, and flexible in its ability to choose its route and destination. This leads to the view that we can learn little from the past to lead us to ways to generate land use impacts from transit improvements possible today. This may well be true. However, there may be another lesson in this display of the history of transit improvements and their effects on urban development. Specifically, perhaps the scale of land use impacts reached by early transit innovations could yet be repeated, if situations can be found or created in which a transit improvement would provide a major increase in access over that presently possible. Examples may include mechanized downtown circulation, at a relatively small scale, and large residential areas served only by slow, simple public vehicles operable by present "transit dependents" such as youths, some of the physically handicapped and the elderly who cannot drive. These draw from history not just the simple linear progression of ever-faster, ever-larger urban mass transit opening ever-larger rural areas, but rather the need to look more specifically for different problems: urban travel functions in which the dramatic improvements in access of past innovations may still be possible.

Chapter III
THE PATHBREAKERS: TORONTO, MONTREAL AND SAN FRANCISCO

Three all-new large-scale rail rapid transit systems built since World War II are now in operation in the United States and Canada. These systems, in Toronto, Montreal, and San Francisco, are of particular interest not only for their newness but also for their role as the prototypes for the generation of rapid transit systems now in development. Such future systems may be able to benefit from the lessons derived from the experience of these early three.

In reviewing this experience, the many differences among the Toronto, Montreal and San Francisco rapid transit systems should be kept in mind. The Toronto subway is characterized by a many-staged construction process stretching over more than 25 years (so far), a compact network of only 26 miles in operation and not extending much beyond the central city limits, frequent stations, and a nearly all-subway configuration built by cut and cover methods.

The Montreal Metro is slightly newer and was built in fewer stages but has still evolved over a period of some fifteen years (still under construction as with Toronto). It is also compact (21 miles), without lines extending into suburban areas. As with Toronto, most inbound patrons arrive by bus. The system is entirely underground -- largely in bored tunnels. Its stations are the most frequent, with an average spacing of a half-mile.

San Francisco's BART is in many respects more a regional rail system than urban rapid transit. It is a very large-network system (71 miles), including several lines extending many miles into low-density suburbs. Most patrons arrive by car. BART was built in a single stage, and in contrast to the others it has been open only since 1972-4. Most of the system is above ground, both at grade (but grade-separated) and on elevated concrete structures. Excluding long tunnels without stops, less than 20 percent is in subway. Downtown distributor stations are fewer than in the other systems, and average systemwide station spacing is well over two miles.

TORONTO

System and Surroundings*

The Transit System: The Toronto rapid transit system, operated by the Toronto Transit Commission, is a 26 mile conventional heavy rail network (Figure 3.1). To date most all of it is in subway, although about 3.8 miles of the existing system are in open cut or on bridges and parts of a 6.25 mile extension to be opened late in 1977 (the Spadina Line) will be above grade. The system has been built in several stages, with the first 4.6 mile segment of the Yonge Street Line opening in April 1954. This staging aids in understanding of the system's land use impacts and is shown in Table 3.1.

Table 3.1
STAGING OF TORONTO RAPID TRANSIT CONSTRUCTION

Subway Line	Segment (end stations)	Length (miles)	Construction Start	Line Opening
Young Street	Union-Eglinton	4.6	1949	1954
University Avenue	Union-St. George	2.4	1959	1963
Bloor Street	Keele-Woodbine	8.0	1962	1966
Bloor Street	Keele-Islington & Woodbine-Warden	6.2	1965	1968
Yonge Street	Eglinton-York Mills	2.7	1968	1973
Yonge Street	York Mills-Finch	2.7	1968	1974
Spadina	St. George-Wilson	6.25	1974	(1977)

The system has 49 stations, for an average station spacing of just over one-half mile. Parking lots ranging from 100 to 2,300 spaces are provided at seven of these, generally the suburban terminals of the various construction stages. All of the major lots are virtually filled to capacity each morning, and some overflow occurs.

Metro Government: The original Bloor and Yonge Street subway lines were entirely within the City of Toronto. Later subway extensions have stretched beyond the city boundaries into three other boroughs. The city and five neighboring boroughs together form the Municipality of Metropolitan Toronto (Metro). Formed in 1954 by the Ontario provincial government, Metro is responsible for provision of major regional services, including

*Because of the widespread interest in the Toronto subway's land use impacts and the importance of the city's structure and growth patterns in understanding those impacts, this description is more detailed than for the other cities covered in this report.

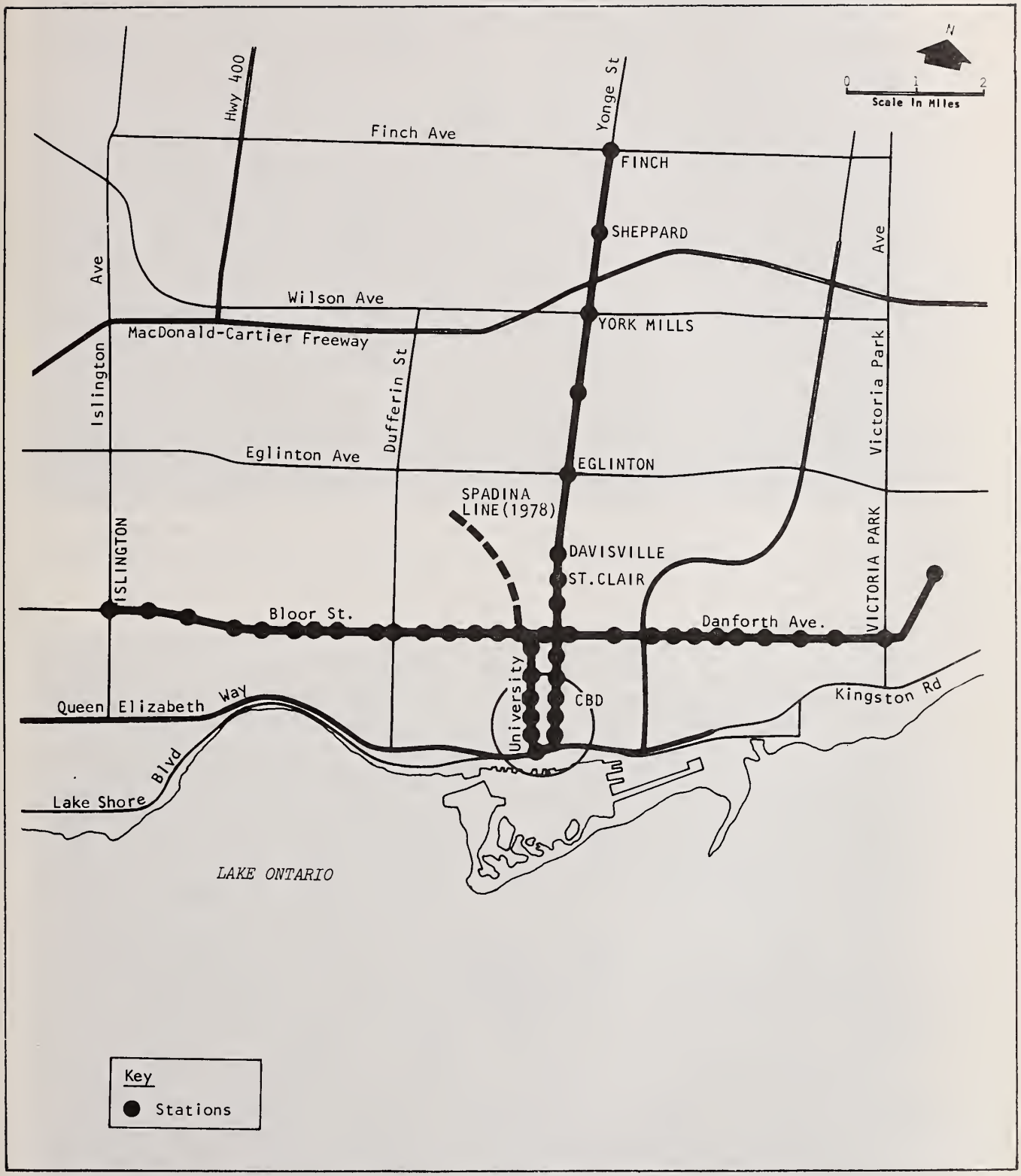


Figure 3.1
TORONTO RAPID TRANSIT SYSTEM

transit. The Toronto Transit Commission is currently operated by a five-man board appointed by Metro Council.

Metro's growth extends beyond its regional government boundaries. It is abutted on three sides by other province-created Regional Municipalities (regional units with similar powers, which contain most of Toronto's continuous built up urban area in a suburban and exurban fringe). As a result, urban growth policies are heavily influenced both by these units and the provincial government as well as by Metro itself. At the local level the city and boroughs, in practice, devise their own plans and zoning by-laws. In theory, such plans and by-laws must be brought into conformance with the Metro Plan once it has been officially approved; however, such approval has yet to occur. Metro also has legal power to create its own by-laws for areas within 150 feet on each side of all arterials, but this has in general not been exercised.

Size, Density and Growth: Metro Toronto is a modern, growing area of well over two million persons (Metro area, census 1976). Its population density in 1971 was 8,633 persons per square mile, exceeded on this continent only by Montreal and the New York SMSA. Within Metro, the density of some tracts in the core city of Toronto was from 40 to 70 persons per acre (25 - 45,000 per square mile) in 1971. Its population then was 712,785 persons. As in most other North American cities, the central city's percentage of the regional population has been on the decline (Colcord, 1974).

The Metro Toronto Census Metropolitan Area (CMA) has been one of the fastest growing urbanized areas on the continent since the Second World War, gaining some 40,000-50,000 persons each year. Of Canada's sixteen CMA's, ranging in 1971 size from Montreal at 2.7 million to Regina's 140,000, Toronto ranked fourth in growth rate with 117.1 percent during 1951-71 after Calgary (183.4 percent), Edmonton (180.4 percent) and London (121.8 percent). Montreal was ninth at 86.4 percent. During the 1960-70 decade, only the Washington, D.C. SMSA among major U.S. cities surpassed Toronto's rate of growth. Moreover, the rate of housing starts in Toronto during that period was more than 50 percent higher than in any major U.S. city.

Since 1970 Metro Toronto's growth relative to the U.S. cities is even more dramatic. During the period 1970-74, 15 of the nation's 20 largest SMSA's actually lost population, in contrast to Toronto's continued growth.

Jobs: According to statistics available for 1969 (15 years after the opening of the first subway line), 50 percent of Metro Toronto's 860,000 jobs were in the central city of Toronto. This was a 16-year gain of about 20,000. At the same time employment in the boroughs grew from 127,000 to 410,000, largely due to growth along the region's new highways. Even so, 38 percent (283,993) of all jobs in Metro were

Illustration 3.1
Downtown Toronto in 1958, Looking South Towards the Waterfront from North of Bloor Street.

Illustration 3.2
The Same View in 1973, Showing the Extent of High-Rise Office Development Downtown in the Intervening 15 Years.

still in the Toronto CBD. Fully 81 percent of all peak hour work trips into that area in 1969 (87,129) were by either bus or rail transit. The modal split averages 50% during the rest of the day.

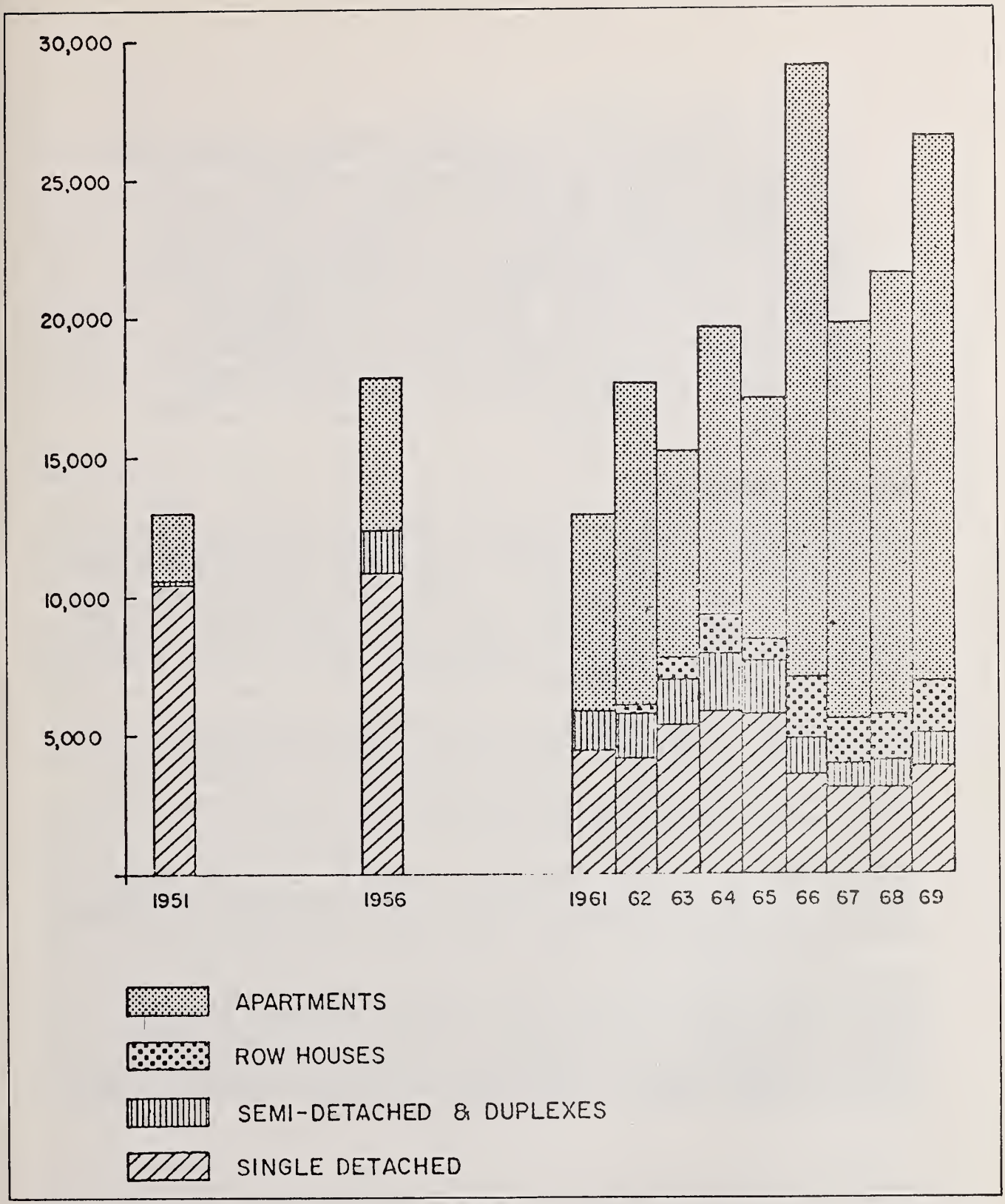
Housing: Apartment life is the norm. In 1971, the majority (53%) of all occupied housing units in Metro Toronto were in multiple-unit structures. In addition, following a surge of single-family housing construction in the 1950's, apartments are once again the most commonly built form of housing. This is largely because of the shortage of available low-cost land and high demand for downtown residences (Figure 3.2). Another important reason for the dominance of apartments is Canada's lack of income tax deductions for home mortgage interest and similar home-owner expenses.

Although originally concentrated in the City of Toronto, since the 1950's apartments have been built farther and farther out in the suburban boroughs. Many of these are near major new roads and rapid transit lines. In fact, several boroughs within Metro have experienced relatively high growth rates between 1971 and 1976 while the City and the Borough of York have lost population. Similarly, the regions of York and Peel have witnessed a very significant growth rate -- partially attributed to resistance to crowded conditions and high rents within the City.

Demographics: A large proportion of the area's 1,500,000 new citizens during the period 1941-71 have been immigrants from southern and eastern Europe. British-Protestant origin dropped from 81 percent to 59 percent. Despite this large influx, the development of inner-city slums has been avoided. One reason has been Toronto's sustained economic growth and low unemployment. Another is the region's housing policies; urban renewal -- in the sense of large-scale relocation of low-income households away from the inner city to allow redevelopment into non-residential uses -- has never been of major importance, first because of a complex administrative process and later because of a decision to support urban rehabilitation instead.

Overall, the average income of residents is lower in the city of Toronto than in the suburban boroughs. However, figures by census tract show that some of the region's highest income tracts are within the central city. In addition, a 1969 analysis of jobs by type indicates that the city of Toronto had the highest proportion of households of white-collar versus blue-collar workers of any municipality in Metro. This contrasts sharply with typical U.S. cities.

Colcord's (1974) summary of Toronto's key features is an appropriate one for this study's purposes:



Source: Metropolitan Toronto Planning Board, 1970

Figure 3.2
DWELLING COMPLETIONS BY TYPE IN METRO TORONTO, 1951-1969

"...the Toronto metropolitan area has managed to take in huge numbers of immigrants, growing at one of the fastest rates of any large North American urban area, and yet avoid the unhappy side effects so often attributed to massive urban growth -- overcrowding, slums, poverty. This is due, in large part, to the favorable economic conditions of the area which have allowed it to keep unemployment at a minimum. The urban rehabilitation policies, as opposed to urban renewal, have, likewise, been beneficial. Within the City of Toronto are maintained numerous attractive, middle-class neighborhoods. These downtown residences have, in turn, helped to keep the city vibrant and economically alive. The City of Toronto is still the shopping and entertainment center of the metropolitan area ." (pp. 29-30)

Sources of Information

The literature on Toronto's transit system and its land use impacts is unusually diverse. Brief and somewhat popularized articles and speeches by G. Warren Heenan (1966, 1968a, b, 1969) are by far the most widely distributed. Similar documents by Kearns (1964) and Wacher (1970) were found, with backup data by Irwin (1959). Other data are published in reports by the City of Toronto Planning Board, Toronto Transit Commission, and the Municipality of Metropolitan Toronto.

Relying largely on these references, several multi-city surveys of information also discuss land use impacts in Toronto. These include studies by Anderson et al. (Baltimore Department of Planning, 1971), Dicker (1974), Keeler (1973), Libicki (1975), Sheldon and Brandwein (1973), and Urban Systems Research and Engineering (1976).

In addition, several formal statistical studies of land value impacts were also identified. All were done by Canadian university researchers. Included are papers by Abouchar (1973), Davies (1974), and Dewees (1975). Kovach (1974) reports on a survey dealing with locational decisions.

Finally, the Toronto case study in the Urban Transportation Decision Making series by Frank Colcord (1974) provided a valuable review of Toronto's development and structure. In addition to these references, a series of interviews was conducted in Toronto with city and Metro planners, transit commission officials, and private developers. A tour of the system and related development was also made.

Evidence of Impact: General Indications

The most visible indication of the Toronto rapid transit system's possible impact is the intensive high-rise development which has occurred near many of its stations. Extending along the transit lines radiating from downtown, much of this development is in the form of ten to 20-story buildings clustered around subway stations and surrounded by expanses of older structures from one to three floors in height. In addition, the Toronto central business district, which receives most of the transit system's commuter trips, is characterized by a skyline of even taller office buildings constructed since the system began service.

Several authors (e.g., Heenan, Kearns, Wacher) have commented on the development pattern in Toronto, pointing out its apparent focus on the transit lines. Over the five-year period from 1959-63, which is generally acknowledged as the beginning of Toronto's transit-related development period, over 48 percent of all high-rise apartment development in the City of Toronto occurred in four of the city's 24 planning districts. All four (Yorkville, Annex, Deer Park and Eglinton Park) are centered on the Yonge Street subway line just north of downtown. This development was much greater than that occurring in comparable or even larger U.S. cities; the transit-centered portion alone was some 4,133,000 of a total of 8,512,000 square feet of office space (Heenan, 1966). At the same time, 90 percent of all office construction (5,036,000 square feet out of 5,595,000) occurred in three districts -- Downtown, Yorkville, and Eglinton Park -- also along the transit line.

Heenan, whose writings have been quoted more than any other on this topic in Toronto, summarizes this development by asserting that "...two-thirds of all new development in a five-year period was put in place within five minutes walk from the Yonge Street Subway...There is no doubt that a subway has a tremendous impact on land use and consequently land values." (1966, p. 5). Although apparently true in principle, in fairness this dramatic conclusion must be tempered by several factors not mentioned by Heenan. First, the Yonge Street corridor and downtown were the most heavily traveled and populated areas in the city even before the subway; employment was mainly downtown-centered and a greatly overloaded streetcar line, one of the world's busiest, had been on Yonge Street for many years. These planning districts were therefore logical places for intensified development even without the subway, and in fact a substantial proportion of the city's development had already occurred there.

Second, as noted in the earlier description of Toronto's postwar growth, many things not related to transit were generating a rapid rate of development. The encouragement of immigration, Toronto's favorable geographical position, stable political situation, employment opportunities, and the lack of major social and ethnic problems are examples. In addition, the late 1950's and

early '60's were a period in which capital was available for development, after a period of "tight money." This led to a surge in construction to ease the city's housing shortage; urban apartments were the logical emphasis since many of those needing housing worked downtown and either could not afford or did not want houses or cars.

Third, the total square footage of new offices and high-rise residential buildings cited by Heenan is not the total of all new development in the city, since lower-density housing and other uses were being developed as well. Much of this was not near the subway. Thus "two-thirds of all new development" in the city did not occur in the planning districts noted by Heenan. Further, Heenan's figures are for the City of Toronto only; a very large amount of development was also occurring at the same time in Metro's five suburban boroughs and beyond.

Heenan's most oft-quoted statement also bears some inspection, since it is derived from his conclusions just discussed.

> "This small investment (the original $67 million Yonge Street subway) ignited a $10 billion development explosion along the route from Front and York Streets to its northern terminal, Eglinton Avenue. The appraised value of all the land and facilities in Metropolitan Toronto is now $50 billion. $15 billion of this appreciation in physical value has been added in the last ten years and two-thirds of this is attributable to the existence of the Yonge Street Subway." (1966, p. 3)

This statement is apparently a substantial overstatment of the facts, and bears correction to protect the credibility of more moderate claims. First, an appreciation of $15 billion in ten years amounts to an annual rate of only about three percent. Much of this must be attributable to inflation, not real growth. Second, the attribution of "two-thirds" to the subway is apparently based on the location of two-thirds of the city's office and high-rise residential construction in planning districts near the line, as already discussed. But this was for a period of five years (1959-63), not ten, and moreover it applied only to the central city, not to all of Metro.

The real growth along the subway line can therefore be only a very small fraction of the $10 billion cited by Heenan. Finally, even some of that small fraction must be attributed to the other powerful factors (immigration, high cost of low-density housing, etc.) which worked independently of the subway's to encourage concentrated development. Consequently, the subway and its related factors (focused zoning, increased downtown accessibility, etc.) probably had a significant impact but much less than that claimed by Heenan.

Other analyses have been done which show that the system may well have had a substantial impact on the city's development and tax revenues. Kearns (1964) and Wacher (1970) as well as Heenan (1970) report a comparison of 1950-59 increases in property tax assessments for the 14 ward subdivisions near the Yonge Street subway versus the 40 subdivisions of the entire city. This comparison, for which data and computations are available in Irwin (1959), is shown in Table 3.2.

Table 3.2
TORONTO REAL PROPERTY ASSESSMENT CHANGES CITYWIDE AND NEAR SUBWAY, 1950-59

Year	Total City Increase $ '000	%	Adjacent to Subway Increase $ '000	%
1950-53	101,426	7.5	48,557	9.2
1954-56	127,721	8.5	69,846	21.1
1956-59	212,523	13.5	121,521	18.8
	441,670	32.8	239,924	45.4

Source: Kearns (1964)

In addition, it was noted that during a slightly later ten-year period (1952-62) tax assessment increases in districts adjoining the Yonge Street subway were 45 percent downtown and 107 percent farther north (College to Eglinton) or a total of 58 percent overall in comparison with 25 percent for the rest of the city. These figures show that the rate of growth was clearly faster near the subway. Although some of this is undoubtedly due to other factors, as discussed earlier, the subway line was an important contributing force.

It is useful to estimate the fiscal significance of this intensive new development. Kearns estimated that the increment of growth along the line above the "normal" rate (i.e., the 25 percent experienced elsewhere in the city) was enough to produce more than $5 million in annual property taxes. In comparison, the annual carrying costs of the bonds issued for the original $67 million Yonge Street subway were about $4 million (30 years at five percent). However, this too is a somewhat simplistic analysis since there is no reason to believe that the additional growth along the line is a net gain to the city (or to Metro); it is likely that much of this development would have occurred even without the subway, but in some other form and location in the city or region. Nevertheless, Kearns' estimate is useful as a sort of upper limit.

In addition to these general indications of impact based on direct observation and review of tax data, at least three university researchers in Toronto have conducted statistical studies of residential sales price data to estimate the subway system's impact on land value. These studies were similar in concept to the Lindenwold studies (see Boyce et al.).

Abouchar (1973) used a large data set of residential sales prices and descriptions for the 1965-72 period. By regression methods, he concluded that the subway has had no impact on the value of the properties studied. However, the study's time period began eleven years after the first subway line was opened and also after most of the rest of the system was either approved or well under construction. Therefore it is likely that much of any impact on land values had already occurred and would not be detected.

Dewees (1975) used fairly similar methods and data to estimate the changes in rent gradients both along and perpendicular to the Bloor-Danforth subway line between 1961 and 1971. His results were mixed, including several which he termed counter-intuitive. However, he was able to conclude that the line did have a positive impact; that is, residential values increased most rapidly nearest the line during the period studied. No numerical estimate of overall effect was ventured.

A third researcher (Davies, 1974) reported on a study of changes in 1951-61 population density changes near the original Yonge Street line. The technique used was a form of nonlinear regression using census data for 1951, 1956 and 1961. No effect was found in 1956 (two years after the opening of the subway), but density near the line was found to have increased significantly faster between 1956 and 1961 than in areas farther away.

General Policies: In addition to the subway and the demand-related factors discussed earlier, the land use policies of the City of Toronto and other boroughs have been an important force in the channeling of new development into areas near the subway stations. Since these policies are not only important but also somewhat unique, a brief explanation should be useful.

It is important to recall that in practice, even if not as intended, land use control has been basically a function of local rather than regional government. Thus the City of Toronto, not Metro, has been responsible for zoning and other planning initiatives until now. Metro has wielded potential influence over land use largely through zoning and its responsibility for infrastructure, particularly the location, sizing and timing of transit and sewer lines. However, in practice this potential power, as well as the broader powers described earlier, has apparently not been used against the policies or plans of the local governments. The result is that the City's authority over land use within its boundaries has been more or less complete.

With respect to control of land development around transit stations, the City's position in the first few years following the opening of the Yonge Street line was merely to react to the proposals of developers, which were generally for intensification of allowable densities. However, as early as 1952 the city formally designated much of the downtown area for intensive high-rise, multiple-use development, typically with a maximum floor area ratio of 12:1. This allowed buildings of fifty stores or more on open sites, contrasting sharply with the then-existing low-rise skyline. Most of the area involved was within a few minutes' walk of a transit station. Since no other areas of the city (or of Metro, for that matter) were zoned to allow such intensive development, this was a powerful incentive to downtown redevelopment.

The city's planners and policymakers were also quick to realize the potential for intensive development around the subway stations away from downtown. Developers were encouraged to attempt such development, first with case-

by-case spot variances in allowable floor area ratio and later by a comprehensive policy which allowed high-intensity development within walking distance of most stations. This policy, enacted in 1959, generally defines this radius as 750 feet but typically excludes areas of stable low-density residential use where so desired by neighborhood property owners. Lesser bonuses are available farther from stations but along some of their feeder bus routes.

The city's affirmative policy toward intensification of station-area development is extremely important, since compared to most U.S. cities, few areas not directly served by the transit system have been allowed such intensive development.* Most of the remainder of the city (apart from downtown) is almost entirely built up in structures not over five stories or so in height. As a result, the transit station areas are virtually unique in their ability to accommodate high levels of construction investment with relatively simple land assembly. The Toronto skyline, with its characteristic high-rise nodes at transit stations towering over an expanse of otherwise almost uniformly low buildings, is eloquent testimony to this policy's successful implementation. It is only lately that high-rise apartment development has occurred in the Boroughs away from transit stations, and there developments have almost without exception, been related to expressways and their interchanges.

Air Rights: As in the United States, land could be taken for the subway in Toronto only if needed for the construction or operation of the system. Value capture or control of land use have not been allowable rationales for further acquisition. However, Metro Toronto has been able to amass and market a large amount of land either over the subway or otherwise excess to its needs for the system's operation. Apart from the original 4-1/2 mile Yonge Street line, for which property was acquired directly by TTC before Metro Toronto existed, all land acquisition and its control has been the responsibility of Metro.

In the first 4-1/2-mile segment, 22 blocks of land were bought by TTC. Seventeen of those have been leased to date and are producing an annual rental income of just over one-half million dollars. The original cost of this land was $3.9 million. The only blocks not leased are those along an open-cut subway segment between Rosedale and Summerhill stations, which by agreement with the city are being kept open as a buffer between the commercial development along Yonge Street and high-quality single-family residential neighborhoods to the east.

On the Bloor-Danforth line, the subway right-of-way is almost an unbroken 14-mile strip owned by Metro. Most of it is parallel to but not within the street right-of-way, since the line was built slightly north of Bloor Street. This was done to avoid disruption to the high-value property along that street and also to facilitate eventual redevelopment of the lower-quality area just to the north.

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*This does not mean that such development away from transit stations is insignificant; however, there is substantial new hi-rise development along several freeways such as 401 and 427 South. A specific example is Thorncliffe Park, which was built away from the subway in East York with many 10-15 story apartment buildings.

A total of some 140 blocks (over 5 million square feet) has been bought, virtually all available for lease to private developers. Metro's policy is first to make such land available for other uses under its control, such as day care centers or senior citizens' housing. The second priority is to offer the land to the local municipality, but always at market value. Finally, land not so consumed is made available to private bidders for development. This approach has led to leasing of about 22 blocks to date, producing just under $1 million in annual rent. Of the $70 million spent overall by Metro for land, exclusive of the TTC-owned portion already described, Metro estimates that the capitalized income stream from rents is now $17.5 million.

Evidence of Impact at Specific Sites

A review of the data available on station-area development, augmented by direct inspection and interviews with planning officials, shows that the timing, extent and nature of development has varied greatly from station to station. The factors contributing to the occurrence or absence of development have also varied. In the following pages the development along each of the major segments of the subway system is described, along with a review of the apparent causes of such development at representative stations.

Downtown Development: As described earlier, there has been extensive construction of high-rise commercial office buildings in downtown Toronto since the inauguration of the subway system. Most of this began in the early 1960's. Some observers argue that the subway system made this development possible by expediting travel into and out of this formerly very congested area. Other previously-cited factors such as the region's overall demand for office space and the availability of capital were also of primary importance. In addition, several officials pointed out that the City of Toronto aggressively promoted downtown development during the 60's and early 70's. High building densities were allowed and zoning bylaws were generally permissive. Allowable floor area ratios (FARs) were increased throughout most of the downtown area, most of which is also within two or three blocks of a transit station either on the Yonge or University Avenue subway lines.

Also contributing was the local government's decision to build a new City Hall downtown. This $60 million public investment, in the city's former Chinatown, was an important force in improving the area's attractiveness for further development. Both city and Metro government offices are included in this complex. However, the City Hall is at the northern boundary of the historical "Financial District," and major new downtown development has not spread beyond this boundary.

Canadian banks have been the biggest and earliest investors in new construction downtown. The first very large development was Toronto Dominion Center in 1968, a two-building complex (one of 56 floors) housing the Toronto Dominion Bank and also providing office space for lease. This was followed by large office buildings of the Canadian Imperial Bank of Commerce, the Bank of Montreal, and Royal Bank. These large developments occurred just south of the prior downtown center on land formerly occupied by industrial as well as commercial buildings. All were within a few blocks of a subway station. Their size and prestige made further development of this area almost inevitable.

The same downtown area is also the historical retail sales center of Toronto. Several large department stores and many smaller stores have been in their present locations for as much as 100 years. Although Toronto has a number of large suburban shopping centers, most with branches of these same downtown stores, the main department stores have also strengthened their downtown operations. Most notable among such efforts is the just-opened (February 1977) new Eaton Centre, a massive in-town shopping center ultimately planned to include 250 stores in conjunction with a 1,000,000 square foot Eaton's department store. In addition to its own large parking garage, the center has direct connections to two subway stations and will add a third when the Centre is completed.

Illustration 3.3
Eaton Center
Near Entrance to Queen Station

According to local officials, the major factors in the decision to build this shopping center were the store's long-standing ownership of most of the land needed, a desire to consolidate the store's downtown operations (which were previously spread among several older buildings nearby), and a belief in the continued viability of the downtown area as a retail center. This confidence was apparently based on the massive new development and increasing office population in the area, and is indirectly but inevitably related to the improvement in downtown traffic circulation as well as access brought about by continued expansion of the subway system.

The 1954 Yonge Street Subway: Aside from downtown, substantial new development also has occurred around some of the stations farther north on the original Yonge Street subway line. The two most obvious are Eglinton, the original northern terminus, and Davisville. At Eglington, TTC built

a large terminal as well as a bus station for the heavily used feeder bus lines which converge there. This station site had long been an important transit transfer point and the site of intensive pedestrian and auto traffic. Development has occurred primarily southeast of the station along Eglinton Avenue for about three blocks, away from stable residential neighborhoods, and where TTC land was already assembled and available. Two high-rise office developments have been constructed at the intersection of Eglinton Avenue and Yonge Street, at or adjacent to the station, and both have direct underground connections with the subway. The Canada Square high-rise complex is situated directly over the subway station and TTC bus garage, thus utilizing air rights opportunities. The other development adjacent to the station consists of two office buildings and two apartment complexes combined with some retail activity.

Illustration 3.4
St. Clair, Davisville and Eglinton Station Areas

Davisville is of special interest because of the variety of forces which have been important in its development. The availability of a large old wood and coal yard adjoining the station allowed one developer to build Radcliffe Towers, a large high-rise apartment complex of several buildings. In addition, TTC chose this station as the site for its own new headquarters in 1958. TTC also built a large transit car maintenance and storage yard here, and in 1966 negotiated a lease of the air rights over this yard for a private development of 1,400 apartments and nearly 500,000 square feet of commercial space in four 39-story towers. According to TTC, the developer has been paying an annual site rental of $85,000 plus taxes; however, no development has been allowed by the City because of objections of neighboring residents to this scale of land use intensification. Similar

Illustration 3.5
Potential Air Rights Development Area at Davisville Station

objections have completely prevented any intensive transit-related development at several other stations such as Summerhill and Rosedale.

The main intersection of the Bloor and Yonge Street subway lines presents a particularly instructive case. Before the subway was built, this was a stable, high-quality shopping and professional office area primarily of two- and three-story buildings. The first building constructed on subway air rights was here, but was only a seven-story structure. With only one exception, no other development occurred at this station for many years. Within the last five years (over 20 years after the first line began operation), high-rise office buildings and a major department store have been built on two of the intersection's four corners, while the other two corners remain occupied by small two-story structures. Several other large high-rise developments have also recently occurred within a block or two of the station.

Discussions with the commercial real estate developers responsible for this recent development revealed that this location is attractive for further development, largely because of transit access. The major deterrent is in land assembly. Each of the two large projects built have involved dealings with no more than five landowners, and one included use of air rights over the Bloor-Danforth subway. However, similar development across the street would require a risky and slow assembly involving 25 or more separately-owned parcels. Moreover, the area is still considered a healthy and profitable one for its existing small specialty stores, such that land assembly for a major redevelopment would be not only difficult but expensive. No further major high-rise development is expected in the near future.

Illustration 3.6
View of Two Corners Not Redeveloped at Bloor-Yonge Street Station Area

The Bloor-Danforth Line: Including its 1967 extensions, this line includes 29 stations in its 14 mile length. Compared to the original Yonge Street line, development along the Bloor-Danforth line has been less extensive; most station areas have undergone much less change. A variety of reasons was suggested for this by the officials and developers interviewed. Included were a lack of sewer capacity, the stable residential character of much of the area served, market-limiting ethnic and income concentrations around some stations, and the lack of a strong enough demand for additional development of the Yonge Street corridor. Different factors, of course, are more important at one station than another.

One example of actual development on this line is found at the High Park station, the first station on the line's 1967 westward extension. This station is in a midtown residential area with large homes and lots, about seven miles from downtown. The street system has a high capacity, and a 400-acre park adjoins the station. In the early 1960's, after the subway location was established, the city actively promoted development here.

Specifically, the city agreed to change the allowed residential density from a 0.6 floor area ratio to 2.4 if the developer could assemble at least 50,000 square feet with multiple street frontages and immediate access to main roads and transit. This was successful, and a large complex of 14 to 16-story apartment buildings was built. The ability to assemble a large tract of land was cited as a key factor, and was made possible by the very large lots which existed in the area. This situation was compared to that of the Chester station, where despite a relatively close-in location no development has occurred because of small lots and their related land assembly difficulties.

Other cases of interest on the Bloor-Danforth line include the Main Street station area, where development has occurred on a former wood and coal yard (as at Davisville), and Victoria Park, where apartments have been built adjacent to a golf course at the station. Here the developer built a $160,000 pedestrian bridge to connect his development with the station. Victoria Park is also the site of what must be the world's only golf pro shop in a transit station.

Illustration 3.7
Victoria Park Station and Surroundings

Islington, the present western terminus of the line, is the site of a large high-rise apartment/commercial development sometimes cited as an example of transit's land use impact. Local officials pointed out that this development partially occurred before the transit system was extended to that point, but was largely due to the anticipation of the already-announced transit service in addition to the site's already existing highway access and land availability.

North Yonge Extensions: Substantial development has occurred and is continuing at some but not all of the system's four newest stations, opened in 1973-1974. Here as in many station areas opened earlier, a variety of forces have contributed to development. For example, the Sheppard Station area has been proposed as a regional subcenter in accord with the current emphasis of Metro and city planning policy on decentralization away from downtown. One large private office building has been built over the subway station, another is currently being finished, and the federal government is completing still another (for 3,000 - 4,000 workers) just across the street. Since this area had been developed previously in only low-density strip commercial uses, land assembly and community support

present no major problems. In addition, the area is well served by bus as well as rail transit and an excellent road network.

Illustration 3.8
New Federal Government Office Building at Sheppard Station

On this most recent line, as with elsewhere on the system, development has not been extensive at most stations with commuter parking lots. No air rights development has occurred over TTC's parking lots, and little intensive development has occurred nearby. Reasons for this are not clear. One possible reason is that surrounding development and land values have not yet increased enough for the air rights to become attractive and viable sites. Still, the availability of transit service (and land, in the form of air rights) have not induced such increases. Observation also indicates that the lots themselves detract from the attractiveness of their general surroundings for intensive development, and also tend to isolate the stations from easy direct access from any buildings which might be built nearby. Also, the largest lot (at Finch Station, the present terminus) is located on a hydro right-of-way under high voltage lines.

Spadina Line: This line, not yet opened, has already generated some development. The most unique example is at the Yorkdale station, where the line is between a major highway and a a large shopping center parking lot. The GO regional bus/rail authority is constructing a regional bus terminal at the edge of the parking lot, connected to the rapid transit station by an enclosed pedestrian bridge. Above this bus station the shopping center owner is planning to build a ten-story office building and has tentative plans for a series of such buildings linked by an enclosed

Illustration 3.9
View of Yorkdale Shopping Center (foreground) and Station (in background) on Spadina Line

mall and extending from the station all the way into the existing shopping center. The presence of the transit system and the already-available land were cited as the main reasons for this development.

Evaluation

The foregoing evidence clearly shows that the Toronto subway system has had a major impact on the distribution and intensity of development, even though not the $10 billion in new development which has been cited by some observers. The subway, in conjunction with appropriate zoning and development policies, has helped to strengthen the Toronto central business district. It has also encouraged the concentration of many apartments and offices in relatively small areas well served by transit rather than dispersal throughout the region, which in turn has probably led to substantially less disruption of neighborhoods than likely otherwise.

Equally important, the evidence demonstrates that the transit system was not the single cause of these effects. A variety of economic and social factors combined to create a heavy and continuing demand for new central-city office space and apartments -- a demand unparalleled today in any U.S. city. Recent historical forces such as European immigration, which insured a strong orientation toward transit usage, are also without parallel today in this country.

These factors in turn, including transit access, provided a powerful rationale for the city's subsequent policy of encouragement of development at the transit stations. This policy was of paramount importance because of the scale of land use intensity which it permitted -- often four or five times that possible in any other locations.

Beyond the importance of these general forces, the availability of large or easily assembled tracts of land has been shown to be an important factor in determining whether a specific station area will be developed. The subway air rights leases have been shown to be an effective way to help make land available and also to generate substantial revenue. On the other hand, neighborhood opposition has been seen to be a powerful deterrent to development even when all other factors are advantageous.

Obviously much can be learned from the Toronto experience which can be applied in the United States. At the same time, in such applications it must be recognized that the large scale of impact observed in Toronto is due in part to factors in addition to transit which are not now present in U.S. cities. Toronto in the mid-twentieth century, in fact, appears to be more similar -- in demographics, immigration, residential and travel preferences, economic growth and other key factors -- to the typical large United States city at the turn of the century. However, with the onset of currently developing constraints on auto travel and dispersed development (notably energy shortages), the model which Toronto provides today may become more and more relevant to the United States tomorrow.

MONTREAL

System and Surroundings

The major objective in designing the Metro system in Montreal was to ease bus and auto congestion downtown and yet provide public transit for high-volume, frequent and reliable travel within the densely built-up central area of the metropolitan region. Its lines are not very long, and it serves only the most densely populated corridors on Montreal Island. Thus, it was not intended to function primarily as a long-distance suburban commuter facility. Construction was started in 1961, and in 1966 the 16-mile all-underground system was opened. A 4.8 mile-long extension was opened in 1976.

To date, Metro is comprised of three lines, all intersecting at the Berri-DeMontigny Station (See Figure 3.3). The 8.5-mile No. 1 line runs east-west parallel to and a block north of St. Catherine Street, Montreal's principal downtown commercial street, and extends eastward into the residential areas beyond the 1976 Olympics site. Several of its ten stations have direct underground access to major downtown department stores as well as commercial and cultural facilities. The No. 2 line runs further south beside the financial district and then swings north to the high-density residential area extending to the north side of the island. This line, 7.4 miles long with stops at 15 stations, directly links its downtown terminal point with the Canadian National and Canadian Pacific railway stations. The No. 4 line (there is as yet no No. 3) with three stops, extends 2.6 miles underneath the St. Lawrence River to the South Shore/Longueuil housing area and the permanent Expo site, "Man and His World".

For the entire system there are 26 stations with an average spacing of about one-fourth mile in the downtown area and just over one-half mile systemwide. Metro stations are typically very large and modern; of the North American systems they are rivaled only by those of the BART system in San Francisco. Many stations have direct connections to adjoining stores, office buildings and recreational complexes, and major stations have large underground mezzanines with several concessions and retail displays. One station, Berri-DeMontigny, has three levels of tracks plus such a mezzanine. Typically only entrances/exits are at ground level, with all other facilities below ground.

A 5.2-mile southwesterly extension of the No. 1 line is nearly complete and scheduled for opening early in 1978. This will add eight stations. Since the line now ends at the western edge of downtown, this extension of the line will open an entirely different area of the city to rail transit service.

An important aspect of Metro is that with its inauguration, the entire bus system (M.U.C.) was reoriented to feed the subway stations rather than continue to carry commuters into the CBD on the crowded downtown streets. There are free transfer privileges between the M.U.C. buses

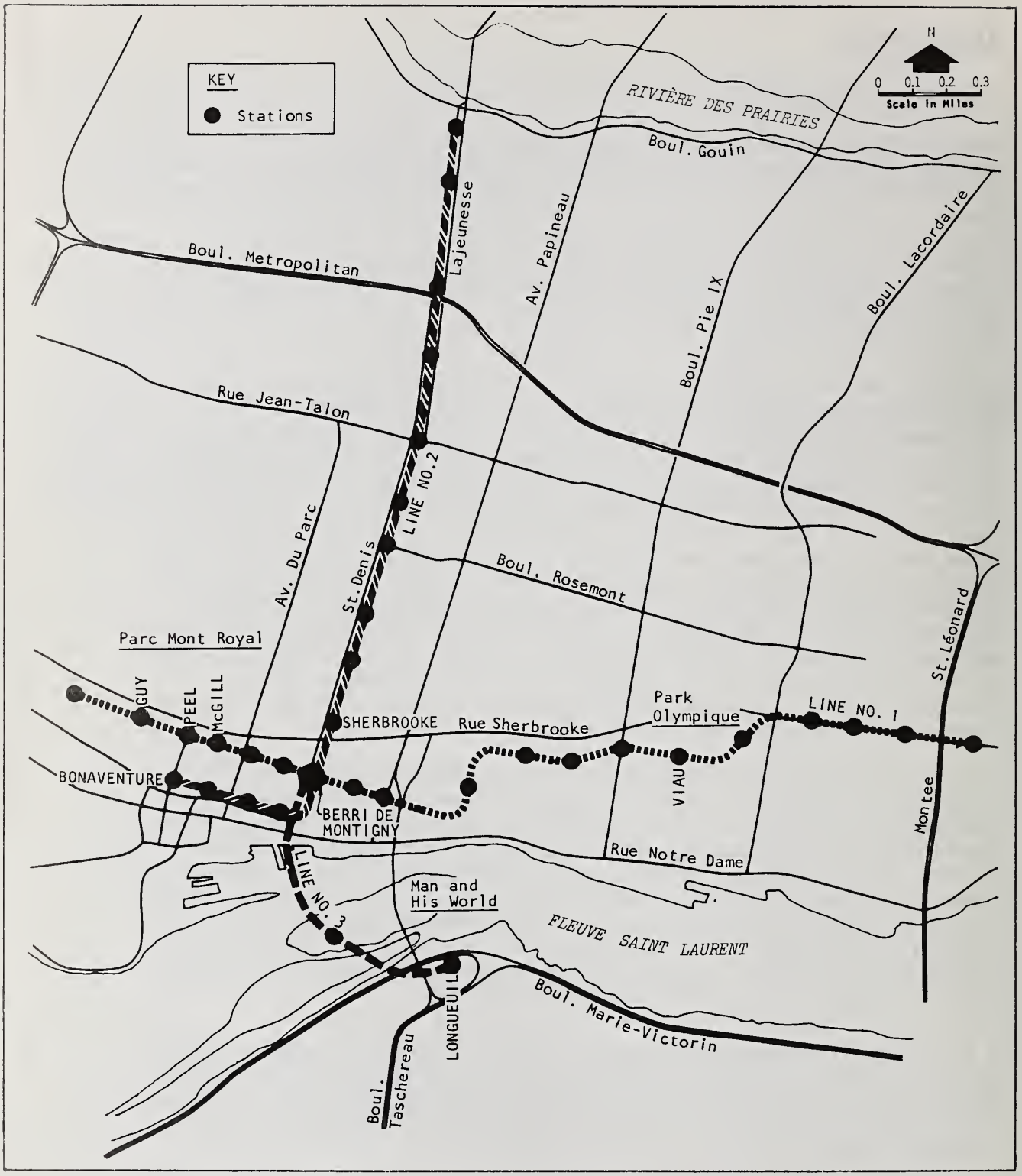

Figure 3.3
MONTREAL METRO RAPID TRANSIT SYSTEM

Illustration 3.10
View of Downtown Metro Station Interior with Shops on a Mezzanine Level Above Transit Platform

and Metro. Approximately 75 to 80 percent of the Metro riders transfer to or from a bus. A 73 percent modal split for transit (primarly subway) has been achieved for travel to downtown in peak hours. A 38 percent modal split for transit applies for all motorized trips. Currently, one of Metro's most visible problems is lack of adequate parking at the outlying terminal stations where many residents beyond the end of the line now arrive by car. The 2200-car lots at two (Henri-Bourassa and Longueuil) of the three suburban terminals are filled early each morning.

Sources of Information

One detailed statistical study of Metro's impact on urban development was made by the city's Housing and Planning Department (Service de l'Habitation et de l'Urbanisme, 1974). No other formal analyses were found. To supplement and verify this report's findings a site inspection was made and interviews conducted with a variety of public transit and planning officials and local private consultants.

Evidence of Impacts

Downtown Development: The decision to build Metro, with radial lines leading downtown, was founded on the desire by the city fathers to support the downtown so that it would remain a viable center. With the exception of Longueuil and Sherbrooke stations, virtually all new development which could be associated with Metro has taken place downtown. Conversations with various local public officials revealed a widespread conviction that without the building of Metro, the downtown area would have continued to decline and give way to decentralization of offices and retail activities. Such a trend was already in progress before the system was built. Any new downtown development, such as office buildings, would have occurred on a smaller scale than has actually occurred, according to these officials.

The new downtown development in Montreal is dramatic both in its intensity and diversity. In addition to expansion of commercial and governmental

Illustration 3.11
Downtown Montreal Looking West from Berri de Montigny toward High-Rise Offices near McGill and Peel Stations.

office space, there has been a major strengthening of the CBD's retail shopping role. Three major department stores, Eaton, The Bay, and Dupuis have expanded or built large new facilities at the main downtown Metro stations, and two of these are connected directly to the underground

subway concourses. Unlike the direct store connections found in some United States subways, these are typically large and open continuations of the station mezzanine itself.

At the beginning the two department stores had their bargain basement at the Metro level. Since last year, however, one of them, the largest, has remodeled and now offers its better quality merchandise on a main shopping floor at the Metro level.

In addition to the direct store connections, downtown Montreal has an extensive system of underground passages connecting major buildings. This concept was adopted by the city before Metro, but prior to the subway only a few developers had seen fit or been induced to provide them in their buildings. Now, however, the downtown is laced with such passages, some built privately and some built as joint public/private ventures. Most connect with one or another of the subway stations, and some link buildings as far as four blocks distant. Although the system is not complete, it is an important factor in the pattern of downtown pedestrian activity, especially during the cold winter months. The passages from McGill, Place Bonaventure, and Square-Victoria stations carry a total of some 150,000 pedestrians per weekday, a large proportion of the 370,000 persons who are estimated to enter the entire CBD each day.

All officials interviewed agreed that the Metro was the key to the rapid

Illustration 3.12
View of Activity Inside Shopping Area Above Place Bonaventure Metro Station

development of the underground passages. Developers, and especially the nearby department stores, saw the passages as an important benefit; some of the passages leaving the Metro stations are actually sales floors of the major department stores with direct connections. At the other end of the store, below-street corridors, some lined with display windows and small shops, continue the passage into the next block of buildings. Thus the subway patron benefits from a warm, convenient walk to his or her destination, while the stores benefit from exposure of their merchandise to a large potential clientele. It must be concluded that the direct connections and underground passages are important ways in which the subway system has provided an impetus for integrated design and function in adjacent areas of the central business district.

The city's study of Metro impact downtown concluded that the system had not materially shaped or altered the overall structure of the area. This study involved three parallel analyses. In the first, actual 1962-72 changes in the quantity and type of development in the downtown area were compared with the 1962 predictions. The differences found could not be attributed to the Metro. Second, 1962-72 land use data at the census tract level were compared, but these units proved to be too large to reflect any local changes.

Finally, an analysis was made of the land use changes which had occurred during the ten-year period in the blocks within 500 feet of each Metro station. Changes studied included land use and floor area for several different functions such as retailing and commercial office. These changes were then compared with those which had occurred in the same functions over larger areas of downtown. No consistent correlation was found to indicate that Metro has shaped the development which occurred downtown during the study period. The study concluded that "undoubtedly the Metro has made the downtown area more accessible, and has thus encouraged new development in a general way, but it did not alter the structure of downtown." However, it did not attempt to assess Metro's impact on the importance or strength of downtown development relative to that in the remainder of the city.

According to local officials, this is likely to have been a much more important effect. Certainly a very large amount of new downtown development has occurred during the past 20 years. Some of this occurred in the late 1950's before the transit system was a certainty, and utilized air rights made available at that time over a rail line and yard of the Canadian National Railway at Place Ville-Marie. Until that time, the lack of available, assemblable land had been a major constraint on downtown development. The subway system subsequently opened other downtown land for development, and also greatly enhanced access.

In general, the construction of Metro required the taking of very little land since almost the entire system was tunnelled and only two outlying parking lots are provided. The leasing of air rights over downtown Metro

stations was an important inducement to development at Guy and McGill stations, among others. These sites were attractive to developers

Illustration 3.13
High-Rise Air Rights Development over McGill Metro Station

primarily because of transit access and land availability.

Impacts Elsewhere: Outside of the CBD and particularly along the north-south Metro line (No. 2) only very limited development has taken place near the transit stations. Both city planning and transit officials feel that there has been little attraction to developers to develop there, because the only land available in most such areas are the relatively small parcels over the transit stations.

Some limited air rights development has taken place at Sherbrooke Station in the form of high rise buildings. In addition, the 1976 Olympic site includes two stations (Pie-IX and Viau), but the transit line was located here to serve the Games rather than the reverse.

The only other major development to occur, to date, around stations outside the CBD has been at Longueuil. At the sourthern terminal point of the No. 4 line, across the St. Lawrence River, this station (and line) was constructed to serve Montreal's now permanent "Expo" exhibition. This

Illustration 3.14
Development Above Sherbrooke Metro Station

station also serves as a major bus terminal for the South Shore communities. Extensive private development has taken place around the station in the form of high-rise apartments, commercial activities, and offices. Although the station has served as a focal point for this development activity, the original development opportunity was directly attributable to the coming of Expo. The land, which had been a military property, was sold to the city by the Federal Government for Expo parking with the understanding that it would later be redeveloped. Development was also spurred by the Longueuil city fathers' strong desire to develop this area. The transit system appears to have provided essential access, because without Metro, the Jacques Cartier bridge to downtown would not have been able to accomodate the tremendously increased travel demands generated by the new development. Major developer investment thus became logical at this readily developable location.

Evaluation

It is clear that Metro has influenced the nature and intensity of retail shopping activity in downtown Montreal, as shown by the success of the direct connections to major stores and the extensive network of underground pedestrian passages extending from the stations. The net transit system seems to have dramatically speeded the development of the underground passageway system by private property owners. Moreover, it has

Illustration 3.15
New Development at Longueuil Metro Station

probably helped to increase the overall strength of the CBD relative to other areas for office as well as shopping activities. At the same time, other unrelated forces, such as the availability of developable land, have also played a strong role in the revitalization of the downtown area.

Outside the CBD, and with the exception of the Longueuil and Sherbrooke stations, effective constraints to development seem to be the unattractiveness of many of the station areas relative to other locations. This is primarily due to the lack of substantial vacant or redevelopable land or its high cost. In addition, few encouragements in the form of zoning and other regulatory incentives have been provided, in contrast to Toronto. Under such constraints, provision of Metro access has been an insufficient inducement to create or redirect development.

SAN FRANCISCO

System and Surroundings

The San Francisco Bay Area Rapid Transit (BART) system began partial operation in 1972 following over ten years of design and construction. The full 71-mile system was in operation by 1974. One station, Embarcadero in downtown San Francisco, was added to the original 33 in 1976. Train frequencies are still less than half the intended level, due to continuing problems with the automatic train control system, train car reliability, and funding for operating costs.

BART now operates 18 hours per day, with reduced frequencies at night and no weekend service. Patronage in March 1977 is approximately 135,000 one-way person-trips per day compared with full-service projections of about 200,000 trips. This is approximately 2 to 3% of the daily trips made within the BART service area; the system carries some 7% of all the area's work trips and 21% of the work trips in the Bay Bridge corridor.[1]

One of BART's major objectives was the relief of peak period highway congestion. BART serves four main corridors which radiate from the central business districts of Oakland and San Francisco (Figure 3.4). These two cities are connected by the system's underwater Transbay Tube. This parallels the Bay Bridge, one of the area's most congested highway sections. One line is short, extending from downtown San Francisco only about six miles to Daly City on its southern boundary. From Oakland, one line serves the older and fully developed cities of Richmond and Berkeley. The other two are relatively long, extending from 15 to 20 miles into the rapidly growing suburbs to the east (Concord) and south (Fremont). All four lines are near parallel freeways.

While efforts were made to share existing rail and roadway rights-of-way, nearly 3,800 parcels of various sizes had to be purchased from private owners. These included many at BART's 23 suburban station/parking lot sites (lots are from 2 to 8 acres, totaling nearly 20,000 spaces). These privately-owned parcels accounted for approximately two-thirds of the land obtained for BART facilities. Approximately 14 miles of the lines are in shared rights-of-way along freeways, another 34 miles in shared/purchased railroad rights-of-way and another 22 miles (subway and aerial) along existing streets.

Three of the San Francisco Bay Area's nine counties (San Francisco, Alameda and Contra Costa) are directly served by BART and support it with taxes on property and retail sales. However, a basic understanding of the entire nine-county region is useful as a background for study of BART's land use effects.

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[1] Peat Marwick Mitchell & Company, Interim Service Findings, Transportation Service and Travel Behavior Project, BART Impact Program, Berkeley: Metropolitan Transportation Commission, 1976.

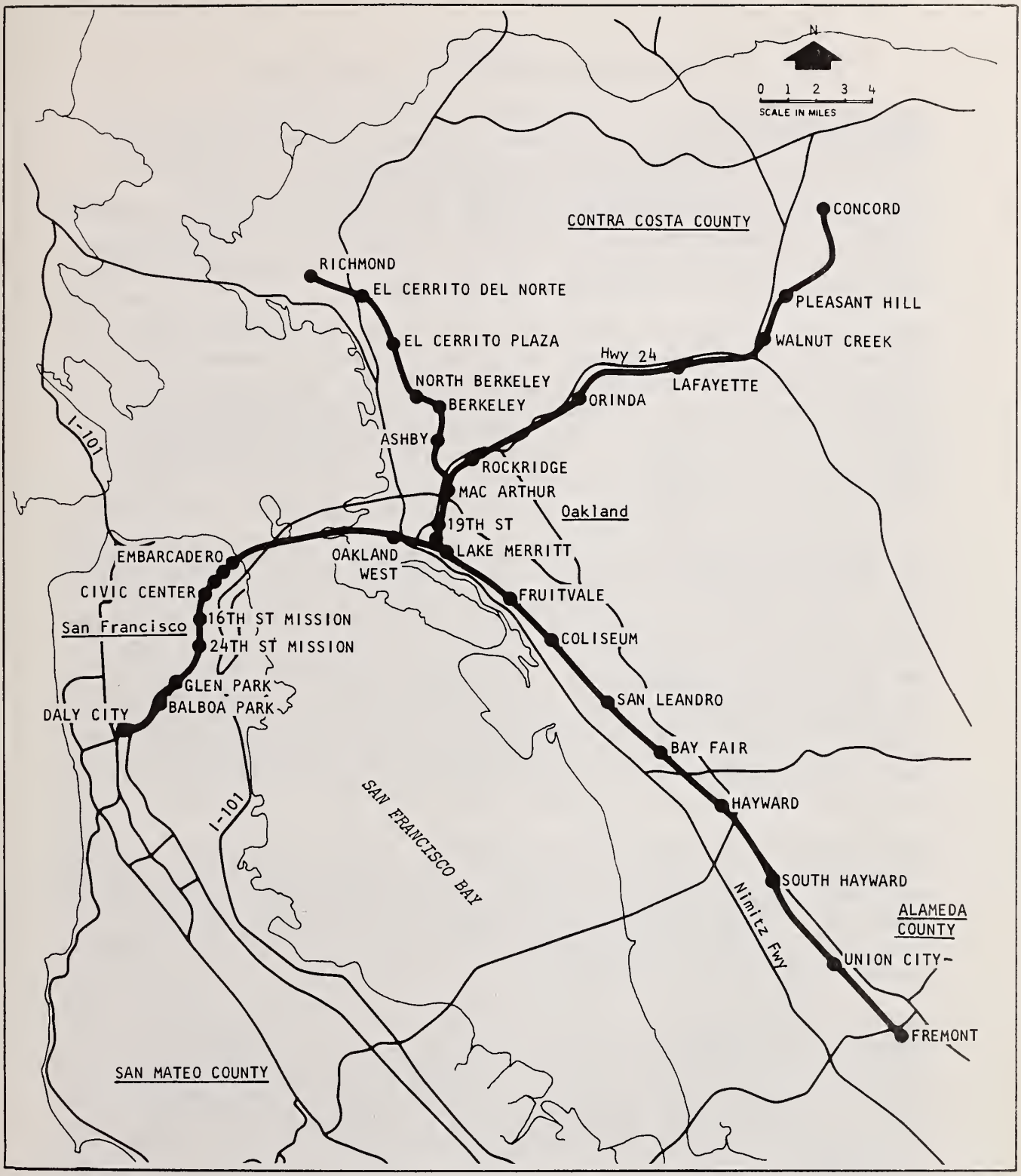

Figure 3.4
BART RAPID TRANSIT SYSTEM

Urbanization Patterns: An important factor in the development of the San Francisco Bay area is its unique topography. The Bay itself is a major barrier, separating San Francisco from much of its tributary area. The city is accessible from the northern suburban area of Marin County only by the Golden Gate Bridge and limited ferry service. Similarly, most of the East Bay population (about half of the SMSA's nearly four million) can reach San Francisco only via the Bay Bridge or BART's underwater Transbay Tube.

The Bay is also ringed by the hills of the Coast Range, which tend to force development into long corridors along the bay shores. Substantial development has also occurred in Contra Costa County to the east beyond the hills, connected to Oakland and the rest of the region by a major tunnel as well as highways through the few passes. These physical constraints, plus the continued growth of the region's population, have combined to generate suburban development in almost all relatively accessible and developable areas throughout the region.

One interesting aspect of the Bay Area development partially attributable to these physical constraints is the growth of Santa Clara County. This area, centered on San Jose at the southern tip of the bay (35 miles south of the San Francisco CBD), is the most populous and fastest growing portion of the region and is now designated a separate SMSA. The county's 1975 population was 1.2 million, out of 4.8 million for the entire nine-county region. Largely because of land availability, the aerospace and electronics industries settled on the bay shores of the peninsula between San Francisco and San Jose in the 1950's. This in turn generated other commerical as well as residential activity, which is forecast to continue through the end of the century.

This South Bay area is not served by BART. Although originally planned, future extensions of the system down the peninsula through San Mateo and Santa Clara counties are unlikely in the near future. The peninsula is served by limited Southern Pacific commuter train service to San Francisco; however, most commuters from the south enter San Francisco by car along the bayside freeways.

Density of Development: Population density (persons per acre) and housing density (housing units per acre) as of 1970 are shown in Table 3.3 for the three BART counties and the region. The figures for San Francisco County reflect its complete urbanization, while those for Contra Costa County underscore its large suburban area. Alameda County is an urban/suburban mix more typical of the region as a whole.

Table 3.3
POPULATION AND HOUSING DENSITY, 1970

Area	Persons/ Useable Acre	Housing Units/ Useable Acre
Alameda County	8.25	2.80
Contra Costa County	2.99	.93
San Francisco County	33.23	13.70
Bay Area (9-County)	5.83	1.95

Source: Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC), Projections of the Region's Future, Berkeley, California, September 1974.

As reflected by recorded subdivisions, land development in the Bay Area has slowed over the past 15 years. In 1960-1961, over 500 tracts and nearly 25,000 lots were recorded; in 1974-1975, the number of tracts was down to 237 and lots to fewer than 10,000. This downward trend was evident in each of the three BART counties.

From building permit data for 1962-1975, the dwelling unit "capture rate" for each of the three BART counties has remained at about the same fractions of the nine-county total during this period: Alameda county has averaged 19 per cent, Contra Costa 15 per cent, and 6 per cent for San Francisco City and County. In contrast, Santa Clara County's share has ranged from 23 to 43 percent and averaged 31 per cent.

The rate of downtown office development in San Francisco has increased markedly since approximately 1960. In fact, during the 1960-70 period the San Francisco CBD's share of the region's office space actually increased, in contrast to the decentralizing trend common to other American cities. In the past few years, however, the rate of office construction elsewhere in the region has surpassed that of the downtown area. Santa Clara County is the site of most of this activity.

Bay Area population: From 3,639,000 in 1960, the region's population has grown by a third, to an estimated 4,846,600 in 1975. Nearly half this population is concentrated in Alameda and Santa Clara Counties, and nearly 40% of the people live in six cities: San Francisco (671,100), San Jose (547,500), Oakland (336,600), Fremont (116,200), Berkeley (108,500), and Sunnyvale (106,400). San Jose and Sunnyvale are not served by BART.

Table 3.4

SAN FRANCISCO BAY AREA POPULATION BY COUNTY, 1950-1975

County	Census April 1, 1950	Census April 1, 1960	Census April 1, 1970	Estimate January 1, 1975
Alameda	740,315	908,209	1,073,184	1,089,500
Contra Costa	298,984	409,030	558,389	587,200
Marin	85,619	146,820	206,038	216,500
Napa	46,603	65,890	79,140	88,200
San Francisco	775,357	740,316	715,674	671,100
San Mateo	235,659	444,387	556,234	573,900
Santa Clara	290,547	642,315	1,064,714	1,193,400
Solano	104,833	134,597	169,941	182,500
Sonoma	103,405	147,375	204,885	244,300
9-County Total	2,681,322	3,638,939	4,628,199	4,846,600

Source: "A Special Report on the Economy of the San Francisco Bay Area," prepared by the Security Pacific Bank Research Department, San Francisco, September 1975, with data from the U.S. Department of Commerce and the California Department of Finance. (From Gruen Associates, Inc., 1977).

Before 1950, as Table 3.4 shows, San Francisco and Oakland experienced most of the region's population growth. Since 1950, the major growth has occurred in the southern portion of the Bay Area, while San Francisco and Oakland have declined in population. Ten of the region's 15 cities which doubled in population between 1960 and 1970 are in Santa Clara County and southern Alameda County.

Employment: The Bay Area civilian force in 1975 was estimated at 2,200,000, with 2,000,000 employed.* San Francisco, Santa Clara, Alameda, and San Mateo Counties accounted for about 80 percent of the region's employment. Of the nine counties, Santa Clara County experienced the greatest numerical and percentage growth in employment during the period of 1960-1970, paralleling its growth in population (Table 3.5). In 1960, the three BART counties provided 64 percent of the region's total employment, while in 1970 they accounted for 58 percent; this decline is indicative more of the strong growth in the southern area than of a lack of growth in the three counties served by BART.

*From "A Special Report on the Economy of the San Francisco Bay Area," Security Pacific Bank, September 1975.

Table 3.5

EMPLOYMENT TRENDS IN THE SAN FRANCISCO BAY AREA, 1960-1970

County	1960 Employment	1970 Employment	Numerical Change	Percent Change
Alameda	353,000	459,000	106,000	+30.0
Contra Costa	103,400	152,300	48,900	+47.3
Marin	32,900	55,600	22,700	+69.0
Napa	17,900	25,100	7,200	+40.2
San Francisco	475,900	536,300	60,400	+12.7
San Mateo	131,100	212,700	81,600	+62.2
Santa Clara	248,000	423,900	175,900	+70.9
Solano	43,300	54,900	11,600	+26.8
Sonoma	46,900	65,600	18,700	+39.9
9-County Region	1,452,400	1,985,400	533,000	+36.7

Source: "San Francisco Bay Area Report," prepared by the Economic Research Division, Security Pacific Bank, San Francisco, April 1971, with data from the California Department of Human Resources Development.

Summary: As evidenced by figures for population, employment, and land development, recent Bay Area growth has shifted away from the region's central area (San Francisco-Oakland-Berkeley) and into the developing southern core area around San Jose (Santa Clara County and southern Alameda County), with some growth as well in outlying suburban areas throughout the region.

Counties in which BART is located have shown a mixed growth pattern which reinforces the pre-BART character of the areas. San Francisco County continues to experience a decline in population but remains a densely developed urban center. Western Contra Costa County is densely urbanized and declining in population, while central Contra Costa County is a rapidly growing, low-density suburban area. Alameda County has a declining population in the Oakland/Berkeley area, with vigorous growth and land development in the sourthern communities.

Sources of Information

Although the BART system has been in partial operation less than five years and has not yet reached its originally planned level of service, there is a large and rapidly growing body of literature on its land use impacts. Much of this is due to the federal government's BART Impact Program and its predecessor, the BART Impact Studies. Several smaller research studies have also been done, as well as a number of municipal planning charts similar to those done by various suburban Washington counties and cities in anticipation of METRO. Finally, the real estate

trade literature and local newspapers have published some impressions and observations of impact.

It cannot be emphasized too strongly that these studies are not the final word. Most of the literature now available was published or relied on data for the period before even partial BART operations began. The University of California's initial BART Impact Studies, for example, were begun in 1971 and completed by 1973. In addition, most of the land use impact-related publications from the subsequent BART Impact Program are resource papers to assist in the program's design for its land use impact study, rather than original studies of BART's impact.

Because of the scarcity of literature on the more recent impacts of BART, this study relied heavily on actual observation. In addition, one very recent BART Impact Program document (Gruen Associates, 1977) provided a valuable comprehensive overview of new development around BART stations, as well as detailed description of Bay Area growth trends.*

A brief explanation of the BART Impact Program may be helpful here. This major research effort will continue to produce results on BART's effects for the next several years, and potential users across the country should be aware of its relevance. A special Transportation (then Highway) Research Board workshop on BART's impacts, held in 1970, demonstrated the usefulness of a comprehensive study of the BART system's effects as a prototype for other cities (HRB, 1970). This led to a grant from U.S. Department of Transportation (DOT) and Department of Housing and Urban Development (HUD) to the University of California's Institute for Urban and Regional Development to conduct the "BART Impact Studies." This encompassed travel as well as effects on the region's environment, land use and retail sales. Professor Douglass B. Lee led the land use impact study effort (1973, several references).

Responsibility for the studies was transferred to the newly-formed Metropolitan Transportation Commission in 1972. In 1973, with the completion of the University's work, the Federal sponsors agreed to enter on a more intensive program of studies. This, the eight million dollar BART Impact Program, involves several private consulting firms under the overall guidance of MTC and with continuing review by DOT and HUD. Separate studies within the program focus on the system's effects on the region's environment, travel behavior, land use, regional economics, social processes, transportation-disadvantaged groups, and public policy.

The Environment Project has produced some results related to land use impact (Gruen Associates, 1977), but the Land Use and Urban Development Project has just begun its work (early 1977) and most of its findings will not be published until mid-1978 or later. However, when complete, this study should provide the most comprehensive analysis of a rail rapid transit system's land use impacts yet attempted.**

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*See the Bibliography for the full list of references.

**Persons interested in further information should contact the Metropolitan Transportation Commission, Hotel Claremont, Berkeley, CA 94705.

Effects of BART on Regional Development

Since BART is a high-capacity system with several radial lines extending from the CBD far out into the surrounding suburbs, it is reasonable to suggest that the urban area might be reshaping around the system. In particular, one might expect suburban fringe development to be occurring more rapidly near the BART line terminals than in other parts of the region not served by transit.

In the few years since BART's inception, there is as yet little evidence to support this hypothesis, as might be expected. As noted in the earlier description of the region's development, the most populous and rapidly growing suburban area is Santa Clara County, far from any BART line. In addition, rapid growth is occurring to the southeast toward Livermore and in the North Bay counties, also not served by BART.

The suburban areas which do have BART service exhibit mixed rates of growth. The Richmond line is relatively short and terminates in an older suburb; in lieu of a BART rail extension, BART contracts with the East Bay bus authority (AC Transit) for express bus service from this line's El Cerrito del Norte station into the fringe areas farther north.* Although some growth has been occurring in these areas, it is small relative to that in the non-BART corridors just cited.

In addition, the BART feeder service and the Richmond Line parking lots are not heavily used, indicating little impact. However, BART service to San Francisco from this area is relatively poor; no direct trains are yet provided due to technical and financial problems, so a mid-trip transfer is required. With full BART service, planned for inauguration within a year or two, development pressures in this corridor may increase.

The Concord line terminus is in a fringe area which has been growing rapidly since 1960. BART has surely contributed to the speed and volume of this growth; commuter travel from here into the downtown San Francisco area is heavy, and BART's heaviest patronage is in this corridor. All five station parking lots along this line are overflowing. BART travel time to downtown is competitive with the auto, and developers of apartments and single-family housing tracts here have emphasized BART access in their promotion.

However, other factors have also been important. First, transit service already existed; BART replaced Greyhound express bus service to San Francisco here. Without BART this service would almost surely have been upgraded in quality and capacity. Second, BART is either in the median strip or within a thousand feet of a 6 to 8-lane freeway from its Concord terminus all the way into central Oakland; this freeway, which was completed along with BART, provides direct access into downtown San Francisco. This freeway improvement (some all-new construction and

*BART also provides express long-distance bus feeder service from other outlying points in Contra Costa County to several of its stations on other lines.

some widening) was made in response to the travel demands already developed in the Concord corridor, and was a major inducement of further growth. It should be noted, however, that funds were made available for the widening of much of this freeway only because of the opportunity for reconstruction afforded by BART's median-strip alignment. Thus BART "caused" the freeway expansion (MacDonald & Smart, 1975).

Finally, the area was a natural location for growth in any case, since it was one of the few places within reasonable commuting distance of the CBD with an attractive environment and available land at acceptable cost. BART's role was therefore that of an important member in a complex of pro-development forces, rather than the only one. However, its influence on the freeway widening in addition to its own more direct land use impact made it a particularly powerful force in speeding the rate of development.

The Fremont Line presents a similar situation. Here the line is BART's longest, extending over 20 miles from San Francisco down the east bay shore to within twelve miles of San Jose. The last five miles of BART line are in the essentially rural but rapidly developing areas of Union City and Fremont. This portion of the line was to be in the median of a then-planned freeway which has since been cancelled although signs of its right-of-way reservations are still apparent along some parts of the BART line. BART patronage at Fremont is sizeable (about 3,000 of BART's total of 70,000 daily patrons). Fremont itself has grown from a few thousand in 1960 to an estimated 116,200 residents in 1975.

Illustration 3.16
Fremont BART Station Area

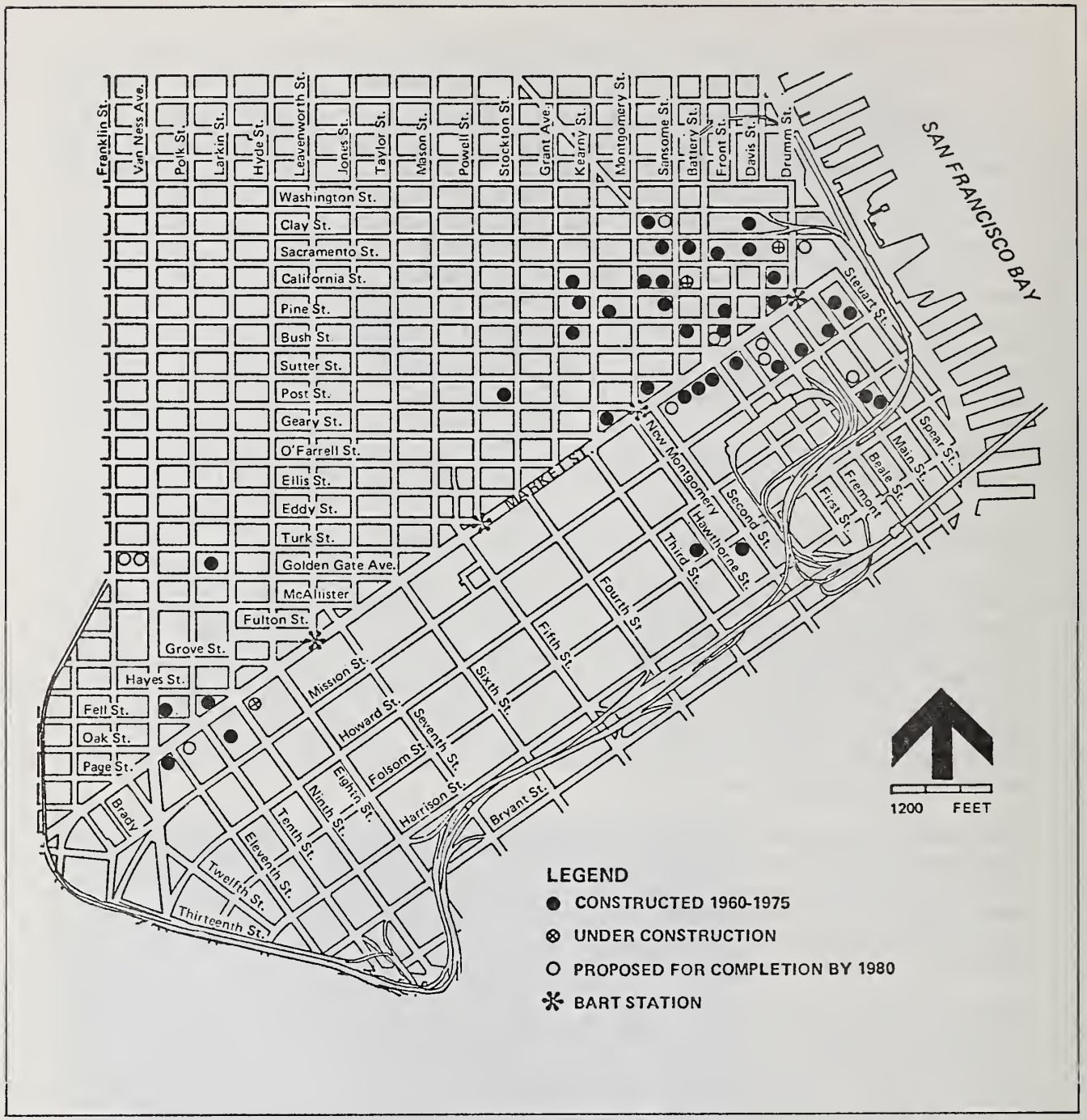
As in Concord, other powerful forces in addition to transit have encouraged development in the Fremont area. First, many square miles of easily developed flat land was available. Second, urbanization has converged on Fremont from both north and south, through growth spreading south from Oakland-San Francisco and north from Santa Clara County. Third, the city government has encouraged growth. Fourth, the area was already well served by the Eastshore Freeway, extending both north and south. Hence its eventual development was probably inevitable. Also, it was growing very rapidly several years before BART was placed in service, and its rate of growth has not increased since then. On the basis of such forces, Wells (1973) concluded that BART had not been an important factor in the decisions of residential and commercial property buyers to locate in this area. The promise of BART service probably added to these other forces, but it appears certain that development would have occurred without the transit system, even if less rapidly.

Effects on the Central Business District

Even if BART has had no major effect on urban form at the fringes of the area, it is logical to expect that such a radial transit system might encourage development at the downtown center. The BART map (Figure 3.4) suggests that BART's "center" is in downtown Oakland; however, since all three East Bay lines merge into a single low-headway line into San Francisco, the downtown San Francisco stations actually have the best service. A following section will describe evidence of BART's effects in the subcenter of Oakland as well as the remaining urban and suburban station areas.

The period since 1960 has seen a dramatic rate of hi-rise office construction in downtown San Francisco. From an almost insignificant rate in the previous decade, an average of 1,300,000 gross square feet of such space has been completed each year. Buildings now under construction or projected for completion by 1980 will raise this rate even higher if all go forward as planned (Figure 3.5).

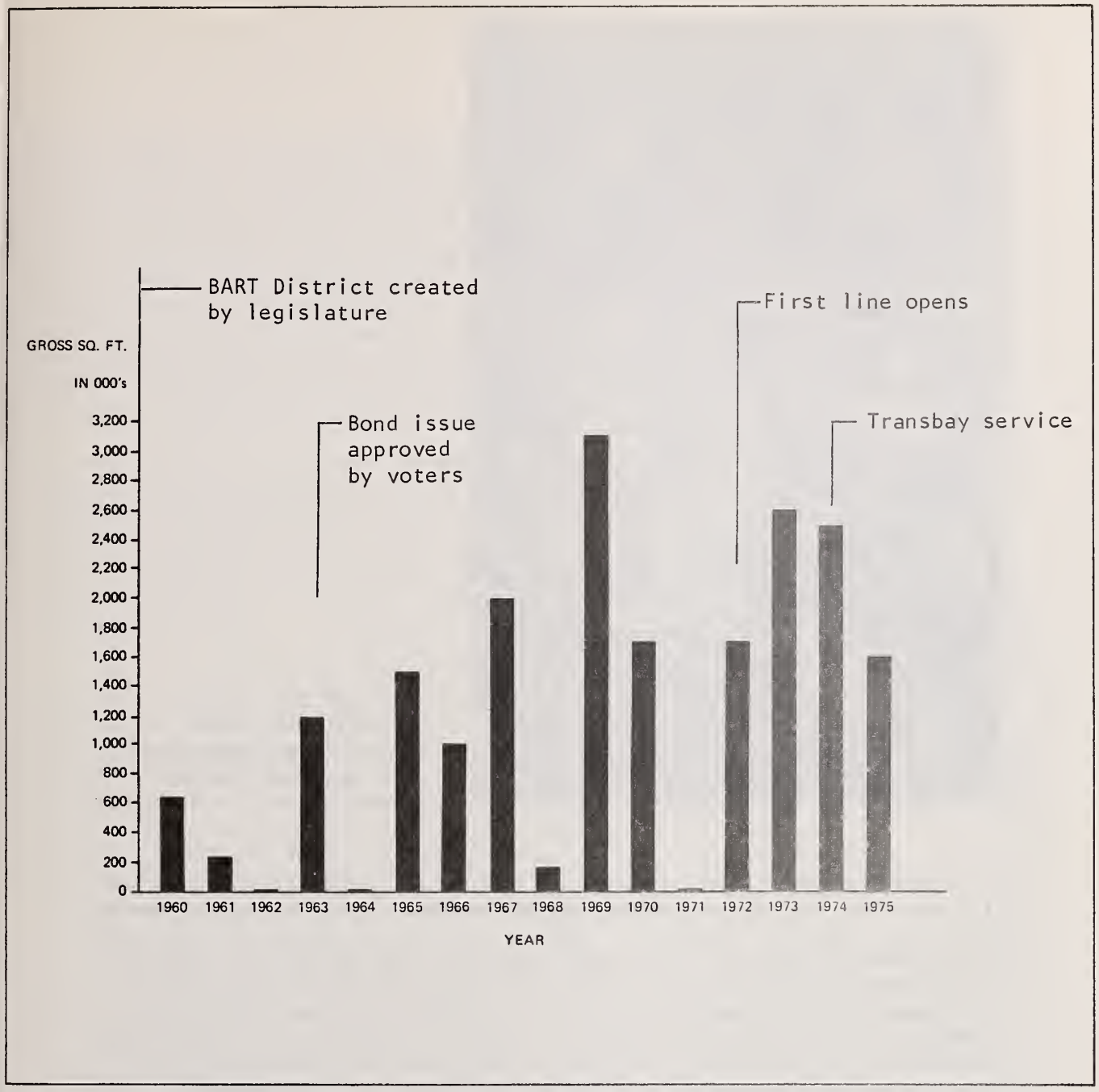
These buildings are almost entirely within about 1,500 feet (five blocks) of the Montgomery and Embarcadero BART stations on lower Market Street. A smaller cluster is located farther to the west near the Civic Center and City Hall. Between these two along the line (under Market Street) lies the main shopping district and a declining older commercial-residential district to the north, and a similar but more deteriorated area all along the south side of Market. This "south-of-Market" area has been the scene of large scale demolition of old hotels, housing and commercial structures for the proposed Yerba Buena redevelopment project. In addition, in recent years new hi-rise office buildings have begun to appear here as well (Figure 3.6).



[1]Buildings or portions of buildings with a height of at least 10 stories or 118 feet.

San Francisco Department of City Planning.

Figure 3.5
LOCATION OF MAJOR DOWNTOWN SAN FRANCISCO OFFICE BUILDINGS[1] CONSTRUCTED 1960-1975 AND PROPOSED FOR COMPLETION BY 1980



*Buildings of 10 Stories or more.

Source: Commerce and Industry: Commercial Trends, San Francisco Department of City Planning, July 1975, and Bay Area Rapid Transit District Office of Public Information

Figure 3.6
HIGH-RISE OFFICE SPACE CONSTRUCTION STARTS IN DOWNTOWN SAN FRANCISCO 1960-1975*

Illustration 3.17
View of Downtown San Francisco Along Market Street; BART and Muni Streetcar Subway Beneath

As Figure 3.6 shows, this intensive construction activity has coincided with the BART planning and construction period. A relationship between the two is therefore possible. Several detailed studies have been done to test this hypothesis (Institute of Urban and Regional Development, 1973g; Gruen Gruen + Associates, 1976). The Institute conducted an extensive review of data on property assessments, sales, and building completions, and also interviewed a variety of developers and planning officials. It concluded that BART had been one of several significant factors in the extent and location of the downtown development.

The GG+A work draws upon the authors' detailed knowledge of the area and experience in commercial office market evaluations to provide a complement to the more academic style of the Institute's work. In addition to interviews with developers, a historical view of trends in property values, rents and development locations was employed along with a review of zoning and other public policy factors. Results were similar to Lee's at the Institute; GG+A also concluded that BART had been a significant contributor to the intensity and location of downtown development, although by no means the only such force. Much of the development would probably have occurred without BART, but more slowly.

Both studies cited several other factors unrelated to BART, including rezoning of the entire CBD to allow floor area ratios as high as 25:1 and the historical dominance of the lower Market Financial district (the "Wall Street of the West") - not only within the region but also as the major headquarters city of the West and the Pacific Basin. To these forces might be added the historical attractiveness of the Bay Area and its San Francisco urban center, as well as the region's unusual geography which allows almost no alternative to a continued focus on the San Francisco CBD for major regional office development; the Bay and hills have forced all new development into corridors in which the transportation arteries and bridges all lead to San Francisco.

Several writers have called attention to San Francisco's 1966 rezoning, which provides incentives for the development of sites near the BART stations. Actually, two ordinances are involved. In 1960, a liberalized city-wide zoning ordinance permitted floor area ratios of 20:1 everywhere in the CBD north of Market, and 25:1 on corners. This rezoning was apparently unrelated to BART, since the BART bond issue had not even been passed then.

In 1966, this zoning was changed following a heated public debate on desirable downtown densities. Specific provisions were made for BART as well as the parallel Muni Metro subway which was to accompany BART. This new zoning approach broke the CBD into its functional subareas. Highest densities were allowed in the Financial district, but even here the maximum was only 14:1 instead of the earlier 20:1. However, the new ordinance did allow maximum twenty percent density bonuses for buildings which had direct access to BART or were directly adjacent to a station, and ten percent bonuses to buildings within 750 feet.* Some development rights transfers are also allowed.

In view of the strength of development pressures in downtown San Francisco, both the 1960 and 1966 policies were probably essential in "lifting the lid" on the overall size and height of the city's downtown development. Their limits were used by many developments and clearly contributed to the intensification of use which occurred. The city's later policy of limiting parking to seven percent of the floor area of new downtown buildings was also a factor complementary to transit use, and at the same time encouraged CBD construction by reducing cost. Moreover, GG+A (1976) concludes from their study of the Montgomery Street BART station's impact on property value and development that the presence of BART and these development incentives along Market Street served to draw development into the lower-status south-of-Market area more quickly than would have otherwise occurred. This resulted in a general upgrading of this area as well as of lower Market Street itself. This appears to be a reasonable conclusion, although it must be pointed out that there was almost no other direction for the financial district to develop.

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*San Francisco Downtown Zoning Study, Department of City Planning, 1966.

Another factor in the renewal of Market Street was the initiative taken by local business and civic groups to beautify the street itself. This initiative sought to take advantage of the temporary removal of much of the street for BART subway construction to redesign and improve the street and sidewalk spaces. Financing was provided jointly by BART, Federal grants, and a $24 million San Francisco citywide bond initiative. The result is a striking improvement, which has undoubtedly contributed to reversal of the gradual decline which had been in evidence all along the street. Although the new facilities are not yet complete, there is an obvious resurgence of new retail as well as office activity all along Market Street. This "streetscaping" is already proving to be a major force in restoring the street to its former prominence as the city's most dynamic and beautiful boulevard, and a general upgrading of the quality of retail stores and other uses is beginning to appear.

Illustration 3.18
Market Street in Downtown San Francisco Showing Street Beautification

Effects on Other Commercial Centers

Other historical commercial centers served by BART include San Francisco's Mission Street and the Oakland and Berkeley central business districts. Oakland is the region's third largest city (after San Jose), while the Mission district is a smaller subarea of San Francisco and Berkeley is the fifth largest city (after Fremont, where the BART station is on the edge of the city's largely undeveloped mile-square CBD).

In downtown Oakland, BART lies beneath Broadway, with stations at 12th and 19th Streets. The 19th Street station is in an older shopping area just north of the busiest part of the CBD. Adjacent to the station itself, redevelopment has been limited to a few buildings of up to ten stories. The two large Kaiser Industries headquarters buildings several blocks distant on Lake Merritt are much larger. Other major activity at this station includes some retail construction and renovation. Local officials and developers agreed that BART has had a substantial influence on this limited new development and renovation. The subway and also the street beautification undertaken with it were both important in encouraging new retail and office activity in this once-declining area.

A more substantial and demonstrable effect has occurred at the 12th Street station, the site of the Oakland Redevelopment Authority's City Center Project. Gruen (1977) reports that according to redevelopment officials this project could have been only a fraction of its present 15-square-block size without BART, and might not have occurred at all. The reason for this is that the cost of the BART station was allowed in fulfillment of the city's required share of the project funding.

Illustration 3.19
Oakland City Center Development Project

HUD provided the remainder, with the result that the city accomplished the project without a major commitment of its own funds. Since Oakland has a history of financial difficulties (arising from its very large low-income population and its inability to attract private investment and jobs), this was a key factor.*

The City Center project is now partially completed. Ideally located in the downtown area, it covers 15 square blocks and already includes two hi-rise office buildings; construction is proceeding on further office and retail facilities. Ultimately the project will have several office buildings as well as a large in-town shopping center with a direct connection to the BART station. BART is expected to be an important source of patrons.

Several blocks to the south of the City Center project is BART's Lake Merritt station. BART cleared a three-block area here for construction of the station as well as its own headquarters building and a parking lot. Situated in a densely populated, low-income, area (Oakland's Chinatown) between a freeway and the old city-county governmental area, little development had occurred here for many years prior to BART.

Since the early 1960's, however, several major projects have been completed or are in progress. In addition to the BART station and headquarters, these include the Oakland Art Museum, a new urban junior college campus, and several planned private office/residential developments. Here again, however, as in downtown Oakland just a few blocks away, the land-assembly activities of the Oakland Redevelopment Agency seem to have been the crucial factor. In the case study analysis of this area by Gruen Gruen + Associates (1974), BART and the public redevelopment activities are concluded to have provided the essential stimulus. BART's effects were not isolated because of their close connection with the redevelopment activities.

Gruen's (1977) review notes that the BART investment in the Lake Merritt station provided the local match for Federal renewal funds here (specifically for the new Laney College site) just as in downtown. This renewal effort in turn has been instrumental in generating private as well as public investment.

In Berkeley, little development has taken place despite the proximity to the University and the ideal CBD location. One 14-story private office building was built at the main entrance to the downtown BART station, but was slow to attract tenants. This building was directly attributable to BART, but its difficulties may have deterred other developers. More important, it resulted in a downzoning around the station to prevent further hi-rise development. The Bank of America had originally planned to build a similar hi-rise building just across the street,

*However, HUD no longer permits this approach.

but have instead recently completed a one-story bank on the site (although some earlier writers on BART's impact have mistakenly cited the existence of the larger building). Although the hi-rise development attempted here appears to have been premature, with eventual direct BART service to San Francisco more such development should be viable even though not now allowed.

Illustration 3.20
Central Berkeley BART Station Area (station entrance is small circular building)

Similarly, virtually no development has occurred at the two BART stations on San Francisco's Mission Street. This area is a densely populated, low-income (largely Hispanic) district of older two and three-story buildings, and is not an attractive area for intensive new development. In addition to its community character, land assembly would be difficult because of the many small buildings and the narrow streets are not well suited to greater traffic. However, the parcels immediately around the stations have been rezoned for somewhat more intensive development although the remainder of the area has not. The originally planned zoning in association with BART was for much more intensive development all along the Mission BART corridor, but was substantially reduced in scale because of local community opposition.

Effects in Other Station Areas

The BART system includes 24 stations in addition to the ten already discussed. These are typically located in areas of varied land uses, often between low-density residential and local shopping districts. In general, very little if any BART-related development has occurred yet at any of these locations.

Many studies of land use and land value impacts have been conducted at various stations. Gruen Gruen + Associates, using data on real estate transactions and observation, reported no impact or likelihood of future impact at Fruitvale, MacArthur and Coliseum largely because of the blighted character of these industrial-residential Oakland areas (1973, 1974). In the case of MacArthur, the station's mid-freeway location was also cited as a strong deterent.

Illustration 3.21
McArthur Street BART Station Area (station in median of freeway)

Davis (1970) analyzed differences in home sales prices between the Glen Park station neighborhood in San Francisco and its larger surrounding area, and concluded that prices rose substantially in the year the station location was fixed (before construction).

Skaburskis (1976) and GG+A (1974, 1976) studied land value impacts around the Rockridge station in Oakland. Both found small effects on value but no development, largely because of a successful community campaign to have the area downzoned specifically to avoid such a change in intensity. In addition, BART is in the median of an elevated freeway built at the same time at this location, which makes it difficult to isolate the transit system's effects. This is a case in which community opposition prevented an impact (of the joint highway-transit facility) which almost certainly would have been substantial; the area is attractive and easily accessible to San Francisco as well as Oakland and Berkeley, and substantial land assembly was in progress up until the time of the downzoning.

Illustration 3.22
Rockridge BART Station Area (station in median of freeway, parking beneath)

Lee et al. (1973) used a statistical analysis of spatial and temporal aspects of single-family home sales data to estimate BART's effects on this type of property in several suburban sites. Major conclusions were that BART has had a measurable effect on residential property values in some neighborhoods but not necessarily in others, and that

BART's impacts are stronger in areas where other factors are also favorable. This view has also been supported by BART's real estate manager, who has argued that BART's impacts are largely determined by local planning decisions and will generally be least in stable, low-density residential areas (Carlson, 1971; Carlston, 1974).

Gruen's (1977) inventory of recent development around BART stations for the BART Impact Program also supports such a view. This study involved comparisons of 1965 and 1975 aerial photos as well as interviews with local planners in all BART communities and direct observations throughout the system, and is the most recent as well as most comprehensive review to date.

Illustration 3.23
Suburban Pleasant Hill BART Station Area Showing Low Density of Development

Although no attempt was made to specifically attribute development to BART, the study found so little development in most cases that attribution was irrelevant. The study also indicated that changes in land use policy had been made for 24 of the 34 BART station areas; in instances when a change had been made, its effect was more often to encourage development (16) as to restrict it (8). Restrictions were most common in low-density residential areas in inner cities such as Oakland and Berkeley. Although several suburban cities rezoned to encourage development, little has yet occurred. Several others, however, refused to change zoning for this purpose, thereby nullifying any BART effects.

At the same time, many of BART's suburban stations were located adjoining stable low-density neighborhoods, in the hope of attracting patronage from these areas. These are the very places in which most property owner-residents have the least desire to see more intensive development, and are often effective in blocking it. Other BART stations were located in depressed low-income inner city neighborhoods in the hope of revitalization. However, few developers are willing to risk major investment in such areas; moreover, major redevelopment would probably destroy the neighborhoods it is hoped to save. Thus the potential for land use intensification and renewal is substantially less than it would be had the stations been sited specifically to encourage such impacts.

Evaluation

So far, BART's impacts on Bay Area land use seem largely confined to the San Francisco central business district, where it was one of several forces which led to a boom in office construction during the 1960's and 1970's. Without BART this development would have probably occurred, but not to the same high degree. In addition, it probably would have remained more on the north side of Market Street rather than extending to the south to revitalize the declining area there, and Market Street itself probably would not have been upgraded as it was.

In attempting to apply the San Francisco experience to other cities, it is essential to remember that the San Francisco CBD never experienced the degree of deterioration common in downtown areas elsewhere in the country. The city's historical role as the major banking and corporate center of the West and the Pacific Basin, as well as the magnitude and importance of its tourist trade, served to keep the downtown prosperous and interesting. With these advantages, suburbanization or outright decline in office functions has never been as serious a concern as in many other cities. Finally, the Bay Area's topography makes it almost imperative to travel through San Francisco to get from one major suburban area to another. This is true for bus as well as rail transit, since all the region's transit systems lead into the CBD. Hence office locations regionally competitive to downtown San Francisco scarcely exist, and BART did not have the degree of opportunity for impact which might be encountered in cities without such constraints.

Impacts of BART outside the CBD appear slight to date. In the cases in which development has occurred, other factors in addition to BART tend to be important. Most important has been the role of other public policies, particularly zoning and the use of urban redevelopment powers as a means of assembling land. Community support has also been shown to be essential; residential opposition to BART-related apartment and office development has resulted in downzoning and prevention of development even when other factors appeared positive.

Despite the lack of impact at most BART stations to date, observation and familiarity with the region suggest that potential remains strong.

BART is only five years in operation, during a period of decline in the construction of housing and a protracted overall economic slowdown. With eventual improvement in economic conditions, further development around some stations outside downtown San Francisco is inevitable. However, land use impact potential would have been substantially greater if some of the stations had been located in areas of greater development potential and supported by stronger land use policies favoring intensification of use.

Chapter IV
RAPID TRANSIT IN OTHER CITIES

In addition to the three full-scale new transit systems described in the previous chapter, a number of significant smaller systems and improvements have been added in other cities. These include new one-line systems in Cleveland and Philadelphia (Lindenwold) as well as outward extensions and relocations of lines in Boston, Chicago and New York.

Each of these major improvements is discussed in this chapter. As with the three larger systems already analyzed, these differ greatly in many respects. The Lindenwold Line is basically a regional rail line, and is separate in operation and administration from the Philadelphia rapid transit system. Cleveland's one-line system serves the CBD from established areas in an east-west corridor.

The Chicago extensions are largely in freeway medians and serve only central city areas. The Boston extensions penetrate suburban areas somewhat more. New York's Crosstown subway, still under construction, is wholly within a densely built-up urban corridor.

In addition to these improvements, the new Washington, D.C. Metro rapid transit system is reviewed. This provides more a progress report on land use impact than a full study, since only a small central segment of the originally projected 98-mile system is in operation.

This broad array of major conventional rapid transit improvements provides a wealth of varied experience relevant to the understanding of the relationship between transit and land use. Since each case is so different in factors important to land use impact, together they permit useful comparisons which help to illuminate each factor's influence.

Only conventional rapid transit systems are included in this chapter; consideration of recent commuter rail, light rail and busway improvements is placed in the following chapter.

PHILADELPHIA

System and Surroundings

The Lindenwold High-Speed Line began service in early 1969. The system consists of one double-track line extending from central Philadelphia across the Delaware River and southeasterly into New Jersey, a distance of 14.5 miles. It is in essence a regional rapid rail line, similar in function to BART's Concord or Fremont lines in the San Francisco East Bay. The line serves the city's suburban south Jersey area, with six stations spanning 8.5 miles. In addition, there are two stations serving the central area of Camden, just across the river from Philadelphia, and five stations in the Philadelphia central business district.

The Philadelphia portion of the line is underground, using the modernized facilities of the old Locust Street Subway. It crosses the river on the Benjamin Franklin highway bridge and traverses Camden using the tunnel facilities of the former Philadelphia-Camden Bridge Line. The remainder is at grade, elevated, or in an open cut, utilizing an earlier rail right-of-way that was completely grade separated for the Lindenwold Line. Service is generally very frequent, with headways of ten minutes or less most of the day and night.

Patronage of the line is now about 40,000 one-way trips per day. Most users of the line reach their New Jersey suburban station by auto.

Illustration 4.1
View of Parking Lot at Lindenwold Station

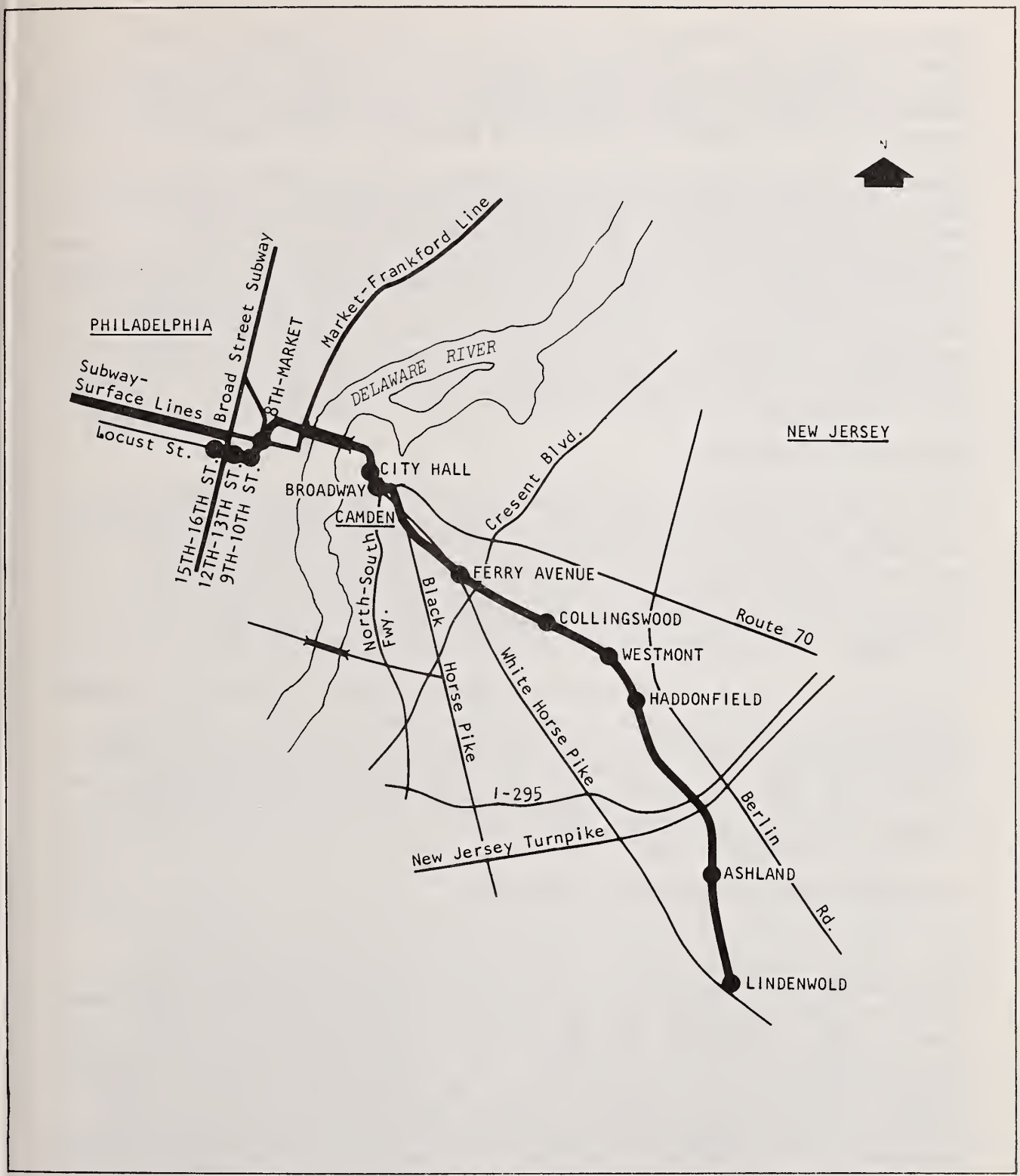


Figure 4.1
PATCO LINDENWOLD HIGH-SPEED LINE

From the initial 4,400 spaces, parking was rapidly expanded to today's total of some 9,500. Most of the parking lots are very large; at Lindenwold Station alone, some 2,745 spaces are provided. Still, more spaces are needed at some stations; a new station is planned between Haddonfield and Ashland in an effort to accommodate this demand.

Camden is an old, depressed city once competitive with Philadelphia in many ways. Crime has been a major problem in Camden over the past several years, and the city shows considerable physical decay and abandoned buildings typical of older industrial cities. The farther suburban reaches of the transit line serve newer, middle-class residential areas. Density is low (5.5 persons per acre in 1970), and growth has been rapid since 1960. Some of the area is still open farmland, but in general, development has spread out from small towns to cover much of the corridor. The line's stations are in some of these towns, adjoining commercial as well as low-density residential neighborhoods.

Sources of Information

During the last eight years the Lindenwold Line has been the subject of the most rigorous and extensive set of studies ever conducted on transit's residential property value impacts. These studies, conducted in the Regional Science Department of the University of Pennsylvania, have been led by Professor David E. Boyce. They include both faculty research and a series of doctoral dissertations, and collectively form a uniquely useful demonstration of statistical evidence of impact.

In addition to these studies on value impacts, other studies have attempted to deal with evidence of actual development along the line. These are less complete and rigorous but still useful (e.g., DRA, 1975). To complement this published evidence, a series of interviews was held in Philadelphia with university researchers, transit authority representatives, and urban planners and administrators. A visual reconnaissance of the line was also conducted.

Evidence of Impact: Downtown Philadelphia

It is impossible to establish whether the opening of the Lindenwold Line had any impact on downtown Philadelphia. This area had been already served by 13 commuter rail, four rapid transit and five "subway-surface" lines (on-street outside the CBD), i.e., a total of 22 rail transit lines. Renovation and extension of the "Bridge Line" as part of its upgrading into the Lindenwold Line, could not have a major visible physical impact on the largely built-up, old city center. While a number of high-rise office buildings and condominiums were constructed during the early 1970's, some atop the Line on Locust Street, it is impossible to estimate the contribution of any one of the many factors causing that construction.

It is worth noting that the Lindenwold Line, with only eight stations in New Jersey, brings approximately 30 percent more persons into Philadelphia (40,000 vs. 30,000 daily one-way trips) than the 17 bus routes

of Transport of New Jersey. These routes, including some expresses, serve a network of 356 miles. The Lindenwold Line also carries more patrons than any single one of the commuter rail lines.

The only formal study to seek evidence of the line's effect on the CBD was that of Gannon and Dear (1972, 1975), who assembled and reviewed data on trends in the locational distribution of the region's employment and new office construction. They found that the city of Philadelphia's share of employment in the SMSA declined steadily during the '60s, from 60.1 percent in 1960 to 49.4 percent in 1970. This amounts to a loss of some 32,000 jobs, while the suburban area gained 158,000 jobs. More recently developed figures prepared by the Center for Urban Policy Research at the State University, New Brunswick, New Jersey (in 1977) indicate a much larger recent decline in employment for the city. According to 1976 employment figures, the city's share of employment in the SMSA has dropped to 31 percent.

Gannon and Dear's review of office space construction trends indicated that Center City Philadelphia's share of the SMSA's office space declined from 30 percent in 1960 to 28 percent in 1970. However, during that time Center City floor space expanded at a mean annual rate of three percent or a total of some five million square feet, making the downtown area still the focal point for intensive new office construction in the region. Gannon and Dear's findings are limited in that their data covered only the 1960-70 period, thus encompassing only the first two years of the Lindenwold Line's operation.

A recent (1977) study by the Philadelphia City Planning Commission on Center City office space indicates a rapid acceleration of downtown office construction in recent years. Between 1970 and 1974 an additional five million square feet of office space was added. Between 1975 and 1976 alone, another four million square feet of new office space has been constructed. Although this has coincided with the Lindenwold Line's construction and early operations period, no other information was available from local sources to support or deny a direct correlation between this accelerated pace of office construction and implementation of the Lindenwold Line.

It should be noted that the Lindenwold Line carries only about 17,000 commuters into downtown Philadelphia each day. This amount is only a small proportion of the several hundred thousand employees in the area. However, on-board surveys indicate that 13 percent of the riders did not make the trip into the CBD at all before the line was available, possibly indicating some inducement of the line to use of the city. Also, since about half the line's riders formerly drove into the CBD, the line may have freed as many as 8,000 parking spaces for redevelopment or use by other drivers.

Evidence of Impact: Downtown Camden

Camden is one of the most economically depressed areas in New Jersey, with high unemployment, crime, and a steadily deteriorating environment.

Illustration 4.2
Row Houses Along Haddon Avenue near Lindenwold Line in Camden

Gannon and Dear's statistics demonstrate that like Philadelphia, Camden has steadily lost employment -- from five percent of the SMSA jobs in 1960 to about three percent in 1970.

Interviews indicated no prospects of major new private development in downtown Camden which might be attributed to the Lindenwold Line. However, a number of major public facilities related to some degree to the line either exist or are planned. Rutgers University's Camden campus, for example, two blocks from the City Hall station, has been expanded substantially. Among the University's new facilities is a law school, expanding the student body substantially. Many Rutgers students are said to use the line.

UMTA approval for a multi-modal transportation terminal is being sought for the downtown Broadway station. Among new facilities to be served here are new and expanded quarters for two major hospitals, a new county office building (actually "recycled" from an abandoned department store) and the planned County Courthouse Annex.

At the Ferry Avenue station, not downtown but still in Camden, a substantial amount of new residential and commercial development has occured. This development is clearly related to the transit line. Included, for example, are the Ferry Station Apartments, a large complex of townhouse/apartment buildings composed of 462 units plus two office buildings, a restaurant, a bank, and several stores. This development adjoins the station in an area where little other new construction had occurred in the several years preceding the opening of the Lindenwold Line.

Evidence of Impact: Suburban Residential Property Values

Although this study was intended to focus on land use rather than property value impacts, the University of Pennsylvania research on the line's residential property value impacts is too important to omit. Many studies and papers are involved, including those of Boyce, Allen, Mudge, Platt, Slater, Tang and Yang. All sought to test the appropriateness of various theories of transit's impact on land value, most notably the "travel savings" hypothesis. These theories state that the savings in a household's journey-to-work costs (so far, only for CBD commuter travel) due to the transit line will be capitalized as added value of the residential property.

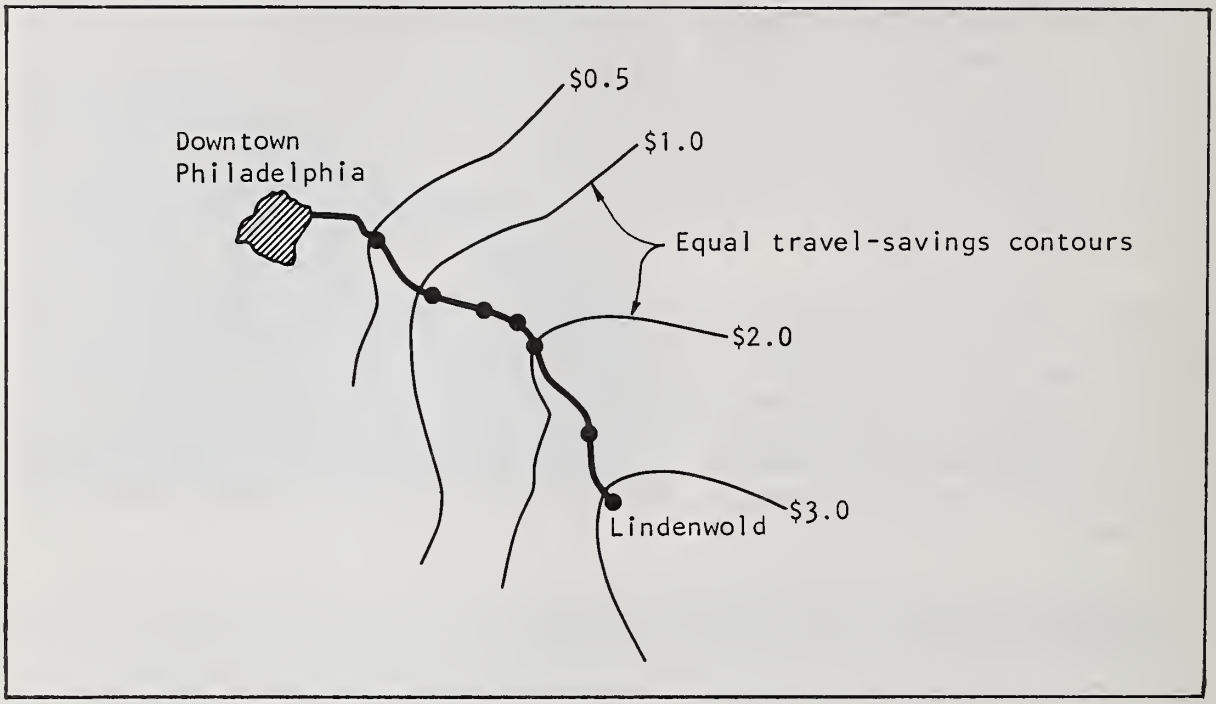
These studies generally relied on extensive data files on property sales prices and physical characteristics. The general approach was to attempt to separate the effects of the travel savings from those of other factors such as lot size, type of construction, location and year of sale. Multiple regression analysis, as well as more innovative statistical decomposition techniques were used for this purpose, some with substantial success in terms of their ability to account for much of the variation in the data.

Most of the studies support the savings theory in general, and indicate a substantial impact of the line on property values of residences in the line's market area. Allen and Mudge (1974) note that the spatial pattern of savings suggested by the model is quite different from the "conventional wisdom" that benefits are strictly a function of the distance from the transportation improvement; if the model is correct, for radial improvements such as the Lindenwold Line they conclude that the greatest absolute benefits will accrue to residents of the outer suburbs as opposed to residents of the generally older and poorer inner suburbs. However, greater relative benefits (savings/cost) may accrue to inner suburbs.

Boyce, Allen and Tang (1976) reaffirm this and provide a graphical illustration of the distribution of absolute benefits (Figure 4.2). They further estimate that each dollar of travel savings can be interpreted as an increase in residential sales prices of about $2,000 during the construction of the line (i.e., the anticipation of the benefit) and slightly over $3,000 just after its operation began (realization of the benefit). For the mean savings values along the line, these figures led to estimates of mean sales price impacts of $4,300 (before) and $6,500 (after).

The estimates of these impacts vary in size from study to study, although all are substantial. Those just reported were based on Tang's (1975) doctoral dissertation research. Two earlier studies by Platt (1972) and Mudge (1974) indicated somewhat smaller effects, in Platt's case an average increase in housing value of $660. Finally, a more recent dissertation by Yang (1976) estimates the effects on vacant building lots to be approximately $1,000 - $1,400 per dollar of daily travel savings.

Figure 4.2
STATION-MARKET BOUNDARIES AND SAVINGS LOCI FOR THE LINDENWOLD LINE



Source: Adapted from Boyce, Allen and Tang, 1976, p. 150

Evidence of Impact: Suburban Land Development

Several studies have focused on the Lindenwold Line's effects on actual new development, rather than property values. The work of Gannon and Dear (1972, 1975) on suburban office development impacts is most extensive, but early in the system's life. Boyce and Rosen (1977) have produced a useful sequel to this research. The original work of Boyce et al. (1972) is also early, but provides useful case studies of the effect of local policies on the land development process in two communities, and also of the effects of that development on local governmental services and costs.

Residential Development: In 1971-2, Boyce et al. conducted very detailed case studies of the local development process in Lindenwold and Voorhees, using local council records and personal accounts of the manner in which development approvals were reached for different apartment projects. Both communities experienced major growth during the period studied (1966-71). In Lindenwold, apartment development was extensive, with nine projects started and nearly 2,000 units completed. In Voorhees, the emphasis was on single family houses, with few apartments allowed despite numerous proposals. A major reason for this was the procedural

difficulties imposed by the township; a developer was required to own all the land for a project before requesting rezoning, which substantially increases risk. In addition, Voorhees required explicitly that apartments generate more public revenue than expenditure. However, as Boyce notes, it is difficult to substantiate the true magnitude of apartment development pressure in Voorhees and thereby to evaluate the importance of local government resistance.

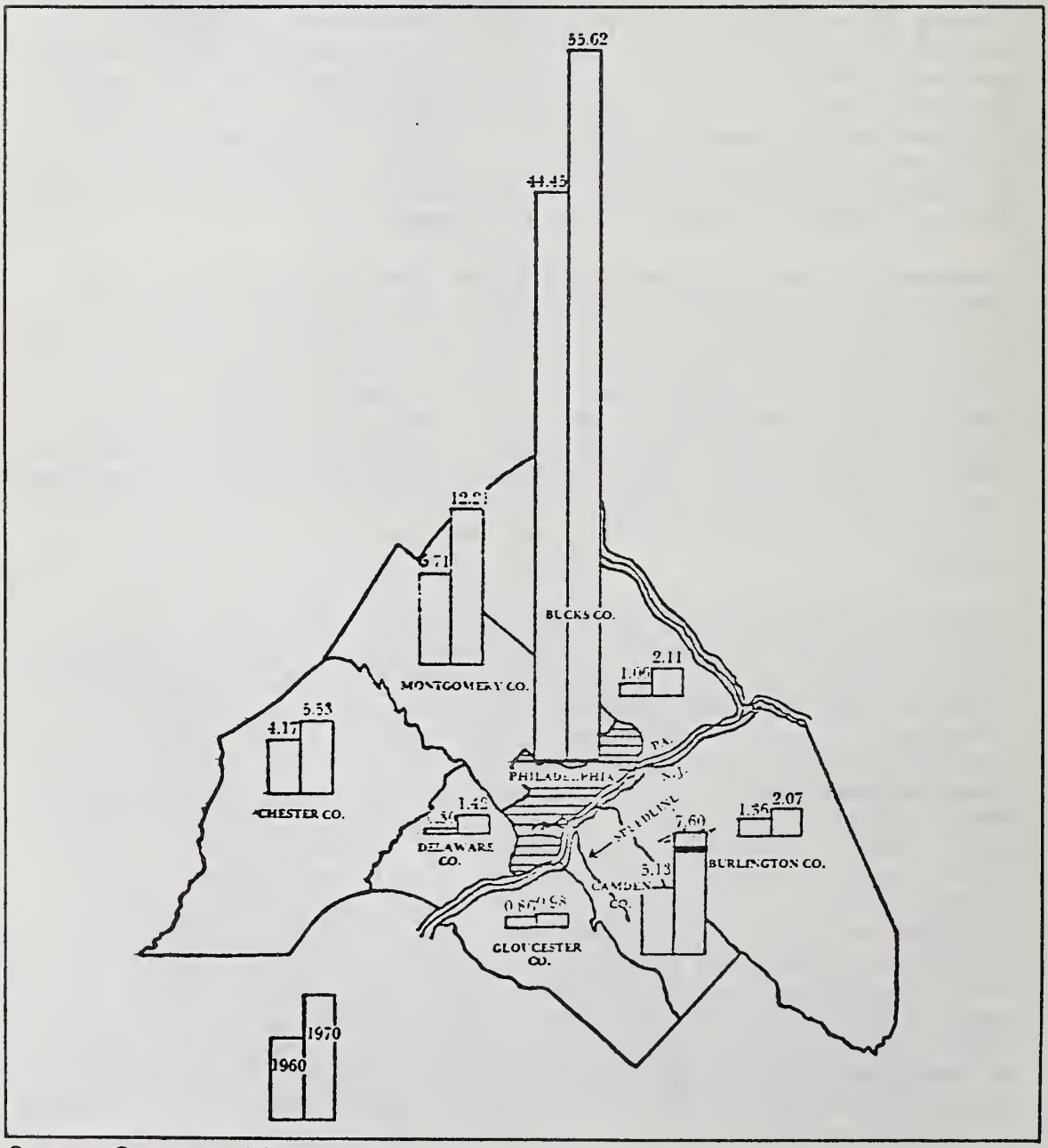
One unusual apartment development did occur in Voorhees. A major national developer, the Rouse Company, bought and was allowed to develop a former general aviation airport into a very large complex including both a regional shopping center, commercial offices, and apartment-townhouse-detached homes development, and community services such as a library, YMCA and senior citizen housing. This development, Echelon Urban Center, will ultimately include 3,700 living units and represent an investment in excess of $100 million. A key factor in this development was the availability of a large single parcel of land not near any existing regional shopping center. The Voorhees site was virtually unique in meeting these requirements.

Spokesmen for the developers have stated that they would have built the shopping center even if there was no transit line; however, they would not have invested in a residential and commercial complex. They view Echelon as a "town center," the only such development in the new growth areas of the 1960's and early 1970's and traceable in its heritage to the town center communities that evolved along the rail lines in upper Camden County long ago. A major addition to Echelon's commercial retail development opened in July 1976, making the enclosed mall there the area's largest with some 1.1 million square feet of retail space. It is also the only mall not located on a major arterial highway.

Office Construction: Gannon and Dear focused on the line's effect on suburban office development. Their review of statistics available on the distribution of regional employment and office space construction indicates that the areas near the Lindenwold Line have experienced substantial growth in office space. As Figure 4.3 shows, despite the continued concentration of new offices in Philadelphia, large and increasing proportions of office construction were occurring in the suburban counties of Montgomery in Pennsylvania and Camden in New Jersey. This development has been more extensive in Montgomery County than in Camden County. This is apparently due to Montgomery County's history as an attractive and accessible suburban area, originally opened by commuter and electric interurban rail service and later strengthened by highways such as the Pennsylvania turnpike. Other important factors in Montgomery County's favor include its larger population base (36.7 percent more than Camden County in 1970) and the historic trend of development to the west, south and north from Philadelphia due to the natural barrier of the Delaware River and the less favorable real property tax climate to the east in New Jersey. However, the situation

is now changing with the Lindenwold Line's strengthening of Camden County's access to the central city and also a recent improvement in the New Jersey tax climate.

Figure 4.3
STOCK OF OFFICE FLOOR SPACE IN THE PHILADELPHIA SMSA, IN MILLIONS OF SQUARE FEET, BY COUNTY; 1960 AND 1970



Source: Gannon and Dear, 1975, p. 232.

In Camden County, which includes the entire Lindenwold Line outside Philadelphia, office development has not been limited to the environs of the line itself. The area is served by several radial highways and freeways in addition to the transit line, and considerable development has occurred along these routes. Gannon and Dear noted that more office construction occurred during 1960-70 away from the line than in the communities directly served by it; however, in proportion to population the office development in the transit-oriented communities nearest the line was greater. Also, there is some evidence (DRA, 1975) that office space vacancy rates are less in such lineside communities as Haddonfield than in competing highway corridors such as Route 70.

Along the Lindenwold Line itself, the Borough of Haddonfield appears to be the major focus for commercial office growth, in contrast to the emphasis on residential development in Lindenwold and Voorhees. Gannon and Dear's review of building permit data was the original basis for this conclusion, and subsequent observation and interviews in this study indicate that it continues to be true. At least 140,000 square feet of new and renovated office space has been built in Haddonfield; within sight of the station several two- to four-story office buildings are apparent. Compared to CBD development, this is small; however, in the context of a small town concerned with the preservation of its quiet and stable quality, they represent a major step by the community to complement the line's development potential in a reasonable manner. This development is extremely large in comparison with the scale of office space available in the same area before the line. Larger structures are generally not allowed.

Illustration 4.3
New Office Development at Haddonfield Station

Gannon and Dear also conducted a small survey of new office tenants near the Haddonfield station. They found that most had relocated from Camden to escape its urban problems, and that many chose Haddonfield for its attractiveness, safety, and ease of access to Camden as well as to the larger labor market area. Boyce and Rosen (1977) expanded this line of research with a larger but similar office tenant survey. Their results indicated that many former Philadelphia firms moving to suburban locations along the Lindenwold Line were often motivated by frustration with the difficulty of auto access into their previous downtown Philadelphia locations and the high taxes there, in addition to the general exodus from Camden.

Other key factors identified by Boyce and Rosen included proximity to the transit line as well as the availability of relatively large and cheap floor areas. The line, however, was seen more by many as an intangible benefit or a "backup" transportation system rather than a key means of access to labor or markets. They also reaffirmed the importance of the Haddonfield area's general attractiveness and prestige as a major factor for many firms.

Commercial office development related to the transit line has also occurred at other stations. In addition to Ferry Avenue, as noted earlier, substantial new office construction has occurred near the Ashland station. The Echelon Urban Center's commercial office facilities provide one example. In addition, the national computer center for the Insurance Company of North America (INA) was located near Echelon specifically for its transit access. The INA facility employs over 600 persons. (Note that this development is remarkably similar to that of the State Street Bank complex at Boston's North Quincy station.) Other office developments in this area could also be cited for their consideration of transit access in their location decisions.

According to the Camden County Economic Development Committee, the Collingswood/Westmont area has also attracted office developers. A new 80,000 square foot office building has been located adjacent to the Collingswood Hi-Speed Station.

Evaluation

It is apparent from the extensive research conducted on the Lindenwold Line that substantial impacts attributable to the transit system have occurred. The most important of these is an apparently substantial increase in residential property values in areas served by the line, most notably in those areas most distant from downtown Philadelphia.*

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*Some observers dispute this, noting that large increases in value can also be observed near the stations closer to Camden and Philadelphia such as Collingswood, where some older row houses have nearly tripled in price since 1968. In any case, values along the line have risen measurably because of its influence.

Other impacts of note include the line's contributory effect on the location of new suburban offices and apartment developments nearby. Although the available evidence shows that office development has occurred with equal or greater intensity in some other Philadelphia and South Jersey areas not served by the line, it is clear that the line was a strong factor in local zoning decisions (e.g., Haddonfield) as well as in actual investments. It seems safe to say that development would be substantially less in amount and concentration in the communities along the right-of-way if the Lindenwold Line had not been built.

There is no basis for reaching a conclusion as to whether the line has contributed significantly to renewal efforts in Camden. In fact, some survey data suggest that the line may have helped to encourage healthy businesses to move out of these older and more central areas (Boyce and Rosen). Patronage and accessibility increases of the line alone are not large enough to be an effective force against trends as powerful as evolutionary central city decline; other complementary factors, such as available land, attractive surroundings, an expansionist business climate, and competitve advantages such as increased density allowances are essential. However, they have not in general been present to a sufficient degree in downtown Camden to reverse the historical downward trend in that area. The impact on downtown Philadelphia neither can be measured (as discussed above) nor can it be so dominant, since the Line is only one of many serving that area.

BOSTON

System and Surroundings

Boston's extensive rail transit system includes 37 route miles of rail rapid transit (Blue, Red, and Orange Lines), 38 miles of streetcar lines (Green Line), and 283 track miles of commuter rail in addition to a 3,500-mile bus system (Figure 4.4).

The entire urban transit network is operated by the Massachusetts Bay Transportation Authority (MBTA). Since World War II, major extensions have been constructed or are in the advanced planning stages for all of the lines. The most recent major extensions have occurred on the Orange Line to the north (1975) and the Red Line to the south (1971).

Boston is the second highest transit dependent city in the United States (after New York) for travel to work. Table 4.1 highlights changes in mode of travel for all trips to the Boston CBD from 1954 to 1974. As

Table 4.1
1954-1974 CHANGES IN NUMBERS OF PERSONS ENTERING DOWNTOWN BOSTON BY MODE, 6:00 A. M. TO 12:00 MIDNIGHT

	Number of Persons by Year				Change
Public Transportation	1954	1964	1972	1974	1972-1974
Rapid Transit	397,714	325,903	311,507	305,175	- 2.03%
Streetcars	164,987	107,441	104,210	88,664	-14.92%
Railroads	110,808	36,772	30,617	30,707	+ .29%
Buses	82,883	63,501	47,568	50,843	+ 6.88%
Steamships	2,041	1,030	936	-	-
Total	758,433	534,647	494,838	475,389	- 3.93%
Private Transportation					
Passenger Cars	714,398	1,000,392	1,192,601	1,201,482	+ .75%
Trucks	96,484	100,201	95,024	117,745	+23.91%
Total	810,882	1,100,593	1,287,625	1,319,227	+ 2.45%
Grand Total	1,569,315	1,635,240	1,782,463	1,794,616	+ .68%
%Public Transit	48%	33%	28%	26%	- 2%

Source: Boston Traffic and Parking Commission, 1974 Cordon Count: Downtown Boston

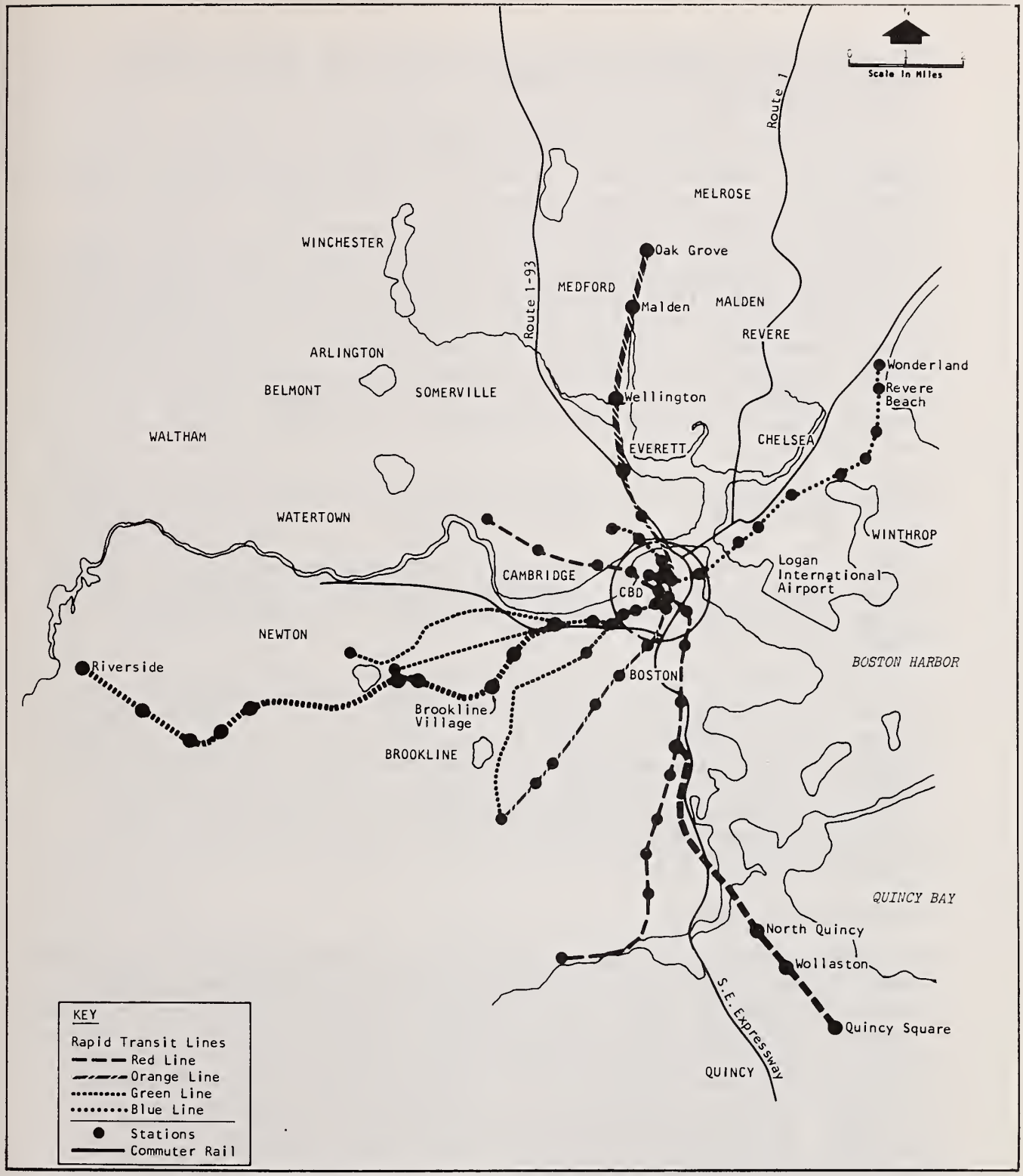


Figure 4.4
BOSTON RAPID TRANSIT AND COMMUTER RAIL SYSTEMS

the table shows, transit's share of the market has declined sharply since 1954, although the total number of trips into the downtown continues to increase.

Within the 17 years since 1960, downtown Boston has experienced a tremendous office building boom. Recent projections indicate that the rate of absorpotion of new space will continue to accelerate. Between 1950 and 1960, only 900,000 square feet of new office space was added to the CBD. Between 1960 and 1970, over 5.7 million square feet of new downtown office development took place, and from 1970 to 1973 alone, another 4.1 million square feet of new office space was added. The expansion of white-collar employment is cited as a key factor in this construction boom, strengthened by a favorable economic climate, a 30 year pent-up demand, and provision of federal and state support and incentives for downtown urban redevelopment through private investment. Average vacancy rates of downtown office buildings has remained constant at less than 9%.

Unlike many other large metropolitan areas, the suburbanization of new office development is relatively unimportant in Boston with the downtown continuing to capture most of the new activity - over 90% in the early 1970's. As of 1974, Boston's downtown contained approximately 70 percent of all office space in the Metropolitan Region. Thus the CBD has maintained and continued to strengthen its dominant employment position, especially in the last fifteen years.

U.S. Census figures for 1960 and 1970 indicate a slight population decrease in the Center City from 697,197 to 641,071 and a suburban metropolitan area population increase from 1,898,284 to 2,112,629. Similarly, population densities (per square mile) have slightly decreased in the Center City while increasing in SMSA suburban areas between 1960 and 1970. This reflects the continuing conversion of land in the center city from residential to commercial and the steady outward movement of residential activity.

Sources of Information

Two useful documents have been published by the Metropolitan Area Planning Council (MAPC). The first of these is their 1973 "Preliminary Impact Study," covering the first year's operation of the South Shore (Red Line) extension to Quincy. This report includes extensive data on changes in travel behavior, traffic, and economic and land use impacts. The second report is 1975 background paper which documents the early land development impacts at the stations on both the Orange Line and Red Line extensions. The planning processes and actions which led to those impacts are also described. Although little data is provided, the impact descriptions and process histories are highly useful.

The findings of these reports were verified and expanded upon through a variety of interviews. Persons interviewed included MBTA and MAPC personnel involved in the various improvement projects, state officials, and local planning and redevelopment officials in Quincy and Malden.

Orange Line North Extension

Line Description: The recent Orange Line extension is from Sullivan Square Station north out to Oak Grove Station along an existing freight and passenger rail line. Encompassed within this extension are three new stations; Wellington Station in the city of Medford, and Malden Center and Oak Grove Stations in the City of Malden. The first two have been in use since late 1975, while the Oak Grove Station just opened at the end of March 1977. The extension also included a complete relocation of the Orange Line's inner portion from Haymarket station to Sullivan Square. The existing Elevated was removed, and a new subway/embankment alighment was built in a totally different location, some points over a mile west of the original route. Three new stations were included: North Station, Community College, and the new Sullivan Square, all opened in 1975.

Impacts Along the Abandoned El: The previous elevated trackway ran above a major street through the center of the community of Charlestown. This area was blighted, with no substantial development having occurred since World War II. However, as soon as the removal of the El was announced as a certainty, private redevelopment began and has resulted in a substantial upgrading of this street and its surroundings.

Relocated Stations: At the Community College station, the location of the new Bunker Hill Community College was selected in part for its access to the new transit line. Availability of publicly owned land was also a factor. At the new Sullivan Square station, where the new alignment returns to within a few hundred yards of the original line, no significant development has yet occurred in the two years since the opening of the new service.

Malden Center Station: Since 1961 the city of Malden has been very aggressive in federal and state funding programs; this effort is said to have been a significant factor in having the line extended out to Malden. According to several local observers, the then Mayor Walter Kelliher felt that the City's future was in redevelopment efforts, and he took a very active and aggressive role supporting this belief in related state and national activities. The city then had no planning department; the Malden Redevelopment Authority was used by the Mayor as a tool to implement various projects with the coming of the Line.

Several special cooperative agreements were worked out between the Malden Redevelopment Authority and MBTA which provided for more coordination and control of potential impacts. For instance, an agreement was arranged under which the Redevelopment Authority would perform all of the land acquisition and relocation for the transit line. This was done in coordination with MRA's own land acquisition and allowed economies which benefitted both MRA and MBTA.

A detailed examination of the history of development around the station provides some insight into the importance of some aggressive development policies which were implemented. Overall, the city of Malden is an older working class suburb, actively renovating its downtown and residential neighborhoods. The Redevelopment Authority's efforts have also led to new growth in light industrial uses. The Malden Center transit station is situated on the western edge of the Malden central business district, which is the most intensively developed portion of Malden. The station area is characterized by fairly high density residential uses to the north, mixed single-family residential and commercial uses to the west, and extensive light industrial use to the south. A few vacant, developable parcels remain within a short walk of the station.

Illustration 4.4
View from Malden Center MBTA Station to Nearby Residential Development

As noted, the Mayor, through the Malden Redevelopment Authority, attempted to coordinate the implementation of several projects which would reinforce one another -- in this instance CBD renewal plans, including a new government center complex; the transit station development; and construction of a downtown bypass of a major regional road (Route 60). Both the local

and Metropolitan Area Planning Council spokesmen agree that the Civic Center Urban Renewal Project would have happened even if the rapid transit extension and Malden Center station had not been built. However, both also agree that the transit improvement has substantially increased the probability of the redevelopment scheme's success (MAPC, 1975, pp. 24-29).

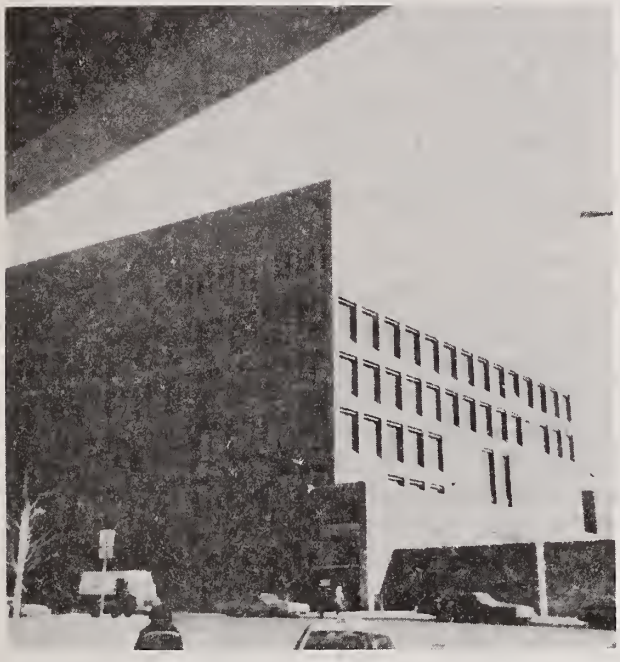


Illustration 4.5
View from Malden Center MBTA Station to Malden Government Center Complex between Station and CBD

Most of the redevelopment which has occurred in the immediate vicinity of the station has been light industrial and not related to the station. The CBD begins several hundred yards from the station; not much activity is occurring presently nearer to the station. However, a proposed zoning ordinance, including provisions for an apartment district nearby, may have some influence on future development. In addition, the redevelopment agency has plans for parking structures near the station, and private developers have shown interest in building apartments and mixed-use facilities in the station area.

So far, the major development in the station area is the Malden Government Center, which stands between the station and the CBD. It was a very important element of the renewal plans. The Center was purposely over-built 100 percent beyond the city's own needs, so that office space could be leased out to other federal and state agencies. This was done because marketing data showed that it would be extremely difficult to attract a

major private developer to this area. This large public investment was premised on the fact that state agencies were previously scattered throughout the City and the belief that this central, convenient location would be much more efficient. This approach has been very successful; the building is now nearly full, and may serve to attract other development.

Current figures indicate low patronage at the Malden Center station, as had been the case with the commuter rail station which preceded it. This is apparently due primarily to the lack of adequate parking and the MBTA's policy of a double fare for the outlying stations on its new extensions (because of the trip lengths served). This may be a factor inhibiting development, but the most powerful restraint probably has been the absence of a strong demand as yet for intensive commercial and residential facilities in this part of the region. As the city's redevelopment efforts continue, however, more transit-oriented intensification is likely.

Oak Grove Station: At the time of this study's investigation, the Oak Grove Station in the city of Malden was preparing for its opening at the end of March 1977. The predominant station area land use is two- and three-family residential structures with a small commercial district in Oak Grove Square and some industrial land along a railroad right-of-way to the south of the station site. Recently, an eighteen-unit garden apartment complex was constructed near the station, apparently in anticipation of its opening (MAPC, 1975, pp. 30-31).

Oak Grove is a residential area which had not been intended as the terminal point of the Orange Line extension. The first phase of the extension could legally go only to Oak Grove because points further north at that time were not in MBTA's jurisdiction. However, the proposed extension to points further north appears to be a very low priority within MBTA's plans.

Local and MAPC officials point out that unlike Malden Center Station, no major effort was made to promote development in the Oak Grove neighborhood in conjunction with the transit improvement, because no major physical changes to the area through the renewal program were anticipated. Only low density uses are now permitted. This reflects the City Council's desire to maintain lower density residential and neighborhood commercial zones around the station. Even if some residentially-oriented redevelopment was desired by the community, land assemblage requirements by private interests would be difficult. Much of the area is divided into single ownership residential lots with an average size of 3 to 5,000 square feet. These factors combine to make further development unlikely unless community attitudes change.

Wellington Station: The Wellington Transit Station, situated in the extreme southeasterly part of the city of Medford, is bordered by the Mystic and Malden Rivers to the south and east respectively, the Metro-

politan District Commission (MDC) Mystic River Basin Park to the West, and commercial and residential land uses and some vacant land to the north. Prior to construction of the station, the station site was a dump. An additional potentially developable parcel situated north of the station area is currently being utilized as a drive-in theater, and a regional park is to be developed just to the southwest. Highway access is excellent.

According to a recent MAPC Report examining joint transit-land use planning at several new station, "with the proposed construction of the MBTA station at Wellington came a reawakening of public interest in the area's development potential" (MAPC, 1975, p. 35). In 1969, then Mayor and State Representative John McGlynn sponsored two successful bills which allowed the City to "lease and/or develop the airspace over the proposed MBTA station and storage yard and the MDC parkway near the station site in order to better realize the development potential of the site" (ibid.). The transit station and storage yard were accordingly designed to allow for such future air-rights development.

Essentially no development has occurred yet at this site. The city has been conducting an extensive planning effort for the site, including market research as well as land use planning. With the completion of these necessary steps, private development may occur assuming continued aggressive support by city as well as state officials.

South Shore/Red Line Extension

Line Description: The new Red Line extension to the south serves the largest post-World War II population growth area in the greater Boston region. The extension was built to accommodate the existing population as well as projected growth. Three new stations were introduced, all in the City of Quincy: North Quincy, Wollaston, and Quincy Square Stations. Extension of the Line even further south beyond Route 128 to Braintree, thus adding at least two more stations, is currently underway.

The extension to Braintree is important in that Quincy City officials point out the line has significantly affected the quality of life in Quincy because none of the three stations were intended to be terminal points. Parking and patron capacity problems have dramatically affected the neighborhoods adjacent to the station areas. Given that the three Quincy stations will continue to serve as the (near) terminus of the Red Line for the near future, it is interesting to trace the history of development to date at these station locations.

General Development Policies: All observers and city officials queried seem in agreement that the key factor in transit-related development in Quincy was that then Mayor McIntyre made the introduction of the Line the major focus of his administration. Since he was mayor, state senator, and chairman of the General Court's (Legislature) Committee on Transporta-

tion at that time, he was in a unique position to influence this transit development, and did so.

In 1971 a new Quincy zoning ordinance was enacted under the Mayor's leadership. Generally it reflects an attempt to provide areas which would complement the anticipated and desired transit-related land use impacts. Most of the land around the three transit stations, excepting existing and stable residential neighborhoods, was zoned for business uses. This was not a major change in allowable land use, since most of the area adjacent to the stations had been so zoned before. However, some zoning boundaries were changed.

A closer inspection of each station area reveals the importance of particular development and planning policies which were implemented.

North Quincy Station: The North Quincy Station is surrounded by a mixture of land uses including residential and industrial uses to the north, the Hancock Street commercial district to the east, industrial property to the south, and a predominantely single-family residential neighborhood to the west. This station initially had the most potentially developable land of the three station areas, and, in fact, by far the most dramatic change to date has been at this station. The major new development includes the State Street Bank office complex, a large Kemper Insurance Company building, and two high-rise apartment buildings with approximately 200 units each. The complex, covering 80 acres, contains 900,000 square feet of office space for 2,700 employees of State Street Bank and Kemper Insurance Company.

A variety of factors appear responsible for the dramatic change of land use around this station. Perhaps most important was the Mayor's insistence to move MBTA's original proposed station location from near Norfolk Downs to its current location. He felt that impacts at Norfolk Downs would be unacceptable, and that the City had a unique opportunity to attract development at the new station location in an area which at that time was primarily wetlands. In order to provide further encouragement for development there, the Mayor was instrumental in getting the Newport Avenue Extension built -- a major roadway which now serves the State Street site and also functions as the northern end of the City's major north-south arterial, Upland Road. This project, coupled with construction of a new bridge over the Neponset River, was an important impetus to new development activity in the area. A zoning change, spearheaded by the Mayor, from industrial to business use at the State Street Bank site, was another important development factor.

With specific reference to State Street Bank's interests, several factors were important in the decision to locate there. The Bank did an employees' survey on residential location and discovered that many lived to the south and southwest of downtown Boston. Their studies also showed that transit was important to the region's largely female,

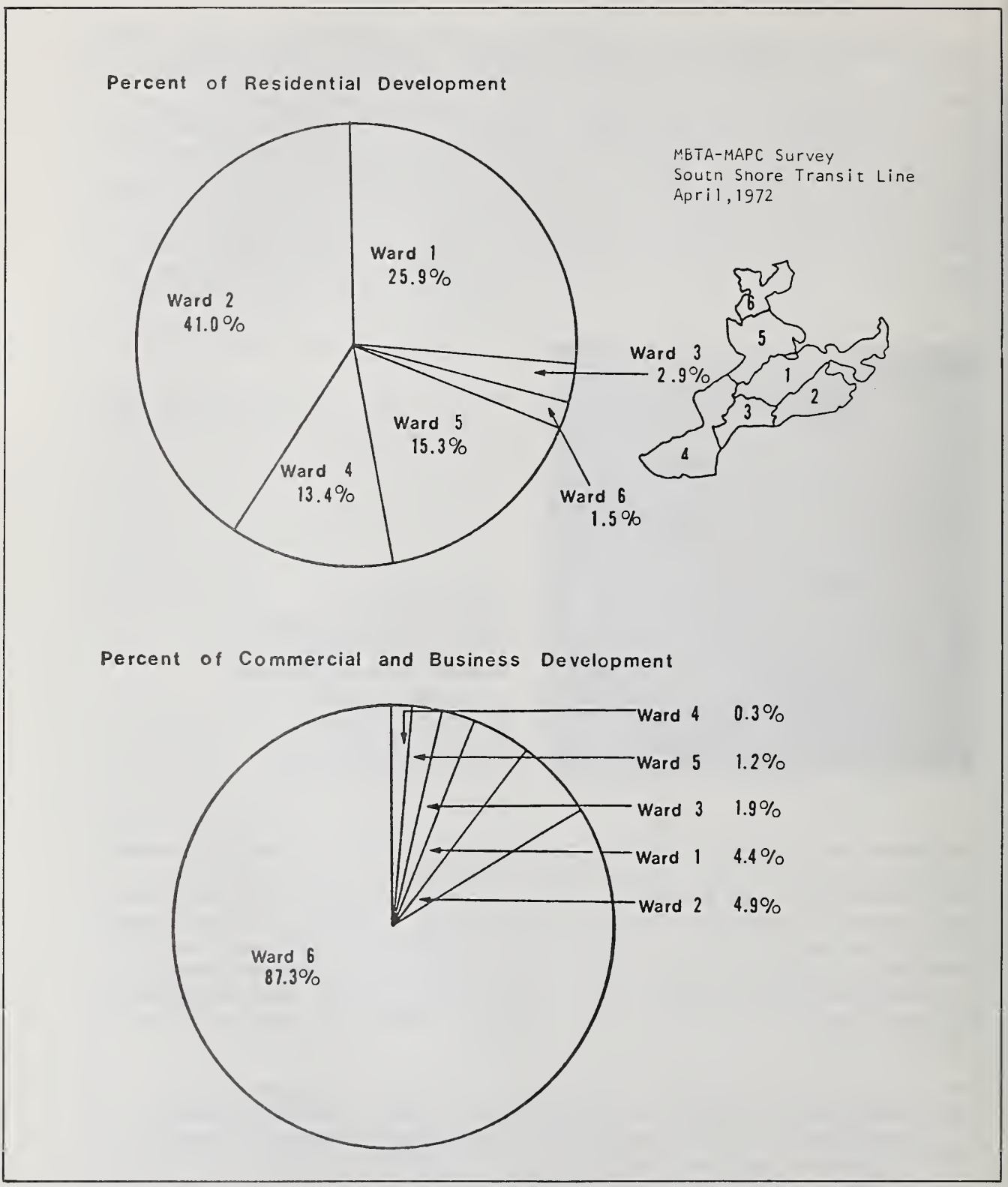
young, clerical labor pool on which the Bank depended. Thus, this location, coupled with direct MBTA service and auto access to the Southeast Expressway (with construction of the Newport Avenue extension), was very appealing. In addition, a large parcel of land was available at a reasonable price and because of the Mayor's strength the zoning situation in Quincy was flexible enough to permit them to come in with minimum delay and uncertainty. It should be noted that the Bank examined several sites before deciding that this one was most compatible with its needs. Kemper Insurance followed with its development about a year later, citing as important factors the availability of land and access to transit. Several other smaller developments have occurred since then.

Illustration 4.6
Aerial View of North Quincy Station Area with Office Development Visible in Upper Left, Station in Center
(Source: Council on Environmental Quality, The Growth Shapers, p. 44)

The impact on the North Quincy area has been dramatic. From 1969 to mid-1972, the period of final construction and first-year operation of the transit line, over 58 percent of all construction activity in Quincy has occurred in Ward six, the North Quincy area. As Figure 4.5 indicates, over 87 percent of the city's business and commercial development has occurred in this ward, while only 1.5 percent of the city's residential construction has been there. These figures show clearly that North Quincy is developing into a significant business and commercial center (MAPC, 1973, p. VII-8).

One new planned unit housing development is being proposed on the old Naval Air Station property, an isolated tract some distance northeast of the station. It will consist of a new apartment complex of 3,000 units with direct access to the station through use of a private auto right-of-way. Public hearings are now being conducted on this PUD.

Figure 4.5
PERCENT OF DEVELOPMENT IN QUINCY BY WARD FROM 1969-1972



Source: Metropolitan Area Planning Council: South Shore Rail Transit Extension, Preliminary Impact Study, October 1973.

According to city planning officials, transit access was probably a factor in the developer's decision to propose this project, but by far the most important consideration was the availability of so large a tract of land so near downtown Boston.

Wollaston Station: The next station in Quincy was intended to serve as a neighborhood rather than regional station. The station site is situated within the small Wollaston neighborhood shopping district, being surrounded by residential uses except to the north which is an industrial area. There is a minimal amount of vacant or available developable land in the station area.

Because of the strong local desire to essentially preserve the character of the neighborhood shopping district no major zoning changes were introduced in this area. In fact, the Mayor negotiated with MBTA to reduce its original proposal for a 1,000 space parking lot to less than half that amount due to local opposition. Some new residential development has taken place in the station area. This includes a few 10 - 20 unit apartment buildings, a two hundred unit public elderly housing project, and a smaller state-financed public housing project. Only the last development has been specifically attributed by others to the opening of the transit station (MAPC, 1973, p. 16), but in view of the lack of other inducements and the city's overall policy of maintaining the area's prior character it seems clear that transit access has been a factor in some of the other development as well. In addition, further development has occurred at this site since the MAPC report.

Quincy Center Station: The Quincy Center Station is currently the South Shore terminal point for the Red Line, although construction is underway for a further extension to South Quincy and Braintree. The station is situated at the north edge of the Quincy CBD, and is surrounded by commercial uses except for some residential use to the west. The station was located at its present site rather than in the heart of the CBD primarily because of the City's concern over adverse effects of a downtown location and because it was an easier taking of land for the station by MBTA. Since the site included a former municipal parking lot, MBTA agreed to allow the city use of and income from two floors in the station's five-floor, 800-car parking garage for municipal parking purposes.

Some revitalization of the commercial fringe area at the station has occurred since the line's opening. A small park has also been built here. The station does not appear to have had much impact on the more distant main downtown area, even though interest has been expressed in some residential redevelopment plans. Zoning was made more flexible within the core of the CBD, while areas bordering it, in medium and high-density residential uses, have remained the same. In addition, legal and engineering provisions were made for the leasing of air rights

above the station. Construction of a government center complex (similar to that in Malden) had been anticipated for the late 1960s, and air rights legislation was passed in order to accommodate this proposed project. However, the project never left the planning stages. The potential for air rights development still remains physically possible due to the station design.

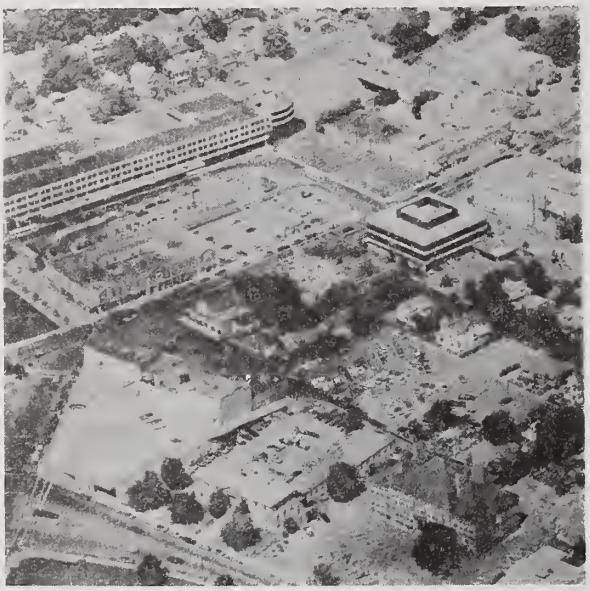


Illustration 4.7
Quincy Center Area, Station and Parking Garage in Top Left
(Source: Council on Environmental Quality, The Growth Shapers, p. 45)

Several explanations have been offered for the lack of major development impact, whether desired or not. One explanation is that Quincy Square, unlike the North Quincy Station area, had intensive residential and commercial development prior to introduction of the station. Land values were already high and the land fully developed in active uses. Thus the transit facility has not changed the land use characteristics; instead it is supporting what presently exists (MAPC, 1973, p. VIII-8).

One major factor believed to have affected potential transit-related development downtown is the local and regional economy. As in many suburban cities, some deterioration is taking place, and several major stores have moved out of downtown and into outlying shopping centers. The lack of consumer demand combined with lack of private developer interest in downtown may be responsible for the absence of the motivation and commitment needed to carry out any improvements or redevelopment plans.

Another important factor is the location of the station with respect to the CBD. The station is actually about 1,500 feet from the downtown shopping area. This is a distance considered to be a long walk by most

patrons, and thus a little too far for the CBD to reap potential business from the transit patrons. Proposals are currently being examined which, for example, would ask the downtown merchants to support a small bus running from the station to downtown. The presence of the station has in fact been cited as a detriment to downtown business because of inadequate parking for transit patrons. The transit patrons often use the parking spaces downtown, occupying them all day, and thus leave nowhere for the shoppers to park. Competing shopping centers thus have become more attractive with their abundance of parking.

The limited residential development which has taken place near the station, both in private apartment buildings and senior citizen housing, is not attributed by local officials to the presence of the station. They assert that this development would have occurred without the transit system, because of local demand. However, its general location seems related to transit; proximity to the transit system is now being used as a major advertising point for the rental apartments. This is readily apparent from a look at the rental ads for this area in the Boston Globe, where references to "closeness to the Red Line" are frequent.

Blue Line: In 1953-54 the Blue Line was extended north from East Boston to Revere Beach and Wonderland. This line replaced an existing interurban line and a main trunk streetcar line. The primary reason for this change was to reduce operating costs, and the new service was not substantially better than that replaced; speeds were higher, but the line required feeder service and transfers to replace the better coverage of the streetcars. In addition, very old rolling stock was used on the new line, providing no significant amenities. Patronage is low.

The area served is not readily amenable to redevelopment. Extensive deterioration is apparent throughout the built-up area, and oil tank farms are a prominent feature as well. Because of these characteristics of the area as well as of the transit improvement, virtually no new development has occurred. The area continues to decline.

Proposed Rapid Transit Extensions

The first phase of a proposed extension of the Red Line north will go from the present terminal point, Harvard Square, to Porter Square, Davis Square, and finally Alewife Stations. Engineers are currently working on the design of the facility to Alewife, utilizing the B&M railroad right-of-way in several areas. The Boston Transportation Planning Review studied the proposed extension in detail and decided upon these station locations because they would most effectively serve population concentrations, even though the right-of-way is not the most direct route.

The Porter Square station area is situated within an established well-developed neighborhood. Current zoning there reflects a local desire to maintain existing densities, confine commercial development to Massa-

chusetts Avenue, and protect the residential areas. The Davis Square station is located in an old deteriorating neighborhood center in need of revitalization opportunities. Principal land uses surrounding the Alewife Station site include high and low density residential uses, commercial and office facilities, heavy industrial uses and vacant parcels of industrially zoned land. Of the three station sites, Alewife offers the greatest development potential due both to available land and good road access.

An UMTA-sponsored project has provided funds for a staff to look into development opportunities, potential changes in zoning and possible implementation of other policies and incentives to get businesses interested in the area along the proposed extension. This project was just started at the beginning of 1977, so results have not yet been reported. Several marketing reports have also been prepared on the development potential at each station. However, no commitment or construction by developers has been reported yet in anticipation of the extension. There still appears to be a wait-and-see attitude, given that the most optimistic opening date is three or four years from now.

The proposed second phase extension is very much in doubt due to the resistance of several cities for the line to terminate within their boundaries. These cities fear that they would be subjected to substantial traffic intrusion from commuters attracted to the line's terminus. This extension's viability in the public mind also seems to be linked to public acceptance (particularly Cambridge's acceptance) of the first phase extension.

A more ambitious proposal is the southwest corridor or Orange Line Relocation. The proposal calls for relocation of the existing elevated structure, now running through a densely populated and highly developed but badly deteriorated commercial area (Roxbury), to the Amtrak/Conrail railroad right-of-way ranging up to about a half mile from the present line. Original plans were for a major highway near this alignment (I-95). However, after much of the required property had been acquired the project was dropped and the federal funds committed to it were transferred to the Orange Line Relocation project. The proposed transit corridor is situated in an area with very little new community development, but with numerous parcels available nearby for new development as a result of the I-95 cancellation. The design engineering contract has been negotiated, and construction is expected to start by the end of 1978.

Because of the available land, development opportunities will be substantial along this corridor. However, the area's deterioration and social problems will have to be overcome. The initial activity will largely come from public investment, including public housing. Three to six parcels out of the 25 publicly owned near the transit line have already been committed for such development. However, further commitments are

not expected before the line is in operation. Some investment interest is being shown by the business community, although they are waiting for MBTA to make the next move before they offer the needed financing for projects. City policy has directed several large investments in schools and utilities to the Southwest Corridor Project area. Private developers will probably require the visible start of transit construction before making investments of their own.

Evaluation

The recent extensions and improvements to the Boston rail transit system appear to have had mixed success in their effects on land use. By far the most dramatic example is found in North Quincy, where the new Red Line service was an important and possibly decisive factor in the selection of that location for several major developments. However, this development depended not only on transit (although it appears to have been essential) but also on several other, complementary factors: availability of a large tract of land at reasonable cost and the city of Quincy's active cooperation and ability to move quickly with the required zoning and other infrastructure were necessary in addition to the presence of the Red Line.

Here as in several cases in other cities, a major "land use" impact of the transit improvement was in the conviction which it generated in the minds of key decisionmakers (in Quincy's case, the Mayor) that it would create a potential for new development. The actual land use changes then occurred because of the actions of these decisionmakers as well as the accessibility provided by the transit system. However, the transit line was the source of both forces.

Apart from the major development at the North Quincy station, relatively few effects are apparent at most of the new Orange Line and Red Line stations. Although extensive efforts have been put into downtown renewal and redevelopment at Malden Center, these appear to have been largely independent of the transit extension in their original conception. Moreover, the presence of the transit station does not appear to have influenced the extent or success of the redevelopment activity, and the city continues to have difficulty attracting private investment.

As in other cities, the scale and specific nature of the transit-related development found shows rather clearly that no interregional investment shifts are involved. All the developments identified were essentially Boston-based, and involved no consideration of other metropolitan areas as competing sites. Thus there is no indication of a net gain to the region.

No analyses or data were found addressing the issue of whether these outlying transit improvements have had any effects on the strength of

downtown Boston. In addition, the downtown-oriented patronage on both extensions is small relative to the total CBD employment. However, it is essential to remember that auto access into the rapidly-expanding Boston CBD is extremely congested, and neither parking nor freeway expansion is contemplated. Transit access will inevitably become more and more important as a result of such policies, and Boston is reinforcing this approach with continued investment in transit facilities to provide the necessary accessibility to the core. Consequently, although transit's influence cannot be "proven" it is certainly a vital factor in the continued development of downtown Boston.

More generally, the Boston case provides valuable evidence of the need for coordinated use of factors complementing transit's own inducement to development oriented to its use. The Blue Line is a particularly telling example of the kind of transit improvement which should not be expected to have land use impacts, since almost every possible factor worked against any such potential. Not only was the transit service itself not a major improvement, but also the characteristics of the area were (and are) such that only a massive renewal strategy could have a chance of success. Transit alone cannot solve problems of this magnitude. The North Quincy example, however, shows clearly how transit can be used with great effectiveness to transform an area when other factors support its potential.

CHICAGO

System and Surroundings

Chicago's rail rapid transit system, totally operated by the Chicago Transit Authority (CTA), and subsidized by the Regional Transportation Authority (RTA), is composed of ten routes and a total of 243 track miles. Nine of these lines serve the Loop area downtown; all are within fully-developed areas radiating outward from the Loop (Figure 4.6). Many of the lines were opened near the turn of the century as part of the elevated system, which since 1940 has been reduced substantially in size. The first post-World War II improvement came with the opening of the downtown Dearborn Subway connector in 1951 (four miles), and was followed by a nine-mile extension (Congress service), about six miles of which is located in the median of the concurrently-built Eisenhower (formerly Congress) Expressway in 1958. This was the first instance in history of a new rail rapid transit route being routed along a highway in a grade-separated right-of-way.

In 1962, the new three mile elevated Lake service opened along the existing Chicago and North Western Railway right-of-way. This improvement simply transferred transit operations along this corridor from the street level tracks, where severe congestion and conflicts between transit operation and the street system were being experienced, to the adjacent railroad embankment.

An unusual experiment was made in 1964 when the CTA purchased and rehabilitated a five-mile stretch of partially grade-separated light rail line between Howard Street in Chicago and Dempster Street in Skokie as a federally-aided mass transportation demonstration project. The two year experimental period was successful enough that the "Skokie Swift" received authorization as a permanent CTA transit route (Chapter V).

In 1969, the Englewood service of the North-South rapid transit route was provided with a new terminal at 63rd and Ashland, but this was in the same area as the old terminal. Also in 1969, a second rapid transit line (9.5 miles) was located in the median of an expressway -- the Dan Ryan This line now makes up part of the West-South service. Similarly, in 1970, a new five-mile extension of the Milwaukee service was opened which utilizes about four miles of the Kennedy Expressway median.

Chicago is the third largest metropolitan area in the United States, and is a major manufacturing, finance and service center. Between 1960 and 1970, Chicago's SMSA population increased over 12 percent to 6,979,000. At the same time, the City's own population declined over five percent to 3,369,000. However, the center city population remains much denser (population per square mile) than the SMSA suburban areas, with a 1970 city density of 15,135 compared to the suburbs' density of 1,877.

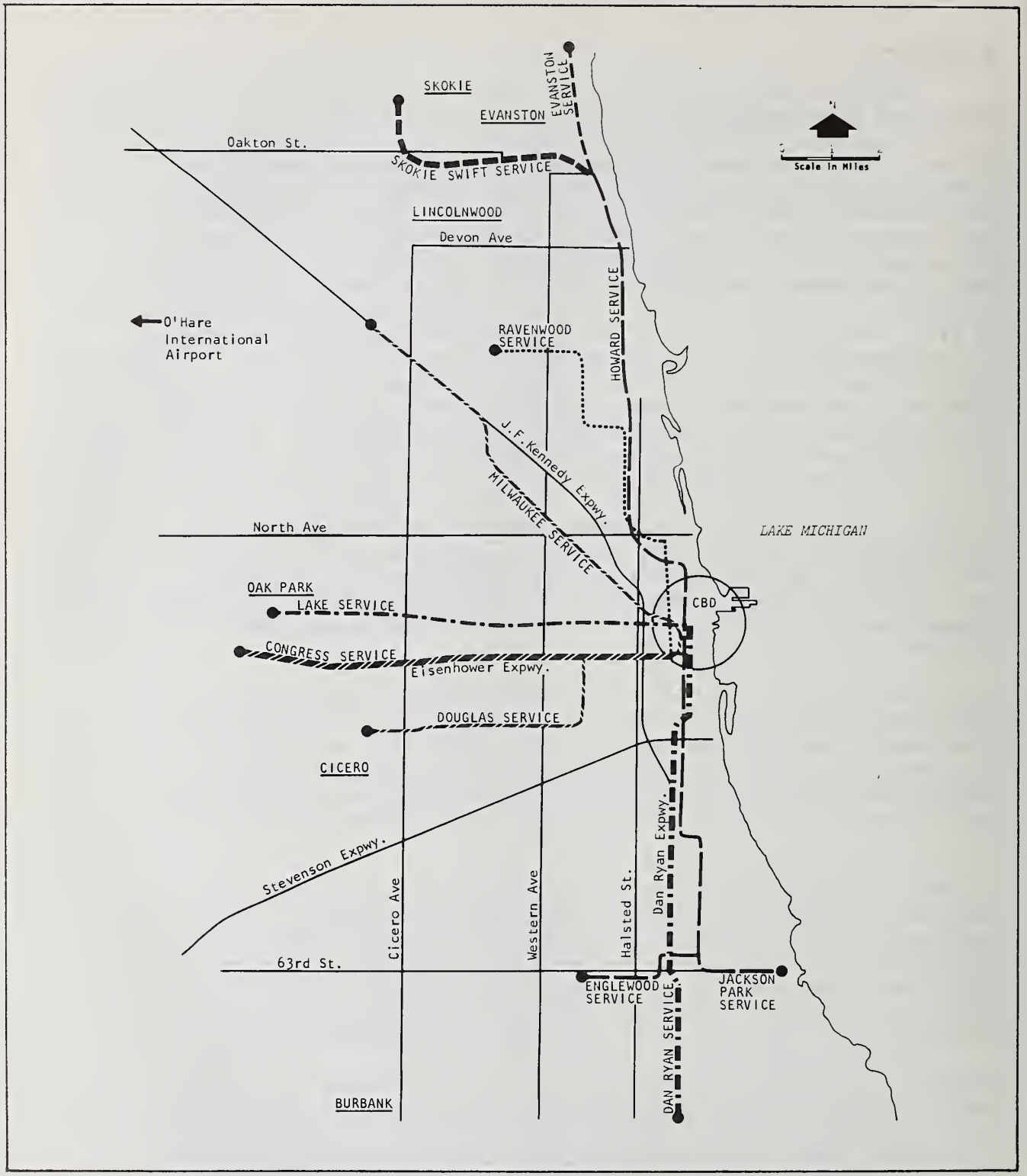


Figure 4.6
CHICAGO RAPID TRANSIT SYSTEM

As of 1970, the City accounted for 52 percent of the employment in the SMSA. This figure represents a continuing relative decline of jobs in the City since 1960, with a corresponding relative increase of jobs in the suburbs. Approximately 35 percent of the City's working residents in 1970 used transit for their journey to work as compared to 11 percent of the workers residing outside of the City.

CBD development has continued to be very strong. Between 1964 and 1970, about seven million square feet of office space was added to Chicago's central area. Since 1970, this area has absorbed over 20 million feet of new office space, bringing the CBD's total to approximately 65 million square feet.

Sources of Information

No published impact analyses or related studies were found. Consequently, the primary sources of information were inspection of the system, statistical data, and interviews with knowledgeable transit and planning officials in the area. Their observations of transit-related development impacts associated with each of the above projects are sketchy, but noteworthy.

Evidence of Impacts

Lines Constructed in the Medians of Expressways: The Congress transit line was the first to be located in an expressway median and essentially replaced the old Garfield elevated route paralleling the Eisenhower Expressway. The idea of sharing a single right-of-way with the expressway was justified from a financial standpoint; only 20 percent of the total corridor cost would be attributed to transit, which was much less expensive than an independent transit right-of-way.

Improved CBD access was the primary rationale for all of these transit improvements. Consideration of potential joint-development opportunities was not a major factor in the final design concept for any of the expressway median rapid transit routes. In fact, utilization of the freeway median has essentially precluded most potential for development due to the relative inaccessibility of the stations and the difficulty of air rights possibilities. Observations confirm the difficulty of quick access to and from the stations and surrounding development, particularly with those located in the middle of a freeway interchange. Most access is via bus feeder service. One major modern development along the Congress line is the University of Illinois Chicago Circle Campus. This large campus adjoins the line, and was located there partly because of the access afforded by transit.

While the system characteristics do not encourage major new land development, it should be noted that supportive planning policies or incentives are also weak. While it is the policy of Chicago's Department of Development and Planning to encourage higher densities around stations, imple-

mentation tools are lacking. In fact, the zoning ordinance does not directly support this policy. Numerous recommendations for a pattern of development with focal points at prototypical stations have been made by the Northeastern Illinois Planning Commission (NIPC), but the organization lacks power to implement such recommendations with the local municipalities. Initiative is left to developers to propose spot zoning changes to allow specific developments.

Even with direct access from the Expressway to adjacent land, much of the development which has occurred is in public use, partly due to lack of private interest. Public housing projects are one example. Most of the existing development is associated more with the presence of the earlier expressways, which provided major increases in downtown accessibility for the areas between the "fingers" of the earlier commuter rail lines.

Similar conditions hold for the Dan Ryan and Kennedy lines, also situated in the medians of expressways. The Dan Ryan, for example, is one of the world's widest freeways. Both lines are currently short of their originally planned terminal points. No major new development anywhere was identified as related to the new transit lines. Along the Dan Ryan Expressway the characteristics of the area itself virtually preclude any impact. Deterioration and crime are extensive in this large low-income area, and this further inhibits private investment.

Illustration 4.8
Typical New Transit Station in Median of Kennedy Expressway
(Source: U.S. Congress Office of Technology Assessment, Ar Assessment of Community Planning for Mass Transit: Chicago Case Study, p. 15)

Illustration 4.9
Station along Dan Ryan Transit Line in Median of Expressway

Other Recent Transit Improvements: Introduction of the 3.9 mile Dearborn subway connector in 1951 could not be expected to generate any visible land use impacts; the subway, connecting the Kennedy and Eisenhower/Congress transit lines to form the West-Northwest Line, was built only a block from the existing State Street Subway in the Loop where development has always been intensive. Moreover, most of the trips were formerly carried on the Loop elevated structure only three blocks distant.

Similarly, relocation of the Lake Street Line from an at-grade street location to the adjacent existing grade-separated railroad right-of-way did not induce any noticeable development-related impacts. Extending through a well-developed single family and duplex residential area, this improvement did not result in any significant change in transit right-of-way location.

Proposed Transit Improvements - Franklin and Monroe Street Subways

Specific plans for the Franklin and Monroe Street subways have been on paper since 1968. These subways are part of an original downtown distributor plan as the Chicago Urban Transportation District Project. Funding problems have plagued the project, although present observations seem to indicate that at least the Franklin Street Subway will be constructed within the next few years. Prospects for implementing the entire project, including an underground loop, to replace the present El, are in doubt at this time.

Several interesting observations should be noted with regard to these two proposed subways. A sizeable amount of new development in the Loop has already been associated with anticipation of the Monroe and Franklin subways. The two most visible examples are the First National Bank (Monroe Street) and Sears Tower (Franklin Street) which accommodated special provisions in their building design to provide a direct link with the subway. Similar accommodations were made with the new Harris Bank, Apparel Mart and Standard Oil Buildings. It should be noted that incentives, in the form of special height and floor area considerations, were offered to any developer who provided direct access to one of the planned subway stations. Such joint development opportunities are an integral part of the overall Core Area Plan.

With specific reference to the Sears Tower, the tallest building in the world, several observers note that anticipation of the Franklin Street subway line was a major factor in its location and design plans. The consensus of these observations is that a new Sears building would have been built in any case, but perhaps at a different location, size and with a different design if subway plans and related incentives had not existed.

Evaluation

The apparent lack of land use impact of the recent improvements in the Chicago system provides an instructive contrast with other cities. With regard to downtown effects, it must be remembered that the Chicago rapid transit system was well-developed before the improvements. The post-World War II extensions have added only marginally to the number of workers and others journeying to the Loop via transit. In addition, the only improvement to the system within the Loop area itself has been the Dearborn subway, which had only marginal effects on the system's CBD capacity.

Along the new line extensions themselves, the lack of effect seems due to several factors. First, the freeway median station locations limited access by walking, and the presence of the freeways themselves produced an environment unpleasant for most types of transit-related development. In addition, the areas were fully developed when the lines were built, and land costs were correspondingly high; at the same time, most were not attractive for new development because of their aging and sometimes dangerous residential and industrial character. Finally, there were not effective incentives to overcome these obstacles. Under such inhospitable circumstances any development potential attributable to a transit improvement could not surface.

CLEVELAND

System and Surroundings

After ten years of planning and three years of construction, the original 13.3 mile, grade-separated Cleveland Transit System rail line was opened in 1955. It extended from Windermere Station on the east to downtown Cleveland via Union Terminal Tower and west to the West 117th Street Station. A two-station westward extension was made in 1958 to West Park. One other CTS right-of-way extension occurred in 1968. Totaling 4.1 miles with three new stations, this surface extension linked the existing line to Cleveland's Hopkins International Airport, thus becoming the first rapid transit system in the U.S. to provide a direct rapid transit line into an airport. In 1971 the 18th station, Campus Station, was added to the system to serve the expanding institutional activity southeast of the CBD and to provide a convenient transfer between the older Shaker Heights light rail line and the main CTS Rapid line to the airport (See Figure 4.7).

Many of the 18 stations are characterized by simple outdoor platform structures. The five newest (and highest patronage) stations on the western end of the line have enclosed waiting areas, but few amenities such as snack bars or newpaper stands. However, a major feature of the CTS Rapid line is the provision of free parking areas wherever possible.

Illustration 4.10
Cleveland Union Terminal Tower

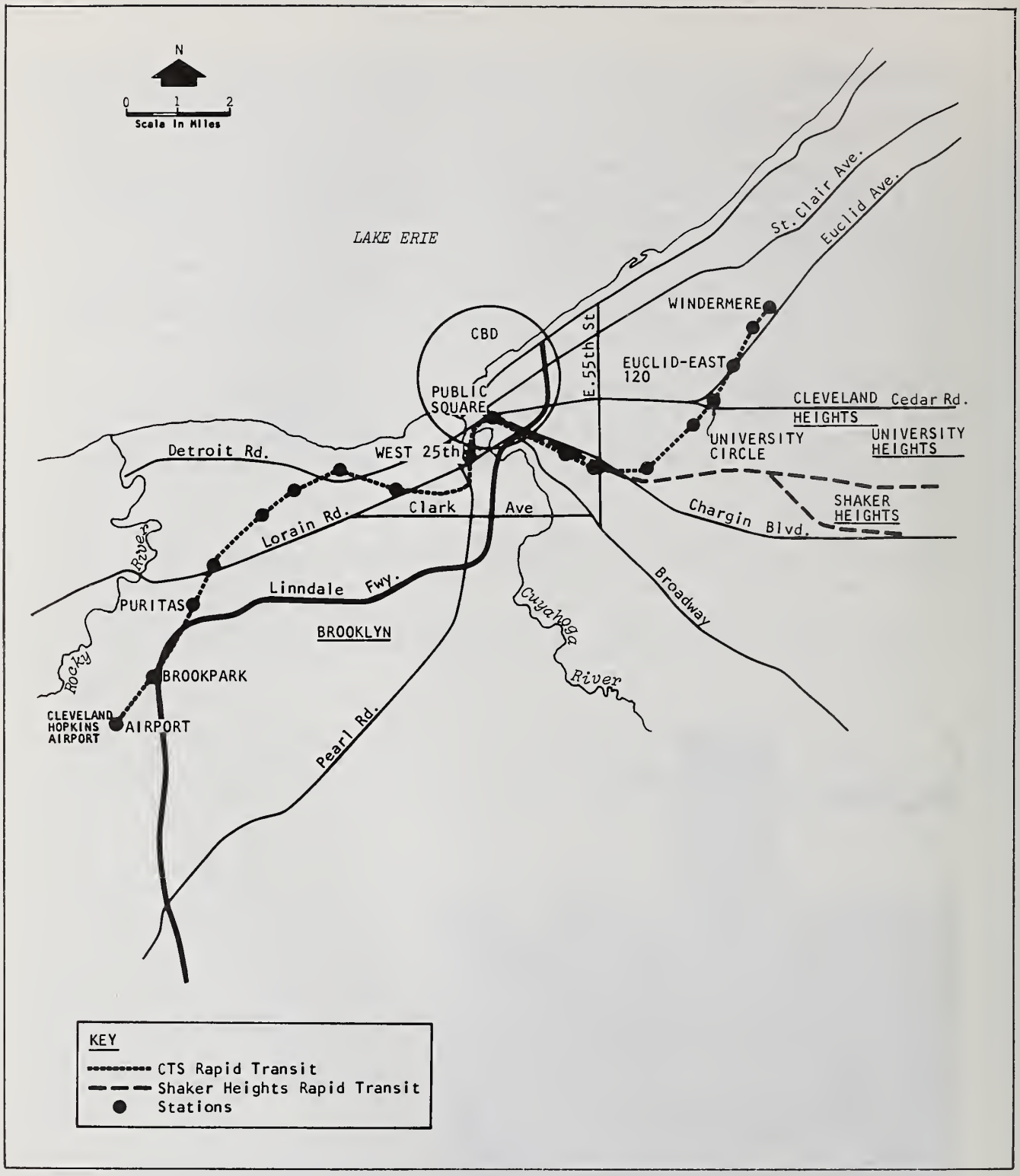


Figure 4.7
CLEVELAND TRANSIT SYSTEM

Illustration 4.11
View of Area Along Cleveland Transit Right-of-Way

Even beyond the contention of highway dominance over transit as a development inducement, not much development has taken place in Cleveland at all in recent years. Some officials cite the declining population of the urban area combined with high construction costs and high interest rates as major factors in the lack of regional demand, particularly for new office buildings. Local planning officials also argue that lack of any existing concentrated activity at the stations has resulted in absence of the necessary "strong pull" or attraction for new development at these sites.

Air Rights: Personal observations and interviews indicated that while no major development has yet taken place due to the presence of rapid transit, except the new State building near the CBD's Union Terminal Tower, the potential for use of air rights is presently being explored at several stations. These conclusions are consistent with previous observations (Marcou, O'Leary, 1971) that significant development interest was not to come until the opening of the airport extension in 1968. This extension, while providing for an increased scope of service throughout the metro area, introduced several new stations with transit system-owned parking lots potentially compatible with air rights development.

Currently, parking is offered at nine stations for a total capacity of 7,325 autos. The Union Terminal Tower is the only rapid transit station serving the CBD. Loop buses distribute trips within the downtown area, including several locations where urban renewal is taking place.

Because the system was developed adjacent to private freight rail service, the line does not directly serve densely populated areas. In distance of the entire CTS Rapid line, so the system is heavily dependent on feeder bus passengers and patrons with private cars. In 1976, the system handled approximately 42,000 one-way passenger trips per day. Expansion of the system to the southeast (Bedford) and southwest (Parma) has been studied, in addition to extensions to the existing CTS Rapid line and the Shaker Heights light rail system (the Green Road line to I-271).

Sources of Evidence

There are no published analyses of the Cleveland system's impacts on land use. Consequently, this study relied upon a visual reconnaissance of the system and interviews with officials of the city Department of Community Development, the Greater Cleveland Regional Transit Authority, and the region's metropolitan planning agency - the Northeast Ohio Areawide Coordinating Agency (NOACA).

Evidence of Impact

Simple observation of the stations and their surroundings indicates that significant land use impacts of the recent improvements are improbable. Several physical factors may account for the absence of any desired development. Most of the rapid transit line is located within a very wide railroad right-of-way. Casual observation reveals many railroad tracks and parked freight cars, often on both sides of the rapid transit tracks. Steep, unstable embankments are also present along much of the line, separating the right-of-way from any contact with immediately adjacent land uses. As the system progresses further east or west of Union Terminal and the CBD area, the predominant adjacent land use pattern is scattered or low-density established industrial development, often oriented to the railroad right-of-way. Such an established industrial environment, apparently unreceptive to change, has remained an unattractive setting for any office or residential development.

In addition to these physical constraints, several general factors have been offered by various individuals as major influences in accounting for the lack of any major development associated with the Cleveland Rapid transit system. Some officials contend that highway access is more important to local developers than the availability of transit. This is supported by the continuing inability of the city to attract and hold businesses in the CBD.

Interviews with key personnel in the Greater Cleveland Regional Transit Authority (RTA), the Cleveland City Department of Community Development and NOACA have provided insight into the evolution and progress of air rights development at three of the stations. Developers have proposed air rights development at only these three stations, although potential leasing of air rights at other stations is possible. Interviews indicate that those specific sites were chosen because they attract the highest volumes of riders of all stations on the system.

At the time of the transfer of the former Cleveland Transit System in 1975 from the city to the new RTA, the city reserved the rights to development on the rapid transit right-of-way except for the Puritas, Brookpark and Windermere stations. At these stations contracts had already been granted to developers. Although any future air rights lease revenue at other stations are therefore the city's, and not available to RTA, the transit authority has encouraged any such development along the rapid transit system which would attract new patrons to the line.

The three air rights contracts now in effect do provide some income to RTA, but no development has occurred. At Windermere Station, in 1971, a 99-year lease was granted to a developer in the amount of $1,510,150. However, the company was never able to secure proper financing for developing this site, and RTA is contemplating cancelling their lease. In 1972, at Puritas Station, a 55-year lease was granted to the Puritas Landing Company for $1,855,000. The proposed development for this site

Illustration 4.12
Potential Air Rights Development Site at Puritas Station

includes a large luxury motel, restaurant, meeting facilities, apartment complex, and parking garages. According to RTA, difficulties in securing the necessary zoning changes have stalled this project. It should be noted that zoning policies in Cleveland are implemented and controlled by the City Council on a ward basis; in effect, a separate Council member controls zoning for each of the 33 wards. The city's failure to respond to rezoning requests at the transit stations suggests that such changes are not perceived by the Council member in charge to be in the ward's best interests. At present there is no coordinated citywide land use planning and zoning.

Also in 1972, at the Brookpark Station RTA granted a 55-year lease for $1,086,000. The proposed development for this site includes a large office building, a motel, restaurant, an apartment complex, and a large parking facility. As with the Puritas station development, this project is tied up in an attempt to obtain permission for high-rise development and use of the land.

It should be noted that two major developments, one currently under construction and one scheduled to begin construction in 1979, are situated less than a block from the only CBD station and the focal point of downtown - Terminal Tower. The respective developments are the State of Ohio Office Building and a Tower City Office Complex. Both of these projects are located on air rights above the Rapid Transit tracks. Several reasons have been given by local planning officials for the developers/owners selecting these sites and thus going to the additional expense of building the structures "on stilts". They include: the scarcity of available land in this central location; the tremendous concentration of existing office, retail and commercial space in this area; and proximity to the existing Rapid Transit line.

Other Plans: Developers are planning for projects in the vicinity of the West 25th Street and Euclid-East 120th Street Stations. In these cases, the rough topography will necessitate moving both stations before any coordinated development can occur. RTA is awaiting a firm commitment from the developers before preliminary planning for station relocations to provide a closer link between the rapid transit stations and the proposed projects.

The development planned near the East 120th Street Station is sponsored by a private non-profit organization which is in the process of acquiring land with the intention of incorporating it into the existing University Circle complex, which is second in size only to the Cleveland CBD as a regional activity center. This organization exists specifically to coordinate this area's continued development, and such an addition is part of their ongoing process of private urban renewal through controlled community development. Members of this organization include hospitals, Case Western Reserve University, clinics, and museums.

Illustration 4.13
Planned Site (near residential structures) for New University Circle Development

The initial development proposal called for a convention center, hotel, apartment, and shopping complex. This activity center is already heavily oriented to transit use. It is the only non-CBD location with user paid parking costs, and the work trip transit made split is similar to the CBD. Some local officials suggest that the rapid transit service has had a major role in this center's stability, if not its continuing moderate expansion.

Near the West 25th Street Station, a local savings and loan association is involved in site assembly and planning. As at the Euclid-East 120th Street Station, topographic problems necessitate moving the present station location. Preliminary plans for this site are for a multi-use complex to include apartment, office, shopping, and entertainment facilities. Owned by the savings and loan association, this site was also selected for its proximity to one of the association's major non-CBD branches, rather than for transit accessibility. This project is still in an early stage of planning and approval.

Evaluation

As in Chicago, land use impacts of the Cleveland rapid transit system are apparently, to date, minimal. Among the major factors are the often-difficult and unattractive station sites and the region's continuing low overall demand for new development. Nonetheless, at least some active developer interest in air rights and nearby areas has been shown downtown as well as at a few stations. In some of these cases, development has been stalled, evidently because of opposition to the required zoning changes, while at others delays in financing and land assembly are involved. No development has actually occurred, with the exception of the CBD's Terminal Tower station area, despite some early published reports to the contrary.

NEW YORK

MTA System and Surroundings

Like the city itself, the New York City rapid transit system can be compared to no other on this continent and few in the world. The system's more than 230 route miles of rapid transit lines and 461 stations serve a population living at an average density nearly twice that of any other American or Canadian city, and a central-city commercial district larger, taller, and more densely developed than any other in the world.

The subway system carries fully 90% of all urban rail transit trips made in the entire country; and 20% of all trips made in the country by both bus and rail transit. To accommodate this vast ridership, the density of the subway lines themselves is far beyond that of any other system: in Manhattan, as many as four parallel lines can be found within four blocks.

Most of this system has been in place since prior to World War II, and before its present administrative structure had evolved (the system is operated by the New York City Transit Authority as a constituent of the MTA -- the Metropolitan Transportation Authority). Only three major post-World War II improvements (one currently under construction) have been made to the subway system. In the mid 1950's, MTA acquired and converted the failing Long Island Railroad's Rockaway commuter line into a rapid transit line. Also in the mid 1950's, the 3rd Avenue elevated line was removed in anticipation of construction of the 2nd Avenue Subway. However, the subway line has never been built (except for a few isolated and unused portions) due to financial difficulties. Other elevated lines were also removed in the post-war period, but were not linked to new subway construction. The third recent improvement is the 63rd Street Crosstown Subway, on which construction is now underway.

As noted in an earlier chapter, there have been three major phases of transit development in New York, occurring between 1900 and 1940. The very dense development found today in the City, especially in Manhattan, has tended to follow where the early transit lines were located. Thus, most of the major development activity in New York City in recent years as well as prior to World War II, has been directly attributed to construction of the subway lines in the early 1900's.

Sources of Information

No published impact analyses or related studies were found. Consequently, the primary sources of information were interviews with knowledgeable local transit and planning officials and consultants.

Evidence of Impacts

Rockaway Line: In the mid 1950's, MTA acquired the Long Island Railroad's Rockaway commuter route linking Manhattan with Long Island. Conversion of the route to a NYCTA rapid transit line offered reduced fares and more frequent service, although a longer travel time than the original commuter service.

One area served, Arverne, is on a two-sided barrier beach on the Far Rockaway Peninsula. When acquisition and conversion of the line was made, this area housed a very low-income population and was predominately developed with large old single family residences and beach bungalows which had been subdivided and had greatly deteriorated over the years. Throughout the 1950's and 1960's, plans were made to redevelop the area with subsidized high-rise housing, with the potential occupants being able to utilize one of several subway stations in the area linked to the new service. A large slum residential area was cleared for the project. However, only a small amount of construction has actually ever taken place due to a change in federal renewal programs and local funding priorities. A large cleared area still remains vacant today. The subway service improvement to this area has apparently had no effect on stimulating the necessary political and financial forces for additional development to occur.

Other points served in Far Rockaway include a generally declining area beyond Arverne. One large private apartment development was built on the beach; no other major development is apparent there. On the line's other branch along the beach, the "boardwalk" commercial area has experienced a substantial amount of mid-rise apartment development oriented to the beach and replacing lower density beach-cottage housing. In all these cases we were unable to determine the influence of the transit improvement.

Current ridership on the Rockaway Line is even lower than when commuter rail service to this beach area was taken over. At one station in the area, Edgemere, the patronage for an entire year averages 60,000 passengers, although most other stations are much more heavily used. This generally low level of transit use, in comparison with pre-war levels and with other lines, suggests that the line's effect on development is unlikely to have been large. However, since the service change was in fact not a large improvement, at least in travel time, little impact is to be expected.

Second Avenue Subway and Removal of Elevated Lines: The proposed new Second Avenue Subway Line was associated with the removal of several miles of elevated lines along 2nd Avenue in 1940 and 3rd Avenue (east-side Manhattan) in the mid 1950's. The new subway was to replace the blighting elevated structures and was to be a major improvement to subway access along Manhattan's east side, providing new routes into the East Bronx and improved access to existing transit corridors in Queens. The subway has not been built (except for a few isolated

portions) due to financial difficulties and a change in MTA priorities (completion of the Crosstown Queens subway line first). However, removal of the 3rd Avenue elevated line has apparently induced some development-related impacts.

At the time of El's demolition, the 3rd Avenue corridor area was characterized by old and deteriorated development, with the elevated structure serving as a major blighting force. Within the last 15 years, after demolition of the "El", and as part of overall pressures for redevelopment and more intensive development of the East Manhattan area, a very large amount of new development, especially office space, has taken place. New York City planning officials reported that the amount of new office space built along this corridor alone exceeds the total amount which has taken place in all of downtown San Francisco within the last 15 years.

Illustration 4.14
View of Dense Development Along New York's Sixth Avenue Subway

It is important to note that while removal of the elevated structure was a major impetus for redevelopment, such a large amount of new development would not have taken place without the availability of the

several other subway lines within walking distance from the new buildings. Also, redevelopment of the area was made more attractive by proximity to downtown Manhattan and the availability of large groups of land parcels in single ownership. It should be pointed out that where such complementary factors were absent, removal of several other elevated lines (including one on 2nd Avenue itself) prior to World War II was not followed by large-scale new development. Also, removal of the Third Avenue elevated line in the Bronx (about 1974) and the Myrtle Avenue elevated line in Brooklyn (about 1968), did not have any significant effect on development. In these areas local characteristics inhibiting development have been particularly strong.

The Crosstown Subway: The most recent transit improvement, now under construction and scheduled for partial opening in the mid-1980's is the new 63rd Street Crosstown Subway Line which extends through the central Queens corridor to mid-Manhattan. The subway is being built parallel to the existing 53rd Street-Queens Tunnel subway to relieve its present 30 - 40 percent overload. Only the Manhattan part is underway.

Most of the immediate subway corridor is densely developed with generally high quality apartment and office buildings both in Manhattan and Queens. However, the new line will also serve Roosevelt Island, a new development on Welfare Island in the East River. This very large residential development, now partially completed, is to be served primarily by transit,

Illustration 4.15
View of Roosevelt Island - to be Served by New York Crosstown Subway

including an aerial cableway in addition to the yet-to-be-completed subway. The only auto access is a low-capacity bridge connection to Queens, intended mainly for service and emergency vehicles. It is clear that the subway is an essential element in the successful operation of this innovative residential complex, and undoubtedly was an important factor in the original determination of the development project's feasibility; the other factor was the availability of a very large tract of close-in land (the island) previously unavailable for development.

Only the deteriorating Jamaica Center area to be served by the new line appears to provide any other major development potential. Active planning is taking place to revitalize its large shopping area by construction of several new complexes including a new shopping mall and college. Provision of transit to this area appears to be one of several important factors which will determine the success of such large-scale planned investment here.

Thus, with the exception of Roosevelt Island and the Jamaica Center area, no major redevelopment opportunities exist along this new transit corridor, and the city is not encouraging any other changes in land use. The new subway line was primarily intended to provide more subway service to an existing dense population corridor with severe transit capacity problems.

Other Improvements: Several system improvements have been made, such as replacement of most of the 6,000-car fleet and trackway/operations improvements (particularly at junctions), to allow better service. Some of these may have indirectly contributed to development near the end of lines by decreasing travel times to downtown, although no evidence was found to verify this possibility.

PATH System and Surroundings

The 13.9 mile Port Authority Trans-Hudson (PATH) rapid transit system is owned and operated by the Port Authority of New York and New Jersey. The line extends from Newark and Hoboken, New Jersey in two branches under the Hudson River to 33rd Street and the World Trade Center in Manhattan, and is served by 13 stations. It is very heavily used, accommodating approximately 143,000 daily weekday one-way trips. (This compares to the BART system's 137,000 as of early 1977.)

The line, essentially serving as a shuttle from major population and commuter rail terminal points in New Jersey to the employment center of lower Manhattan, was acquired by the Port Authority in the 1960's. The previous owner, a private railroad, had gone into bankruptcy in the early 1950's. While the origin of the line dates back to the 1800's with the Hudson and Manhattan Railroad, acquisition and operation of the line by the Port Authority has resulted in a substantial upgrading

of service. One major reason for this upgrading was an agreement between PATH and the Erie Lackawanna Railroad, which operated a frequent and heavily used ferry service in this corridor, to upgrade the rail system and phase out the ferry.

Evidence of Impact - The World Trade Center: Several major developments have been associated with the system at three of its stations. One of the two Manhattan terminals of the line is located in the new Hudson Terminal in the basement of the recently constructed World Trade Center. This terminal provides an excellent example of joint use.

The actual site is on Port Authority-owned property where the old Hudson Terminal was situated. The complex comprises two-110 story towers totaling eleven million square feet of space. Begun by the Port Authority in the mid-1960's, this massive investment was viewed by some local officials as an efficent way to increase returns and help to pay off acquisition costs of the PATH system. Such optimistic views, however, have been dampened by the fact that vacancy rates of the Center have averaged from one-third to one-half. It is still believed by Port Authority officials that this investment decision will be beneficial in the long run.

It should be noted that introduction of this massive amount of office space has resulted in adverse side effects within the real estate market in terms of existing and proposed competing private investment. The high vacancy rates in the World Trade Center indicate that the area will require several years longer than expected to absorb such a large amount of new office space.

Because of extremely intensive existing transit service and retail development at Herald Square, the other PATH terminus in Manhattan, no land use impacts of the PATH improvement could be expected. In any case, the influence of PATH would be marginal.

Jersey City and Newark: The recently completed $85 million Journal Square Transport Center in Jersey City provides another striking example of joint development which has taken place with PATH's transit facilities. The actual development consists of a multi-use building including a new subway station (to replace the outmoded one). Opened in 1975, Journal Square is in one of two downtown nodes in Jersey City. The new development has reportedly helped to strengthen the deteriorating downtown area. However, it has not as yet been followed by any private construction nearby.

Some major development has also taken place at the New Jersey terminal point in Newark. The station serves the TNJ (Transit of New Jersey) light rail subway line, several TNJ local bus lines, Amtrak intercity and ConRail commuter trains.

Illustration 4.16
New Jersey PATH Journal Square Terminal

Two office towers were recently constructed on urban renewal land adjacent to the Newark Station in 1972 and 1974. According to local officials, this site was selected for redevelopment due to its proximity to the multi-modal transit terminal and thus its potential to attract patrons for commercial and retail development. To make access even more convenient for potential patrons to the new development, the city built pedestrian bridges between the office towers and station so that direct access can be made without walking along the street.

No major redevelopment is occurring elsewhere in downtown Newark. Thus, the decision to use urban renewal powers to redevelop this site in conjunction with the transit station, provided an attractive inducement for developer investment.

A $25 million renovation of the actual station itself is scheduled for the near future. A proposed Newark airport extension will also originate from this station, enhancing its development potential still further.

Evaluation

New York is a unique case among American cities with its history of transit development. The City's extemely heavy subway construction in the early 1900's led to intensive downtown development both before and after World War II, with some development not occurring until many years after construction of a line.

It is obvious that the extremely dense development in Manhattan today is totally dependent on the existence and maintenance of the City's efficient rapid transit system. Movement of the large number of people in and out of the area would not be possible without the subways. Such dependence on transit is further evidenced by the large number of City residents including middle and upper income persons who do not own an automobile.

General observations of the MTA transit system's impact on the City's development, then, suggest that New York's intensive development was made possible by its earlier rapid transit, with most areas well served by World War II. The few major improvements made since World War II have not materially changed access, and may well have even been offset by the general level-of-service cutbacks which have been instituted in recent years as economy measures.

In addition, existing development was already so intensive that no major impact of these few improvements is likely except in very unusual cases such as Roosevelt Island. Finally, the single major improvement in service to date which could have contributed to localized development, the Rockaway Line, was prevented by stronger forces (lack of redevelopment funding and political support) from doing so.

All of these examples, however, serve primarily to illustrate the difference between New York and other cities. In New York, the transit system has already had its major land use impacts, and its role is now that of a vital element in the maintenance of the city's ability to function. Other cities seek to induce transit-oriented development; New York has long since succeeded in this, and must now concentrate on keeping it working.

The PATH system is a striking contrast to the MTA subway system. Its basic difference is that it is opening a "new" area to (re-)development by increasing access to the lower Manhattan city center, while the MTA serves areas already built up around such intensive transit service. This appears to be a rare case in which a transit improvement has significantly altered a region's internal accessibility, since limitations of commuter auto access to lower Manhattan have made PATH (and its predecessor ferries and commuter rail line) the most attractive available travel alternative.

Consequently transit-induced development pressures, particularly at the New Jersey terminal outside the deteriorating downtown areas of Jersey City and Newark, are strong. As in other cities, the availability of land (here through urban renewal powers) has also been a key force complementing the transit system's land use impact potential.

WASHINGTON

System and Surroundings

The Washington area's new METRO rapid transit system has been under construction since 1969, after some fifteen years of planning. Formal adoption of the route was in 1968. Of the projected eight-line, 100-mile system, a four and one-half mile segment, with five stations, has been in operation since spring of 1976. Two more stations were recently opened. Another line, 19 miles in length and with 13 additional stations, is scheduled to open later in 1977. These first two lines will intersect near the White House, at the Metro Center station (Figure 4.8).

Completion of the full 100 miles is in doubt. The construction schedule has been lengthened, and alternatives for much of METRO's planned suburban mileage are under study. Completion of at least 60 miles is apparently assured, however, and scheduled for operation by 1982. Forty-eight miles of the planned system are underground, with most of the remainder at-grade paralleling rail or highway rights-of-way. Thirty-eight miles are to be within the District of Columbia itself, with the remainder (of the full 100-mile system) evenly divided between suburban Virginia and Maryland.

The District is characterized by a small area (61 of the SMSA's 2300 square miles in 1970) and a stable population (756,510 of the SMSA's 2,105,238 in 1970). Population density is quite high at 12,231 persons per square mile in 1970 versus 919 for the suburban area. A very high proportion of the region's jobs is in the center city (45 percent in 1970), although suburban jobs increased from about 36 percent in 1960 to 55 percent in 1970 in a continuing shift outward from the District. Peak period traffic congestion is extreme, particularly on CBD-oriented routes.

Despite the region's growth in suburban jobs since 1960, the "Downtown" area of Washington (the old commercial core east of the White House where Metro's lines converge) has undergone a substantial increase in both public and private development. In the 1950's, only seven buildings were constructed downtown, for a total investment of about $40 million. In contrast, from 1960 through 1974, over 60 private buildings and 12 public buildings were built or under construction, totaling $640 million in value. Figures available for that period further indicate that another $240 million was planned at that time in public development alone.* This recent and planned development totals an estimated 18.7 million gross square feet, of which some 11.7 million is in office buildings. Although somewhat less than the 20 million

*Figures supplied by Downtown Progress, a non-profit organization existing to encourage revitalization of downtown Washington.

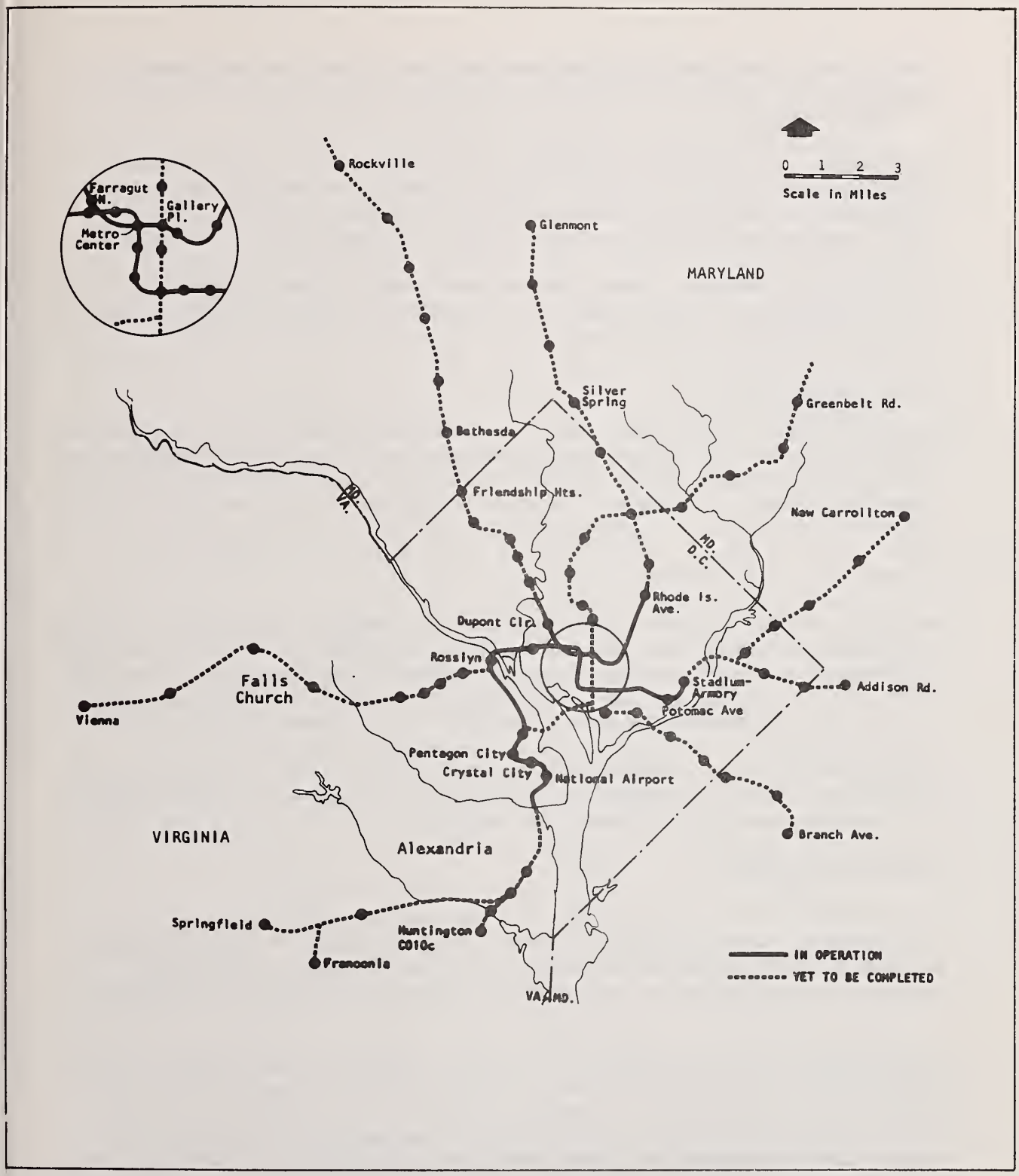


Figure 4.8
WASHINGTON, D.C. METRO RAPID TRANSIT SYSTEM

square feet of high-rise office construction in downtown San Francisco during the same period, for example, this is still a substantial degree of redevelopment.

The District is unique in the United States in its use of an absolute building height limit. All buildings are restricted to 130 feet plus rooftop mechanical structures, or an effective 150-160 feet. This limits maximum allowable floor area ratios to about 10:1. In addition, the Congress exercises considerable influence on District planning and the Federal government owns or controls a sizeable proportion of the land. Otherwise planning controls and procedures are similar to those employed elsewhere in the country.

Sources of Evidence

Although several "impact studies" have been conducted on various portions of the METRO system, to date nearly all published results are projective rather than factual. Brief mention was made of current development activities at specific stations in reports by Lanfeld (1971), National League of Cities et al. (1973), Libicki (1975), and Sharpe (Rice Center, 1976b), among others. All of these were observational accounts and involved no detailed study.

Small but detailed analyses of property value impacts around three station areas were conducted as a part of the New York Office of Midtown Planning and Development's DOT funded joint development study (Reynolds & Reynolds, 1976a, b, c). These included both effects to date and projected, and are the only published statistical studies. To broaden this information base, interviews were conducted with responsible officials of the Washington Municipal Planning Office, METRO Real Estate Division, Federal City Council, Northern Virginia Transportation Commission, and Maryland-National Capital Park and Planning Commission.

Evidence of Impact

All officials interviewed agreed that the emerging METRO system has not yet generated any significant overall level of impact on land use. Most attributed this primarily to the system's early stage of development. However, several important cases were identified and examined in greater detail.

Metro Center - Gallery Place: It is clear that METRO did influence the Redevelopment Land Agency's (the local urban renewal agency, subsequently absorbed into a broader city agency) selection of properties for acquisition and redevelopment. RLA elected to concentrate its acquisitions around the two main METRO transfer stations, Metro Center and Gallery Place (Reynolds, 1976a). Both are a few blocks east of the White House, along G Street. This is a part of the old downtown retail center of Washington. Much of this area was substandard, although fully developed in commercial and residential structures. Ownership tended to be

dispersed, with many small parcels and a high degree of trusteeship. RLA attempted to encourage private developers to assemble and redevelop the area, but land assembly under such conditions was apparently too difficult. As a result, in 1970 RLA was authorized by the Planning Commission and the City Council to use Federal renewal funds to purchase selected properties that were otherwise eligible under local and Federal regulations at these two stations. RLA now owns portions of four blocks at Metro Center and an entire block at Gallery Place (Figure 4.9).

So far, however, none of this land has been sold or redeveloped. One major private development was proposed for the Metro Center holdings in 1973, but the developer failed to obtain financing during that inflation-recession period. Another developer now (1977) has an option on some parcels, but has not yet committed the financial backing necessary for development pending agreement with the city regarding a public lease of some of the space. Thus even with public land assembly, a central location and maximum potential access by rapid transit, and some initial transit service actually in operation, private development activity has not yet materially increased in this older portion of the CBD.

In the same general area, just two blocks north of these two stations is the site of the city's proposed convention center. This site was chosen largely as an impetus to further renewal of the area but also because of its ideal access by METRO. Construction of the convention center has been stalled for several years because of the many required approvals, including several Congressional committees. There are, however, indications that this project will soon proceed.

Apart from these public efforts, one substantial private investment has been made at the Metro Center station in the form of a direct underground connection between the station and a major department store (Woodward & Lothrop). This $1 million project was entirely financed by the store. No other evidence of development or of unusual increases in land value were found in this area.

Farragut North: At Connecticut Avenue and L Street private development (1101 Connecticut Avenue Building) is under construction. The site is owned by WMATA and leased on a long-term basis to a developer. The development will have direct access to the station. This case is of special interest for its value capture provisions; the developer has agreed to share future profits, above his expected return, with the transit authority as a condition of the lease.

At 18th and K Streets a larger-scale development known as International Square is being developed in three phases and upon completion will have direct access to the station. WMATA obtained an easement at no cost from the owners for the station entry in exchange for direct access at a cost of $150,000 to the owners. According to key participants interviewed, it is likely that this development would have occurred even without the transit station's proximity, because of favorable land availability

Figure 4.9
LAND PARCELS HELD FOR REDEVELOPMENT AT METRO CENTER AND GALLERY PLACE METRO STATIONS, WASHINGTON

Source: Department of Housing and Community Development, District of Columbia.

and market conditions. However, it would have probably been somewhat smaller and less diverse.

Friendship Heights: The Metro subway station here is situated on the boundary of Maryland and the District of Columbia near Bethesda. It is a prime uptown suburban retail shopping district within a high-income residential area. In the 1950's and '60's a number of high-rise residential developments, offices, and retail shopping facilities were built here. Several additional retail and office developments have been proposed or are under construction in the station area. Their location is primarily attributed by local officials to the attractiveness of the area with the presence of Metro acting as an additional but not pivotal inducement.

The prestige Neiman Marcus department store is being constructed adjacent to the station as part of a 50-store shopping complex. N-M's location here was a marketing decision based on the desire to take advantage of the existing consumer appeal of Saks Fifth Avenue and other prestige stores already established nearby. Auto access is expected to continue to be dominant, and no provisions have been made for direct access to the subway station from this or any other development in this area.

Another large development -- an indoor shopping mall/office complex -- has also been proposed in the station area. A building permit was secured by the developer, but the proposed development exceeded allowable sewer capacity limits. While a solution was being sought, local resident pressure against additional development mounted, resulting in downzoning of the site and withdrawing of the building permit by the County. The downzoning action has recently been upheld in the courts.

Also adjacent to the station, a large office/commercial complex was proposed by the landowner as a redevelopment project. The plans called for increasing the existing 125,000 square feet of retail/office facilities to nearly 750,000 square feet. The proposal was ruled out by the County Council because the proposed increase would exceed overall density requirements established by the official development for the area.

Very little additional development has taken place recently in the station area due to the County Council's desire to adhere to limitations established in its development plan.

Potomac Avenue: This case was analyzed and reported by Reynolds & Reynolds (1976b) for the NYOMPD joint development study, and also discussed in several interviews. Here a private developer assembled a block at the station for a government office building, but the required rezoning was denied. This station is at the edge of the increasingly affluent Capitol Hill residential area, where extensive private restoration of homes has been in progress for years. These residents have effectively opposed such changes in zoning. The site in question is now zoned for mixed commercial and apartment use, but remains vacant. Reynolds and Reynolds assert that the developer's selection of this site was definitely due to the anticipated METRO station. (The station is not yet in operation.)

No other new construction was underway or planned at Potomac Avenue at the time of the Reynolds study. Based on their knowledge of the area, experience in real estate evaluation, and a case-by-case review of local property transfers, they concluded without further discussion that the added convenience of METRO is likely to increase nearby land values by approximately twenty percent, or from $13 million to $20 million. They predicted that this would occur within twelve years. However, as with the other Reynolds forecasts (1976a, c), no explicit justification is given for this projection and no impacts to date are identified.

Other Washington Cases: Interviews indicated that in a number of instances of recent development, METRO's location was influenced by the development rather than vice versa. Such situations include the L'Enfant Plaza and Waterfront station areas. Similarly, the location of the Van Ness station was influenced by the decision of the Washington Technical Institute to build a campus there on a large tract of excess land held by the National Bureau of Standards.

Similar situations occurred outside the District. METRO stations are located in the large office developments of Rosslyn and Crystal City, but there is no evidence that the stations were a major factor in these developments. Rosslyn and Crystal City were already well underway when the station locations were selected. Pentagon City's development was anticipated to occur by the start of revenue operations, however zoning delays resulted in the development subsequent to Metro operations. Its design and rate of construction were apparently influenced by the station's presence, but demand for the complex was strong and those interviewed felt that it would have occurred without METRO.

Illustration 4.17
View of Washington Metro's Rosslyn Station Area

Evaluation

It is apparent that METRO has had little effect on actual development around its stations at this early stage in the system's own life. However, the system seems to have had a substantial effect on public authorities, who are attempting both to encourage transit-related development and control its nature and effects. Several city and county studies have been conducted, in anticipation of development, to guide these public land use policies. The District, through its redevelopment agency (a function now incorporated into another city department), acted aggressively to encourage station-area development, and other jurisdictions have sought to create station-area plans and development incentives. But despite such efforts, neither public nor private development has appeared to any significant degree.

This is partly attributable to the fact that very little of the system is yet in operation, and its ultimate extent not yet known. As already noted, neighborhood opposition has been another reason in several cases. Yet another is the District's strict height limit policy, which makes it difficult to offer incentives to developers. Finally, many METRO stations tend to be either in fully developed commercial areas (where the costs of redevelopment are high), in deteriorated areas (where demand is low), or in low-density residential areas (where resistance is strong). So far, the advantages of METRO, coupled with the efforts of public agencies to encourage development, have not been strong enough to overcome these obstacles. However, since so little of the system is in operation this amounts to a "progress report" rather than a conclusive review of the system's power to induce land use change.

Little study of possible land value impacts was found. Although the various impact studies conducted thus far have tended to predict such effects, almost none has reported any such effects to date. Langfeld, the only exception found, reported a large apparent effect on the selling price of one 50-acre parcel. The Reynolds & Reynolds studies of three station areas predicted land value impacts for the future, but found none to date through their review of sales data. Again, however, these results should be interpreted only as a very early benchmark in the transit system's generation of land use and value impacts.

One final observation should be made. In conducting interviews with public and private actors in the development process throughout the Washington area, we were struck by the conviction shared by all that METRO had been a principal factor in halting the decline of central Washington. All acknowledged freely that little was yet apparent in specific station area impact, but insisted that developer confidence and investment throughout the city had been and still would be much lower without METRO. They agreed that METRO's major impact may well not be

its encouragement of specific station-area redevelopment, but rather its symbolic demonstration of the government's commitment to preservation and enhancement of the central city in the face of a continued drain of economic vitality to the suburbs.

This contention could not be tested because of lack of recent development statistics, and is not amenable to empirical "proof" in any case. However, it is of the greatest significance if true, and should be given further study.

Chapter V
COMMUTER RAIL, LIGHT RAIL AND BUSWAYS

This chapter explores the observed land use impacts of recent improvements in three additional modes of rapid transit: commuter rail, light rail and busways. In all three modes, the number of recent improvements has been limited. Most commuter rail systems were well established before World War II, and contemporary light rail and busway are relatively new technologies. The analysis provided is therefore less extensive than for the rapid transit systems reported in the preceding two chapters, particularly for light rail and busways. The examples cited in this chapter are not meant to be all-inclusive, but rather representative of a wide range of environments and experiences insofar as recent improvements and information allow.

COMMUTER RAIL SYSTEMS

All except one of the presently operated North American commuter rail systems were well established before World War II. Most commuter lines were developed as offshoots of mainline railroads in conjunction with suburban development surrounding many major eastern cities. There have been relatively few recent major improvements to these systems.

The notable exceptions of Toronto (a new commuter rail system), Philadelphia (significant upgrading of service, equipment and marketing) and Chicago (complete re-equipping of the private commuter railroad fleet) are studied in some detail. The comparative lack of commuter rail's land use effects in Boston, Montreal and New York is also discussed. It should be noted that a few other cities have small or moderate-sized commuter rail operations, all of which fall into the no-impact category and which are therefore not examined.

Toronto "GO" Commuter Rail System

System and Surroundings: The origins of Toronto's GO (Government of Ontario) commuter rail system date back to 1962 when the Government of Ontario, in response to increasing regional rush-hour traffic, established the Metropolitan Toronto and Region Transportation Study (MTARTS). The Study was to devise an overall transportation policy for Toronto and surrounding municipalities. The resulting recommendation included the concept of GO Transit -- an innovative commuter rail service cutting through many area municipalities and six regional municipality boundaries.

The system began operations on a limited basis in May, 1967, and by September of that year the initially planned service was implemented. In September 1970 the first GO bus service line was put into operation linking outlying cities with the two outer stations on the Lakeshore rail route. Today the combined GO rail/bus service accommodates approximately 36,000 daily one-way passenger trips. Operated by the Toronto Area Transit Operating Authority (TATOA) since 1974, the GO rail system currently consists of two routes (Figure 5.1). The 60-mile Lakeshore route, utilizing Canadian National Railroad trackage, consists of two segments which extend out to the west and east from Toronto's downtown Union Station near the waterfront. The western segment serves six stations, excluding Union Station, out to Oakville on a regular daily basis with rush hour trains running every 20 minutes and non-rush hour trains running once an hour. An additional three stations west of Oakville to Hamilton are served on a limited basis. The eastern segment also serves six stations, excluding Union Station, out to Pickering with the same regular daily service as the western segment.

The second rail line, from Georgetown to downtown Union Station, operates three morning and three evening weekday trains along the 30-mile, seven station route. Downtown Toronto's Union Station serves as the boarding and terminal point for over 90 percent of all weekday GO train riders.

Union Station also has direct access to the City's subway and indirect access (via subway) to the bus system. Parking is provided at all stations except for the three downtown stations which link directly with the subway. Plans are underway for expansion of the system to the north.

The West Lakeshore corridor is the heaviest patronage area of the GO system. Several towns served by GO stations have retained their long-established industrial character, reflected by low density industrial uses in station areas for easy access to the freight railroad lines. While much of the corridor passes alongside well-developed older single family residential areas, new high-rise apartment buildings are rapidly being constructed at several locations both at and between the stations. Such new development is most apparent along the portion of the line/stations closest to downtown Toronto. Several of the stations have also been provided with commuter parking lots. The corridor reinforces the existing Queen Elizabeth super-highway.

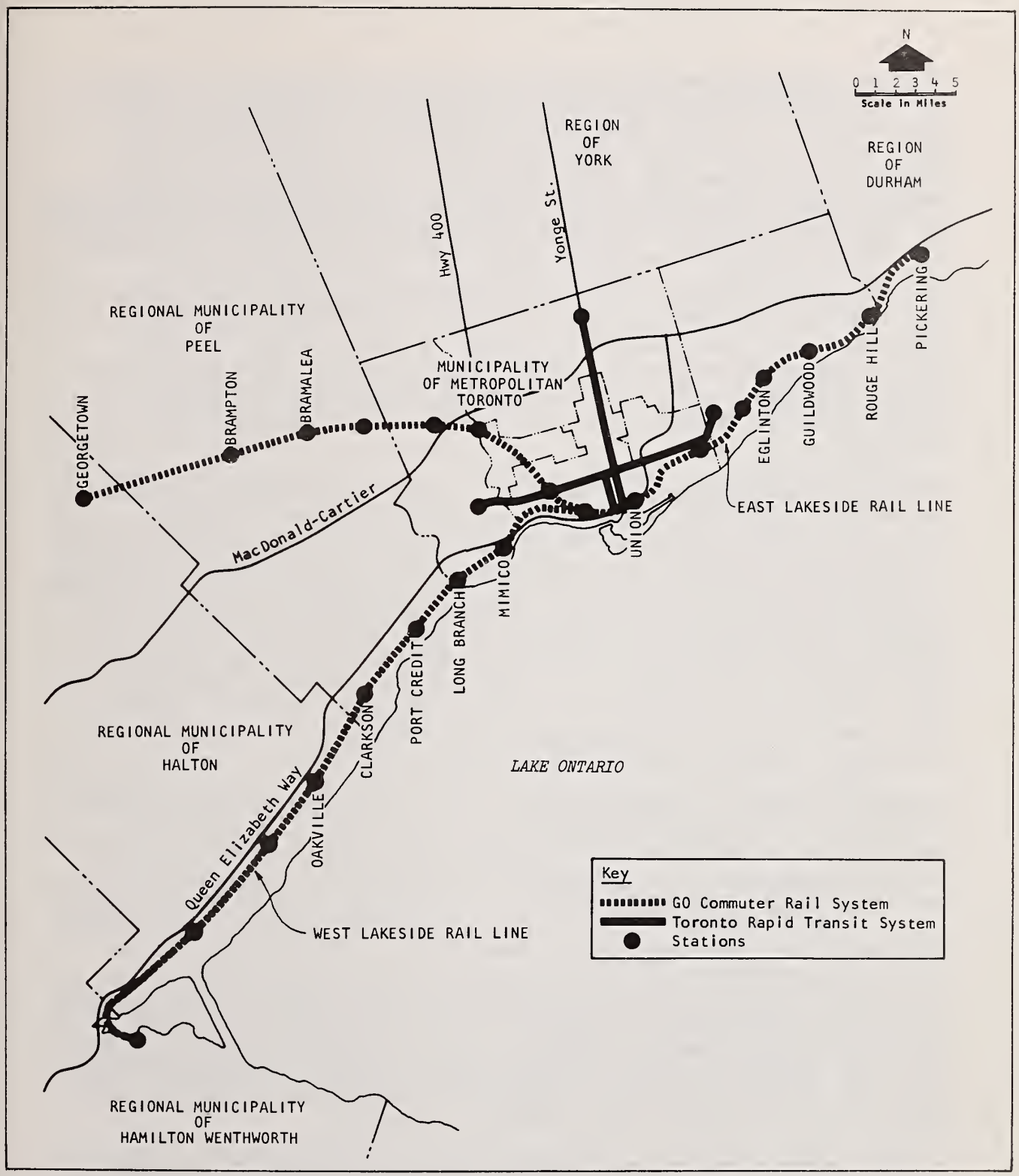


Figure 5.1
GOVERNMENT OF ONTARIO (GO) COMMUTER RAIL SYSTEM

The East Lakeshore portion of the system serves well-developed single family residential areas, 15 years or more in age, except at the eastern-most portion of the Line around the Rouge Hill and Pickering stations. Those areas have developed only since the GO train service was implemented. Very little multi-family/apartment redevelopment has occurred anywhere here. All of the station areas, except at Rouge Hill or Pickering, had been (and continue to be) well-served by Toronto Transit buses before the introduction of GO. Highway 401 East also parallels this GO corridor.

The Georgetown corridor serves a rapidly-developing area which includes the towns of Malton, Mississauga, Bramalea, Brampton and Georgetown. These towns are separated from each other by undeveloped land, much of it still zoned and used for agricultural purposes. Some redevelopment to multiple family units is occurring in the vicinity of both Bloor and Weston stations which are located within Metro Toronto's boundaries.

Sources of Information: A study of GO's impact was performed by the University of Waterloo (1973) which, utilizing Eglinton, Pickering and Oakville GO stations, sought to determine the effects of commuter rail service upon development and land use activities, and establish the relationship of changes in land use and activity patterns to local and regional planning policies and regulations. Other major sources of data for the study included interviews, assessment records, field checks and aerial photos. Our observations of development-related activity at other stations primarily relied on visual inspection and subsequent interviews with officials of the Toronto Area Transit Operating Authority (TATOA), the Ontario Ministry of Transportation and Communications, and planning officials of various regional and local municipalities.

Evidence of Impact - General Factors: Due to the limited data available, observations could only be made at selected stations. Generally, a very limited amount of new development at these station areas has been directly attributed to the presence of the GO system. Three major factors were often suggested which have influenced the kind and location of development occurring in the entire greater metropolitan area. First, development has been controlled in some areas by the capacity of sewer and water services available to accommodate new growth. Second, most municipalities have adopted policies encouraging industrial rather than residential development in order to ease the infrastructure requirement and tax burden on existing residents. It should be noted, however, that these two factors have been differently applied among the various jurisdictions. Some localities have appeared to ignore them altogether with introduction of new high-rise residential complexes.

A third factor cited by local observers which has influenced the type and location of development in the greater metropolitan area is the presence of two superhighways (pre-GO construction) which parallel the Lakeshore GO lines. Often, new high-rise development apparently associated with a GO station is more appropriately attributed to the adjacent, convenient super-highway.

The effects of these three major factors on development potential at several GO transit stations, combined with specific local development policies, are highlighted in the following sections.

East Line - Pickering Station: The Pickering Station catchment area has been influenced by continuing expansion of the Metropolitan Toronto urbanized area. Located on the fringe of this urbanized area, Pickering has felt the increasing pressures of the private land development process. Increasing numbers of new residents, formerly from Metro Toronto, still depend upon and commute (primarily via auto and GO) to downtown Toronto for their jobs.

A number of political, administrative and physical factors have influenced the development activity around the Pickering GO station. The GO system was introduced during a rapid growth period of this area's history (due in part to pressures of the expanding Metropolitan Toronto urban area). The type of development occurring at that time was noticeably influenced by several local government policies, the most obvious being encouragement of a balanced residential/industrial tax base, resulting in constrained residential growth. The Township of Pickering, in which the GO station is situated, felt that the inadequate property tax base would best be remedied by encouraging industrial and multi-family development. In fact, the Ontario Municipal Board in 1967 imposed a yearly restriction on residential building permits of 100 to 300. The official justification given for this restriction was the Township's financial inability to expand its water treatment plant.

In all but one case, the considerable new manufacturing/industrial development has not appeared to be influenced by the GO system. The location of residential growth has mainly been controlled by where public services such as sewers and water could be supplied, and thus where enough serviceable parcels of land could still be assembled.

Commercial development in the general area has mainly been attracted to two major shopping plazas, the locations of which are not related to the GO system.

Several other development-constraining factors particularly relate to the immediate station area. First, most of the area is industrially zoned. Second, the GO line together with the paralleling Highway 401 create a dividing effect on the area, rendering cross movement almost impossible. Finally, established residential development in the adjacent area has limited potential for further structural growth.

In summary, only two large development proposals in the late 1960s have been specifically associated, by the developers, directly with a GO station and the availability of the GO service. One proposal for an area southwest of the station called for an 18-story high-rise apartment building. One particular amenity of this site is that residents are offered a view of the harbor and associated recreational facilities, which are also within

walking distance. The presence of GO was also cited by the developer as a supportive factor in his application for the necessary amendment to the zoning bylaw. An agreement was signed only after the developer agreed to provide land for industrial development elsewhere to counterbalance this new residential development. This new high-rise apartment building is only one of several (being) built in the Pickering vicinity; the others are situated at least one or two miles from the GO station.

Another new development, Sheridan Mall, is situated directly north of the GO station opposite Highway 401. The development, opened in early 1973, includes 200,000 square feet of retail-commercial space. Once again, the presence of the GO system was promoted by the developer as one justification for the project. It should be pointed out, however, that the Mall is located almost half a mile from the station, a distance considered too far to walk by most. In fact, a local dial-a-bus system is focused on the Mall during off-peak hours (it operates from the GO station during peak hours) to serve residents of the area. It should also be noted that GO's services -- widely spaced stations catering to long distance peak hour commuters to Toronto -- are rarely utilized for shopping trips. Access via Highway 401 would appear to be a more attractive and practical alternative. Also, the Mall appears to be situated in a strategic location with respect to the local area. It now serves as the focal point for a publicly desired expanding town center. Thus, the existence of the GO station must be recognized at best as only one of several factors considered in the final decision of the Mall's financial success and location.

Eglinton Station/Borough of Scarborough: The Eglinton Station area has been undergoing active development in a variety of ways for the last twelve years, except for perhaps the most extreme southern part. Such development appears to have been a dynamic process, set in motion without regard to introduction of the GO system. The University of Waterloo report on the impact of the GO service at this station area cited several strong development patterns in the time period extending several years prior to and after inauguration of the service.

The main developing industrial area, the Progress Industrial Estate, was strictly road-oriented and was too far away to be influenced in any way by the GO service. On the other hand, a few wholesaling firms replaced pre-existing manufacturing firms in the very limited industrial zone adjacent to the station. The central and northern parts of the larger catchment area had (as of 1970) only recently completed the first stage of their single family residential development. This has taken place in systematic fashion according to pre-existing "district" plans prepared by the municipality and without any influence from the GO service. High-rise development, which had already started before the GO plan was announced, seems to have taken place in limited prescribed zones or corridors. Commercial development tended to follow residential development in the general area of the Markham-Ellesmere and Markham-Lawrence intersections and in the latter area in particular has consti-

tuted a logical rounding-out of the already well established Cedarbrae Shopping Center.

To date, only two development proposals could be tied directly in part to the presence of the Eglinton GO station. A proposed development, Plaza Mall, was to be located immediately adjacent to the Station. This commercial complex required a rezoning of the site from "industrial" to "highway commercial." Such a rezoning was sought by the prospective developer. In an application for amendment of the proposed development of the Official Plan, the stated reason for the location and commercial development was "to take advantage of the GO line terminal." The promoter of this proposed development died, and as of yet, no actual development has taken place.

Another application was made for an office/commercial complex near the station. A zoning amendment to the bylaws was passed to accommodate the proposed development; however, the developer has not been able to obtain enough holding tenants to satisfy the application conditions.

Other East Line Stations: Similar rezoning proposals, linked to the presence of the GO system, have been made at other GO stations in the Borough of Scarborough. For example, the area immediately adjacent to the Guildwood Station had originally been planned for residential and commercial purposes. However, after the arrival of GO, residential development was no longer considered appropriate for the area, and approval of an Official Plan change made possible the redesignation of the site as a "special transit-oriented area" which "might include hotels, convention centers, and specialized commercial and institutional/residential uses." This "Municipal Incentive," in response to the presence of the GO system, has to date failed to interest any developers.

The other example of GO's influence on potential land uses involves the Rouge Hill station in the Borough of Scarborough. Here, an amendment to the Scarborough Official Plan modified zoning of an area adjacent to the station from "highway commercial" to "community shopping area" uses. The amendment specifically related the proposed zoning change to "the establishment of the GO Transit Station to the South-East." A shopping area has been built, although local planners attribute its existence much more to response to a local need for a shopping center in the area rather than to the presence of the GO station. No evidence of the GO system's influence on residential development here was found. Recently the Municipality expressed in its Official Plan a recommendation for new office space to be constructed adjacent to the shopping center, and thus close to the GO station. Once again, no interest has been shown by developers and the necessary rezoning has not materialized.

Several observations or explanations have been offered for the perceived lack of development response to the presence of the GO system in the Scarborough area. First, aside from a few specialized locations such as the Scarborough Village area and land zoned for industrial uses,

relatively little land is actually available for new development of any kind. Furthermore, redevelopment potential is low because most of the existing development is very established and in such good condition that economics would not justify its removal or modification. Because of a firmly stated land use and development policy for Scarborough in the Official Plan (approved in 1957 before the concept of the GO system had even evolved), any changes in density, type and location of new development requires a thorough justification and approval in the form of an amendment to the Official Plan. Such a procedure serves to discourage, if not prevent, major changes from the established development policy. Thus, the coming of the GO station to the Scarborough area could be viewed as a late introduction of a transportation system to an area already physically well developed and firmly controlled by established planning policies.

West Lakeshore Corridor: Within the last few years, high density residential development has occurred at several GO station areas after introduction of the commuter service. Given the information obtainable from the respective local and regional planning organization, GO has appeared to be influential on development at these stations.

Specifically, at the Mimico Station rezoning took place after introduction of the GO system to allow several high-rise residential structures to be built in a previously zoned low-density residential area. Recently, multi-unit high-rise condominiums have been constructed along Etobicoke Creek within one-half mile of the Long Branch GO Station. Also at the Long Branch GO Station, new low-density residential development took place after a zoning change from industrial development. Similarly, at the Clarkson Station, intensive multi-family residential development has taken place in the last three years in an area previously zoned for industrial uses. At the Port Credit Station, several high-rise apartments have been constructed, such development having been specified in the Official Plan in the early 1960's before the GO station was established.

Conversations with local planning officials revealed a common viewpoint that while the GO system was certainly an influencing factor on these zoning and development changes, it was not the only reason for them. For instance, as was cited with Port Credit, most of the development to occur after introduction of the GO system was guided by zoning which had appeared in the Official Plan devised in the early 1960's. However, the presence of the GO system may have encouraged development at this site before other similarly zoned sites away from the GO line. It is difficult to determine how much influence the proposed GO system at that time may have had on local policy decisions. Unfortunately, more specific data on the history of development around the GO stations was not obtainable. Our planning contacts pointed out that most of the local decision makers during that earlier time period are no longer working or have since left the area. Furthermore, as noted earlier, no formal studies of development history or GO impact have been conducted to date on this corridor or the newer and less well served Georgetown Corridor.

Illustration 5.1
New High-Rise Development at Mimico GO Station

Illustration 5.2
New High-Rise Development at Clarkson GO Station

Illustration 5.3
New High-Rise Development at Port Credit GO Station

Evaluation: It is apparent from the limited information available that the GO service has had some impact on the planning process (i.e., zoning changes) in the particular areas discussed above. Most actual development has resulted along the western Lakeshore corridor where the previously existing Queen Elizabeth super-highway has also been a major influence. Demand for new development has not been as heavy in the eastern Lakeshore corridor, for a variety of reasons unrelated to GO. Much of the entire GO system operates adjacent to a previously existing railroad right-of-way along which small towns grew up many years ago. Only very recently have these areas been experienced new growth due to population pressures from the Metropolitan Toronto area, and the effects are still small.

Characteristics of the GO service itself are also important in an understanding of the system's impact or lack of impact. Even if demand for development had been strong in the general area of the line, its initial impacts were likely to be small because of the introduction of the GO service as a demonstration project rather than a permanent service. Even after the system was made permanent, patronage at its station has been small relative to that experienced at many of the Toronto

subway stations; hence little new traveler-generated demand for development is likely. Some local planners contend that the parallel highway facilities have been more successful in attracting new development to the corridors which they serve. It should also be remembered that access to GO stations is primarily via auto and feeder bus; thus development impacts may be dispersed throughout the area rather than concentrated at stations where greater pedestrian access would be reflected. Consequently they are much more difficult to identify than those at the stations themselves.

Also important is the fact that the official land use plans for many of these suburban areas had been developed without regard to encouragement or control of GO impact. As a result, until formal plan revisions several years later, developers had to request variances for every proposed project. Only recently have these plans specifically included provisions to encourage development at the GO stations. Accordingly, several officials interviewed believe that GO's potential influence has yet to be realized.

Several other development-related factors have been major influences on the location and kind of development which has taken place throughout the region to date. For example, no major extensions of water and sewer services have been provided, thereby often limiting development to areas already served. The zoning policies of municipalities -- seeking less residential and encouraging more industrial development as a tax base -- have also affected development patterns in some localities. Industrial development is further encouraged by the presence of the Canadian National Railway's main east-west freight line in Southern Ontario which parallels the GO tracks.

Despite the limited impact to date, however, the evidence suggests that impacts in the future may be more substantial. Zoning policies supporting station-area development are now enacted, and as the urban area grows outward these locations will become increasingly attractive for such development.

Philadelphia

System and Surroundings: The Reading and Penn Central Railroads, now operated by ConRail under contract from SEPTA, provide an extensive commuter service network of 13 routes from Center City Philadelphia to throughout the Pennsylvania suburbs. Towns served include Levittown and Trenton in the northeast, Landsdale, Doylestown, Norristown, Germantown and Chestnut Hill (within the City of Philadelphia), Media, West Chester and the "mainline" communities to the west, and Chester and Wilmington to the southwest (Figure 5.2).

This network has not been substantially changed for several decades. The only significant improvements in its infrastructure in recent decades has been electrification of the Fox Chase line and extension of the line from Hatboro to Warminster (1.8 miles) in 1974. A major improvement of service did, however, take place with very significant results in ridership trends and impacts.

In 1958, when transit services were deteriorating, the City of Philadelphia started an initiative to reverse the trend of decreasing ridership which was related to the economic decline of the city. The city signed an agreement with the Pennsylvania and Reading Railroads to cooperate in revitalizing commuter rail service. The improvements consisted of:

- Purchase of 55 new cars for some of the lines (the entire fleet was replaced with new cars over the following 15 years);
- Increased service frequency (up to 50 percent);
- Reduction of fares and introduction of transfers with some bus transit routes.

For administration of this program the city created in 1960 a non-profit entity, the "Passenger Service Improvement Corporation." One year later the Southeastern Pennsylvania Transportation Compact (SEPACT) was established to perform the same task on a regional basis. Presently (1977) commuter railroads are operated by ConRail under a contract from the Southeastern Pennsylvania Transportation Authority (SEPTA).

Results of service improvements were quite significant. From 1960 ridership on the Reading Railroad of 10.0 million passengers annually, there was an increase to 11.4 in 1965, 13.5 in 1970; it is now (1977) about 13.0 million. On the Pennsylvania Railroad system the 1960 ridership of 13.7 million grew to 16.0 million in 1965, 18.7 in 1970 and it is still at that level. It is interesting to note that during the same period, while these two systems increased ridership by 30 - 45 percent, SEPTA had a 30 percent decrease in its ridership on regular transit lines. This comparison suggests a complex range of urban problems affecting transit ridership; the commuter service is less vulnerable to the problems facing the inner city.

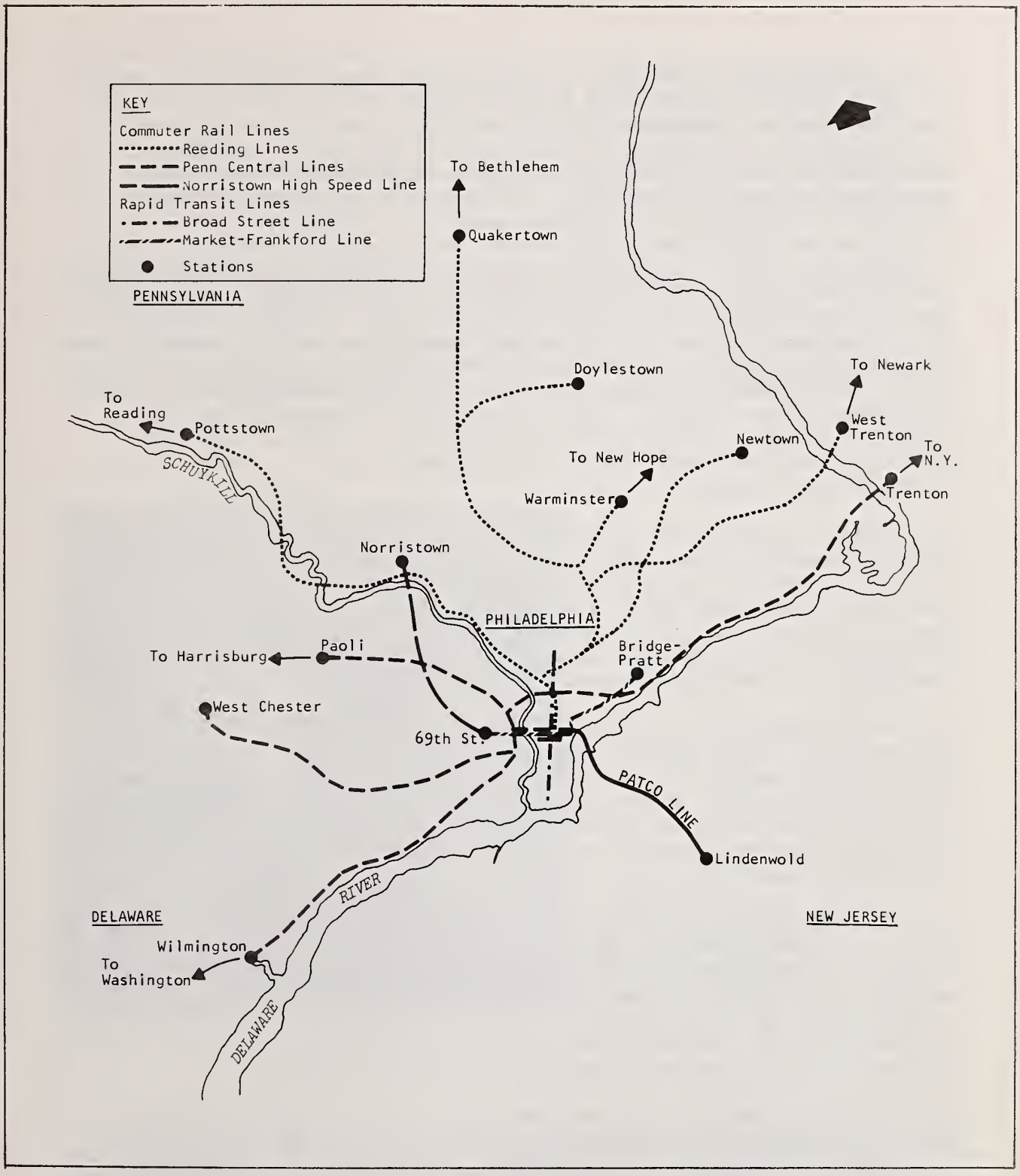


Figure 5.2

GREATER PHILADELPHIA COMMUTER RAIL AND RAPID TRANSIT SYSTEM

A major improvement, currently in the planning/construction phase, will provide a direct commuter rail tunnel link between the Reading Terminal and Penn Central's Suburban Station four blocks away, thus integrating the long-partitioned commuter rail network. Currently, through east-west commuter access is not possible because no track connection exists between the two terminals. The tunnel is expected to have a peak-hour capacity of 85,000 persons, increased from a current level of 27,000 persons. The increased capacity will result from elimination of existing "bottleneck" approaches (several crossovers on converging lines) and stub ends, and a reduction of problems associated with union requirements for changing crews at terminal points which will be eliminated by connecting the two sets of terminating lines into a set of through lines. This project, officially known as the Center City Commuter Connection (CCCC), is planned in conjunction with a larger downtown Market Street East Redevelopment Project. Construction of the commuter tunnel is scheduled to begin in late 1977, with completion estimated for late 1982. However, a current legal challenge may cause some delays in the start of construction.

The commuter lines focus on Philadelphia's CBD primarily to bring workers into the downtown area; some 70 percent of the downtown employees now arrive via some form of public transportation, of which the commuter rail lines form a key part. They also carry a substantial number of shoppers, school and other types of trips in both directions (including reverse commuting). Most lines operate on 30-minute headways on weekdays and Saturdays, and some basic service on Sundays.

The Philadelphia CBD is the dominant employment area and retail center for the nine-county metropolitan area, which has a population close to five million people. About 75 percent of these live in the five Pennsylvania counties served by the commuter rail lines. About 300,000 people currently work in this area, and despite a citywide decline in employment since 1960 the employment opportunities in the CBD are strong and expected to grow in future years.

Recently Philadelphia has been experiencing a revitalization of the center city in a number of ways. There has been a return of professional and upper middle class people to renovated residential areas in the downtown, most notably Society Hill. In addition, the Independence Mall area has been rehabilitated and redevelopment has occurred along Market Street West in the form of high rise development in the vicinity of "Penn Center," which was the result of a major development in the early 1960's.

Sources of Information: No published impact analyses were available on any of the commuter rail improvements with the exception of the Center City Commuter Connection (CCCC) project, but valuable information was obtained from a number of planning and other officials. Because the CCCC project has not yet been constructed, the information obtained from the Philadelphia Redevelopment Authority/Market Street East primarily pertains to joint planning and design considerations made to integrate the

commuter line with planned new development. Efforts to determine the commuter rail project's role and influence on the total redevelopment project is based upon visual inspection and interviews with officials of the Redevelopment Authority, Southeastern Pennsylvania Transportation Authority (SEPTA), Philadelphia City Planning Department, the Delaware Valley Regional Planning Commission (DVRPC) and city business organizations (and indirectly, retail users and developers). These individuals were also consulted for information on the entire commuter rail system.

Evidence of Impact - Center City Commuter Connection: The $300 million CCCC project is being developed concurrently with the larger Market Street East Project, one of Philadelphia's most ambitious commercial urban renewal projects. The renewal plan is designed to create an attractive and dynamic urban shopping environment and to revitalize the City's major retail and commercial shopping district east of City Hall.

Illustration 5.4
Site of Future Center City Commuter Connection in Market Street East Redevelopment Area

The redevelopment project, encompassing almost 130 acres along Market Street between Independence Mall and City Hall, is intended to restore this area as a major regional commercial center in the Delaware Valley. Upon completion, the project is expected to total over 1.3 million square feet of commercial space and 7 million square feet of office space. The

project is an excellent example of joint development: CCCC is fully integrated into the development plans and it is a component which is considered to be basic for the success of the entire project.

The CCCC project has been cited by transit and Redevelopment Authority officials as an important factor in the shape and magnitude of recently constructed and proposed development in the Market Street East project area. The commonly expressed belief is that redevelopment on the planned scale would not have taken place without the CCCC project plans and vice versa.

In March of 1975, the U.S. Department of Transportation gave final approval for funding of the $300 million transportation project. However, the approval carried the stipulation that local developers and businessmen guarantee a matching $300 million worth of new development to occur in the Market Street East project area. Although substantial new development had already been completed or committed, this served to strengthen existing private commitments and hasten others.

Officials of the Redevelopment Authority note that direct access to the commuter system was a major concern of the largest developers and potential occupants. Specifically, the new Gallery (215,000 square feet of retail space). Gimbels' department store (500,000 square feet of retail space and the first major department store to be constructed in downtown Philadelphia in 50 years), and the 1234 Market Street Building (600,000 square feet of office space), all recently constructed (or under construction), have provided for direct transit access. In addition, the existing Strawbridge and Clothier Department Store (500,000 square feet of retail space) recently cut its basement width by 30 feet to provide a large concourse area to the rapid transit and commuter rail system.

An extensive pedestrian underground area presently exists around City Hall, particularly to the west and south. It connects the existing Suburban Station and Reading Terminal (commuter rail) with both major city rapid transit lines, five underground trolley lines and the Lindenwold Line. It houses a number of stores, banks, restaurants, etc. The plan is to expand this type of facility to Market Street East when that area is renewed and CCCC is constructed.

The direct access provisions reveal a strong physical tie between commuter rail transit and new development. However, so many elements are involved in planning such a complex project that it is difficult to determine precisely in any quantitative terms how critical the CCCC plans have been in the decisions of developers (and occupants) to invest in the Market Street East project area, as compared to other influencing factors. Thus all our sources also cited the attractiveness of readily available land in the downtown area, assembled by the redevelopment agency, as an important factor. The scale and mixture of the proposed development was also cited as encouragement to invest in the area.

Some special incentives, such as various city offices guaranteeing to locate in the new 1234 Market Street office building, also helped to

encourage new development. Some business leaders argue that a general demand for new office space in downtown Philadelphia in the last decade has been a major factor contributing to investment interest in the Market Street East area. These varied factors, combined with the large number of new people expected to be brought into the area by the CCCC, have all apparently served to reduce the measure of risk involved in major investment commitments to this presently deteriorated area. Yet, the CCCC was definitely a major part of the rationale for the entire project, and will be a major component of the completed redevelopment.

Other Commuter Rail Impacts: Most commuter rail lines serve older, established suburban communities. Therefore no major new towns could be built around the stations. However, there is a general consensus that the lines have had several very important impacts. The following paragraphs provide several examples.

In recent years apartment complexes have been constructed at or in the immediate vicinities of a number of stations: Gladstone station on the Media Line has a building with direct access from its third floor to the station (previously least used on the entire line); Secane, on the same line, has many apartment complexes within the immediate vicinity of the station. Swarthmore has a new residential building which advertised easy access to the city by train. Wallingford had a long court process in its attempt to prevent construction of over 500 apartments.

Similar developments took place along other lines, such as Chestnut Hill and Trenton. Since land around stations is generally more expensive than elsewhere, the improved rail service may have had an offsetting positive impact which resulted in location of these developments there. In some areas (e.g., central section of the Media Line) it is said that an aerial photograph could indicate the direction of the line by locations of apartment buildings.

Some commercial development has also taken place around commuter stations. For instance, headquarters offices for Sun Oil, Chilton Press, and TV Guide have been located near the Radnor Stations on the Paoli Line and the 69th Street-Norristown Line.

Commuter rail service is considered to be a significant asset in the Philadelphia suburbs. In particular, it has long contributed to the image of the most prestigious suburban areas such as Chestnut Hill (two lines), Radnor, Bryn Mawr, Swarthmore, Wallingford and others. This positive association apparently continues today as it did many years ago. Areas served by the commuter rail lines have generally had great stability. Exceptions are several inner city stations (49th Street, Angora, 52nd Street, Westmoreland, Allegheny, Tioga) where general decay for other reasons was apparently stronger than any positive influence this service could have.

The center city clearly benefits from the accessibility which the 13 commuter lines help to provide: the service is generally fast, frequent,

comfortable and extremely reliable. With only a few exceptions during peak hours, the entire commuter system is now operated with new cars. The attractiveness of the service is best illustrated by the passenger trends cited earlier. The postwar service improvements cited appear to have been influential in maintaining this attractiveness in the face of competition with auto travel.

Evaluation: There is convincing evidence that the CCCC has a major impact on the Market Street East renewal effort; city officials, DVRPC planners and transit agency officials are in agreement on the close interaction of the two. The USDOT requirement of evidence of private land development commitments in the area is expected to assist in achieving the planned land uses. However, impact of the tunnel (CCCC) started some 15 years ago, when the project began to be formulated and long before the DOT requirement existed. In addition, DOT accepted the already-existing recent development (cited earlier) in partial fulfillment of the $300 million private commitment, acknowledging its relationship to the prospect of the CCCC.

The Philadelphia experience also suggests that substantial improvements in the level and quality of commuter service can contribute to an enhancement of its land use impact potential as well as its ridership. In part, the recent residential development around some commuter stations is probably caused by the original transit facility in interaction with the postwar expansion of the urbanized area, rather than by the recent improvements in service. Nonetheless, these service improvements appear clearly to have enhanced the chances for such development.

Chicago

System and Surroundings: Chicago's commuter railroad system is composed of eight privately operated commuter railroads, coordinated and subsidized by the Regional Transportation Authority, which carry patrons to the downtown in twelve corridors. With a combined total of over 1,160 miles of track, almost 68 million passenger trips are handled annually (Figure 5.3).

Most of the commuter rail lines extend far out into suburban and a few rural areas. However, all the lines have existed since before World War II, and most of their stations serve communities which are well established. Many of these are now within the heavily urbanized area, although service is provided to others more distant. Overall, there are 240 stops with five downtown terminals.

Few major improvements have been made since World War II. Most of the rolling stock has been replaced with modern equipment; in addition, some consolidation and removal of terminal facilities has occurred and more is planned. There has been some upgrading of terminals; Union Station has been completely renovated including air rights office development over the track platform. Some modernization of suburban stop facilities has been done and more is planned. Currently, however, these lines are more of interest for the development potential of the railroad station-area land holdings than for the impact of specific transit improvements.

Evidence of Impact - Burlington Northern: Commuter services are operated by Burlington Northern and RTA on one route extending 38 miles southwest from Chicago to Aurora. It serves 14 cities and communities, including Chicago, with a total of 26 stations. With 64 trains operating during the weekdays, BN accommodates approximately 46,000 passenger-trips each weekday, plus some weekend service.

Recently, BN has ventured into the real estate development business with a 460 acre parcel of land near the suburban community of Naperville. The property was originally purchased by the railway's parent company for industrial development. However, a mixed-use development is now planned, including high and low rise office, commercial, industrial, research and residential uses. A transportation center, linked to the BN commuter line from the development, is also being planned, although final acceptance and funding will depend on appropriate regional and federal authorities.

BN is interested in developing this parcel for a number of reasons. The land has become more valuable over the years because of its location in a major growth corridor, and the railroad believes that market demand now justifies action. The development is also hoped to boost ridership on the line. Finally, introduction of a new station will help reduce congestion at the downtown Naperville commuter station.

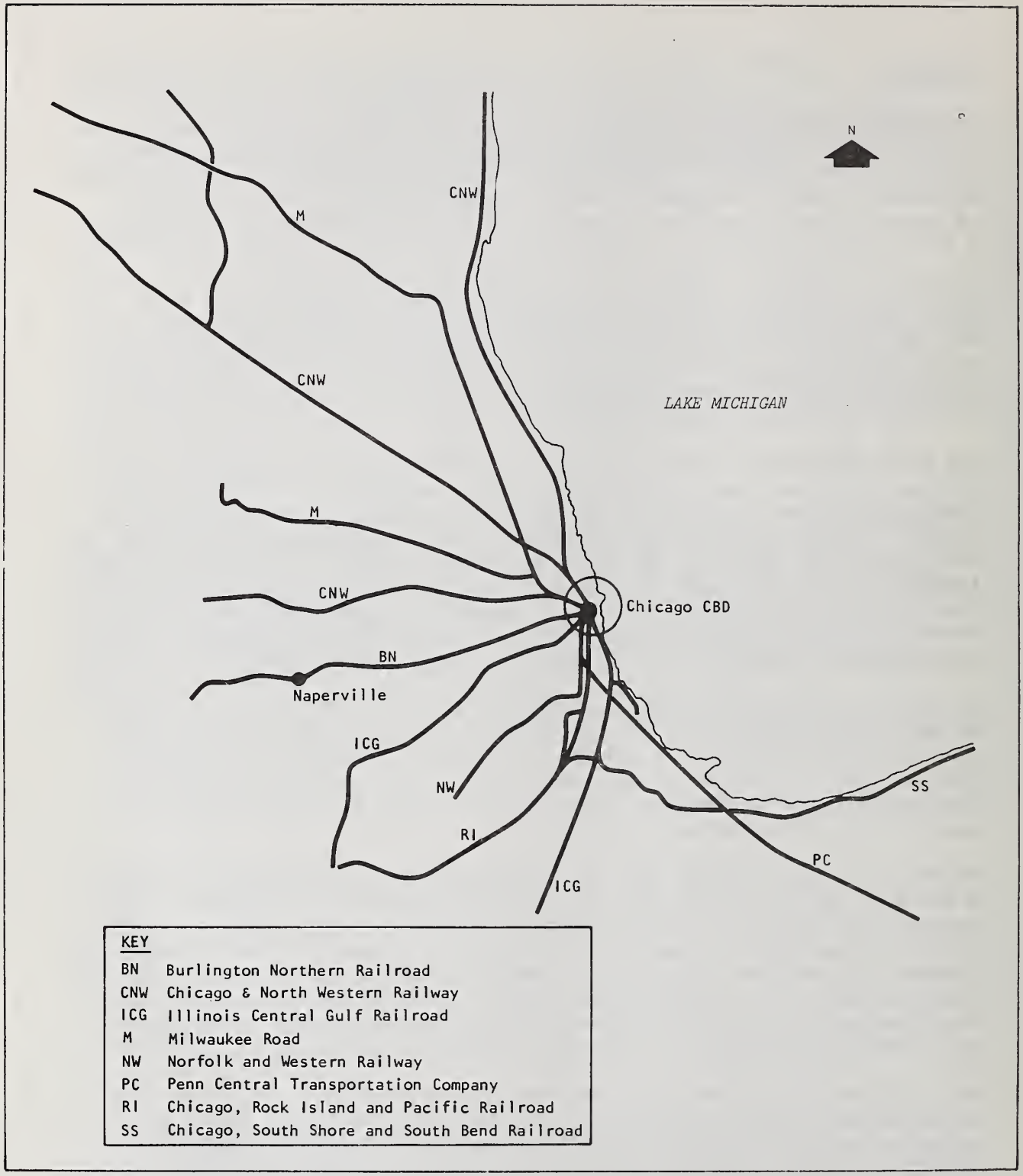


Figure 5.3
CHICAGO COMMUTER RAIL SERVICES

BN's role as a real estate developer in this instance is significant because it illustrates use of the existing transportation facility to justify, attract and serve a proposed large scale development. It should also be noted that the feasibility for this type of development is partly dependent on compatible local community policies. The property will be annexed to Naperville so that BN, a private body, will be able to apply for funds through the City. This action would not have been possible prior to 1972 when the City maintained a policy of no growth and consequentially no annexation. In contrast with that earlier stance, the city is now asking RTA to support the concept of a transportation center at the downtown station and is asking for funds for station rehabilitation.

Another factor accounting for the large demand for new development in this area is the recent trend of office migration out of Chicago's CBD. The demand for office space appears to be shifting westward from downtown Chicago as more national companies seek to locate regional offices there. There has been a desire to accommodate white collar executives who want to work where they live.

Chicago and North Western Commuter System: C&NW, with RTA, operates three separate lines, and the operation is the largest of the Chicago suburban services in terms of route miles, revenues, and passengers carried. Serving 44 communities and Chicago with 65 stations, the system accommodates approximately 100,000 passenger trips each weekday.

C&NW, like BN, has recently been attempting to develop its real estate holdings to derive added income and patronage for both its commuter and freight service. Working with community planning officials, the Railroad has been evaluating redevelopment and development opportunities for its own marginally utilized land such as old railroad switching yards.

A specific example may be found in the town of Wheaton, about 30 miles west of downtown Chicago. A railroad yard adjacent to the existing downtown has been developed for high-density housing. An obvious selling point was proximity to the commuter rail service. Once again, this illustrates the potential influence of the transit system even though no improvements were introduced. After many years, market forces caught up with this site, finally making it a marketable location. The presence of the transit system was an important, but not the only, element to make the project feasible.

Illinois Central Gulf Electric Commuter Service: The presence of the IC commuter rail service has been cited as a contributing factor toward the continued viability of the old Hyde Park and South Shore area communities of Chicago. The history of one particular Chicago community along the commuter rail line, Pullman, is particularly interesting. For many years, Pullman experienced a common trend, that of the shift of middle income people and businesses to further outlying communities and subsequent deterioration of this older town. In 1965 the community was scheduled for demolition as part of an urban renewal project. Today, the community of Pullman is a

National Historic landmark and recognized by the State of Illinois and the City of Chicago for its historical and architectural significance.

Several critical factors have been associated with this community's complete reversal and subsequent prominence. First, there was a stable core of older population, interested in staying, which realized that a major effort had to be made before the community's decline reached an irreversible point. Second, it was recognized that the historical significance of the area could be utilized to attract young professionals to live there. And finally, it was realized that the already present, efficient rail transportation service to the CBD could become an important selling point or attraction for new residents as well as visitors. These observations suggest an interesting role for the transit service in urban redevelopment. The transit service itself has also been upgraded in the last several years, with new air conditioned cars, memory-pattern schedules and some station improvements. These improvements added to the other forces provide the opportunity for transit to enhance the viability and attractiveness of the Pullman area.

Milwaukee Road Service: The Milwaukee Road operates two commuter lines serving a total of 37 stations on 110 route miles with a combined patronage of 34,000 weekday trips. The service area is generally similar to, but not duplicative, of that of the CNW service. Milwaukee Road off-peak service is much less frequent than that of CNW, making it less attractive for non-work trips. Most suburban stations are in well developed middle and upper-middle class communities and neighborhoods in which citizens do not desire additional development. As with the other Chicago commuter railroads, the principal service change has been the introduction of a uniform fleet of modern, air-conditioned, light-weight bilevel cars and new motive power. No substantial land use changes were identified.

Impacts at Downtown Terminals: The inbound Chicago commuter rail lines operate into four different terminal stations, all just outside the Loop. All but the IC make only one downtown stop. The IC and South Shore Line trains make three stops to the east, discharging some 35,000 passengers near the Loop. They terminate at a major air rights development now in progress and gradually covering the former IC marshalling yards. This large area, long under-used, is adjacent to the existing built-up area of the CBD. Among the buildings already in use are the 90-story Standard Oil Building and other major high-rise structures. Its development, however, is due not to the IC commuter service but to the availability of the land (and IC's decision to develop it) and to the proximity of the Loop.

The Rock Island Railroad brings some 13,000 persons to LaSalle Station just south of the Loop. There has been no recent development clearly related to this station or to the RI's limited service improvements, most likely because of the otherwise deteriorated quality of much of this area. Within the next two years the RI is to move to Union Station (which already handles the BN and Milwaukee commuter traffic as well as several smaller operations) in order to reduce terminal costs and gain accessibility to the more intensively developed area there.

The remainder of the commuter rail lines terminate at one of two stations to the west of the CBD, across the river from the Loop (Union and Northwestern stations). The NW lines bring in approximately 50,000 persons each weekday, while present patronage into Union station is slightly over 40,000. There has been extensive high-rise office development in this area, particularly around the Union station, in a general expansion of the Loop in this direction. In part this development is due to the availability of land close to the Loop, and to the general demand for additional downtown commercial office space. However, the attractiveness of this area for development is unquestionably enhanced by the presence of the new Sears Building a few blocks away and by the continued high patronage of the commuter rail lines passing through this area, brought about in large part by the early and extensive post-war improvements in the quality of the rail service.

These systems (especially the CNW) were the country's first commuter rail lines to make such improvements as bi-level air-conditioned cars (as early as 1955, when most automobiles had no air conditioning), trackway improvements to allow faster operation, and simplified schedules. As a result of such improvements, patronage remained relatively steady and even rose when systems in other cities were experiencing steady losses. The resulting steady stream of commuters moving from the stations by foot and bus eastward into the Loop naturally made the intervening area a logical place for development.

Evaluation: The Chicago commuter rail system's postwar improvements have been shown to be primarily in the quality of service rather than in physical extensions of service. These improvements have in general led to few impacts around their suburban stations, partly because of the lack of encouragement for intensive development at those locations either in local policy or availability of land for economically feasible development. The major exception found concerned a proposed high-rise development by a railroad on its own land.

At the same time, the sustained vitality of some of the major lines, brought about largely by service improvements, has enhanced development potential around their central city terminals. This suggests that such improvements could be coordinated with land use policy incentives and related measures to aid in revitalization of areas around such terminals elsewhere.

Other Commuter Rail Systems

Boston: The Boston metropolitan area is served by an extensive 230-mile 87-station network of commuter railroad lines with combined weekday one-way ridership of 42,000. The lines basically extend out in a radial pattern from downtown Boston. The Boston and Maine Railroad (B&M) provides commuter rail service on five main lines radiating out westerly and northerly to distances of 20 to 35 miles from Boston. Service level averages 30 weekday round trips per line. All service is provided by modern, air-conditioned RDC equipment (see Figure 4.4). The B&M also provides commuter rail ser-

vice on five routes extending to the west and south of Boston over ConRail tracks previously owned by the Penn Central Company (PC). These routes vary in length from the 14-mile Needham Branch to the 44-mile Providence Route (see Figure 4.4). Service ranges from four round trips per weekday on the Stoughton route to 12 round trips per weekday on the Needham Branch.

Boston's commuter service has experienced a near-steady reduction in operations since World War II, with corresponding substantial drops in patronage. A major upgrading of service has been planned for the near future, with some improvements having already received funding and approval for implementation. The anticipated changes in service are not, however, expected to significantly affect existing land use and growth patterns in the well-established suburban service areas.

Montreal: There are two major commuter rail systems serving the metropolitan Montreal area: Canadian Pacific Railroad (CP) and Canadian National Railroad (CN). CP operates three commuter lines extending to the north, east and west of downtown Montreal, while CN operates two commuter lines which extend north and south of the CBD.

CP's major commuter line is a 40-mile, 26-station route west along the lakeshore to Rigaud. Approximately 15,000 daily weekday trips occur on the Lakeshore service. The lines, originating around the turn of the century, have seen little change since World War II. Even though suburban population growth has continued during recent years, ridership on the dominant Lakeshore Line has remained constant throughout the last decade.

CN's commuter service includes a 24-mile, 14-station electric service north to Deux-Montagnes, with a branch to Cartierville. Average one-way weekday patronage is 40,000 on the Deux-Montagnes line. CN's history of commuter service closely parallels that of CP. Service on this railroad has also experienced a steady decline since World War II. As with CP, any reversal of the deteriorating trend in service or introduction of improvements will not occur until CN's financial difficulties are resolved. Unlike CP, which has partially modernized its fleet, CN service is performed primarily with antiquated equipment.

New York: The metropolitan New York area is served by the largest and highest patronage (approximately 370,000 weekday trips) commuter rail system in North America. With the numerous Long Island and ConRail lines totaling approximately 600 miles, no major post-World War II right-of-way extensions have taken place within the long-established system. Recent improvements have been limited to modernization of existing service, e.g., purchase of new vehicles, upgrading of stations, rehabilitation and grade separation of track and signals, and extension of electrification along a few lines. These improvements have not had any major perceptible influence on development in the long-established and well-developed suburban areas being serviced, according to the sources investigated.

Evaluation

Beyond the conclusions already drawn for the impacts of recent Toronto, Philadelphia and Chicago commuter rail improvements, these brief discussions of the Boston, Montreal and New York systems add no new evidence of impact. In all three cases, improvements have been small in comparison to the size and operating characteristics of the already-existing systems, and no substantial new development was identified which might be related to those small or incremental improvements. This provides an instructive contrast to the three systems discussed earlier, where the transit improvements were much more significant and where new urban development has subsequently occurred. Without conclusively confirming that these Toronto, Philadelphia and Chicago developments were impacts of the commuter rail improvements, they do help to support such an hypothesis by their own lack of development without such major improvements.

LIGHT RAIL

Rail transit services which can be categorized as "light rail" because of their overhead traction and lack of total grade separation are found in Boston, Chicago, Newark, Philadelphia, Cleveland, New Orleans, Pittsburgh, San Francisco, and Toronto. These existing systems are primarily upgraded versions of former streetcar or interurban trolley operations. As such, they are along well established routes unlikely to induce the potential land use changes that new alignments might bring about. Also, the service characteristics of these routes tend on the whole to be significantly lower than those of proposed new light rail systems. Since the introduction of PCC streamlined streetcars in the pre-World War II and early post-war period, there have been virtually no vehicle or route improvements until the 1977 introduction of the Boeing U.S. Standard Light Rail Vehicle in Boston. The same state-of-the-art fleet will be eventually brought to San Francisco on upgraded existing routes including a Market Street Subway to replace mixed traffic surface operation.* The future potential land use effects of these present improvements is still only speculative. Therefore, only two light rail type operations, which did experience significant post-war change, are discussed in this section.

Boston Light Rail

The Riverside branch of the MBTA light rail Green Line commenced service in 1959 along a former commuter railroad right-of-way. The corridor, previously served by the Newton Highlands Branch of the Boston and Albany division of the New York Central Railroad extends for 9.4 miles from the

*Although not to be in operation until late 1978 or 1979, the subway is completed. However, since it shares the BART right-of-way and station (BART tracks are directly beneath) any possible impacts on land use are obscured by BART's greater effects.

Fenway Park station in northeast Brookline westward to the Riverside terminal station at the western boundary of the City of Newton. Linking up with the existing Green Line light rail service under Beacon Street at Park Drive, the total route extends approximately 12 miles to Boston's downtown Park Street Subway Station (see Figure 4.4). Thirteen stations serve the 9.4-mile extension, with nine of the stations providing commuter parking facilities. Most of the stations are simple shelters situated unobtrusively a few feet from the tracks. This extension provided a substantial upgrading of transit service from downtown Boston to this rapidly growing suburban area, even though the route was basically unchanged.

No documentation on the impact of this improved service on the surrounding area was found. Interviews with knowledgeable transit and planning officials revealed a general feeling that little development, if any, has taken place directly due to the transit improvement. All neighborhoods along the line were already well established as commuter bedroom communities. The Brookline and Newton areas had already been experiencing growth as part of the continuing population shift from the city to the suburbs and later because of improved access afforded by the Massachusetts Turnpike Extension.

Only one specific reference was made to development in an area near a transit station. The town of Brookline had a very active urban renewal program during the 1960's. Some development reported which could be associated with the new transit service was the rejuvenation of the Brookline Village area near the station in the form of office space, high-rise apartments, and some commercial development. The development now includes use of air rights over the open cut right-of-way. However, the development in Brookline Village is also a natural extension of the growth of the hospital area proceeding down Brookline Avenue.

Chicago Light Rail

One rapid transit service of the CTA is considered by some to be a light rail operation. It exhibits hybrid characteristics of both light rail (grade crossings and partial overhead power collection) and conventional rapid transit (high speed operation, partial third rail power collection, pre-payment stations, high level platforms). The "Skokie Swift" Shuttle, a non-stop nearly five-mile line from Howard Street station on the northern edge of Chicago to a Dempster Street terminal in the inner suburb of Skokie was introduced as an experiment in 1964.

The Skokie Swift is more a revitalization of transit, in a transit corridor which in one form or another existed from 1925 to 1963, than a totally new service. Thus, much of the growth associated with increased accessibility to the area took place back in the 1920's with the introduction of the predecessor Chicago, North Shore and Milwaukee interurban electric line. There appears to be no documentation of any recent development impacts (if they have occurred) related to the transit line, even for the period after 1966 when the line became a permanent CTA route.

One study (NIPC, 1966) was carried out to determine the system's impact on land use during the two-year demonstration project period. Specifically, the study attempted to document the impact of the Skokie Swift on a number of development factors including land use and zoning, land values, building vacancies, retail sales and employment. Not surprisingly, the studies concluded that no significant or widespread acceleration or other change in development had occurred. The study pointed out the fact that because the line was undertaken as a temporary experimental service and was widely recognized as such throughout the two-year demonstration period, local investment was not encouraged. Property owners, businesses and developers were reluctant to make any investment decisions related to the transit system until it was determined that the service would be continued permanently. Interviews and observation also revealed no further indications of transit-related development after the line was made permanent.

Evaluation

The scarce evidence indicates little if any land use impact in the Boston and Chicago light rail improvement cases. However, the information presented on these cases serves only as historical documentation, for modern light rail systems bear virtually no relationship to these. Such modern systems as the one proposed for the City of Buffalo may well have substantial potential for land use impact; system capacities are to be higher, facilities are to be more attractive and substantial, and in typical proposals careful attention is given to consideration of land use interaction in the planning process.

However, within the scope of the present study's mandate to report only evidence of actual impacts of recent system improvements in North America, nothing of relevance can be concluded. A high quality light rail line, although with some characteristics of conventional rapid rail, is under construction in Edmonton, Canada. The completion and early operation of this system in 1978-80 will provide the first indications of impact from such modern systems on this continent, and should be monitored carefully.

BUSWAYS

The land use impacts of bus priority treatments, such as express bus freeway lanes, are difficult to identify. Major distinguishable transportation-related land use impacts are most likely to occur where large changes in accessibility of an area have taken place or permanent station structures are introduced as a focal point for development. Neither has been the case with this country's recent busways. Thus, bus improvements such as exclusive or express lanes incorporated into existing freeways appear to have little potential to affect surrounding development.

The existing land use patterns are most likely to be influenced, if at all, by construction of the freeway prior to introduction of the busway. The major busways which appear to support these observations include the Shirley Highway Express Bus Service, the San Bernardino or "El Monte Busway",

"Blue Streak" in Seattle, and "Blue Dash" in Dade County (Florida). A brief description of the characteristics and operation of each system follows.

Shirley Highway Express Bus Service

The Shirley Highway (I-95) Busway was the first major busway implemented in the United States. First opened in 1969, the busway was subsequently expanded to its present 12-mile service from the edge of the Washington, D.C. CBD into the northern Virginia suburbs. The highway itself was built around 1940 as a four-lane, limited access facility and was rebuilt within the past five years to an eight-lane facility, including the two reversible bus lanes in the median.

The busway was implemented in response to rapid growth in this urban corridor. Planners reasoned that existing lack and subsequent high cost of necessary facilities to accommodate more automobiles in downtown Washington, D.C. would not support further expansion of an all-automobile oriented Shirley Highway Corridor. Some other more efficient service such as an exclusive busway was considered more compatible with the increasing suburban commuting needs.

Public response to the busway has generally been favorable, as indicated from the start by increases in bus passengers and declines in auto passengers on the Shirley Highway. More than twelve bus routes currently utilize part or all of the busway.

There are no actual stations associated with the system. The bus routes extend through residential neighborhoods, making pickups and dropoffs at bus stops approximately two blocks apart. An agreement has been made with two shopping centers located near the Capitol Beltway (I-495) for use of approximately 500 parking spaces. No special bus service is offered from these lots; they are simply stops on one of the neighborhood routes. A special 400-space parking lot was also constructed in an industrial park in the same general vicinity. Once again, this pickup point is a stop on one of the regular neighborhood routes. The existing industrial development surrounding the parking lot has apparently not permitted any potential new development to take place.

No evidence of development impacts related to the busway was found. There has been a significant growth in residential, commercial and light industry development along the Shirley Highway corridor in recent years. While such growth has undoubtedly contributed to the success of the express bus project, most local transit officials believe that the development has occurred primarily because of the highway facility itself, with the presence of express bus service a minor secondary factor.

San Bernardino Freeway Express Bus Service

The San Bernardino Freeway express busway, sometimes referred to as the El Monte busway, began operation of its first segment in January 1973.

The total busway, extending for 11.2 miles from near downtown Los Angeles east to suburban El Monte, is one of the most heavily patronized routes operated by the Southern California Rapid Transit District (SCRTD) in the Los Angeles metropolitan area. The busway offers a maximum three-stop commute from numerous medium-density suburban communities to downtown Los Angeles and further local service to the busy Wilshire commercial/ office corridor west of the central business district.

Illustration 5.5
San Bernardino Freeway
Express Bus On-Line Station

The actual busway facility was created by adding a set of twin lanes, one in each direction, to the freeway's east and westbound lanes or adjacent to the freeway for exclusive bus use. Room for expansion of an existing freeway facility was a unique opportunity, since the other 12 major freeways in the Los Angeles area do not have adequate available space for the extra two lanes.

The easternmost section of the busway was the first part to be opened. Six months later the $1 million El Monte station, designed exclusively for buses, was completed. Adjacent to the circular-shaped building, provisions were made for 1,000 park-and-ride commuters. Recently, 700 additional parking spaces were made available, but late arrivals still have trouble finding parking.

The western half of the busway opened in May 1974, boosting daily one-way trips to 11,200. In late 1974, the first of two on-line stations opened at California State University at Los Angeles (formerly L.A. State College), situated at the junction of the San Bernardino and Long Beach Freeways. The

multi-level on-line station attracted an additional 1,000 one-way trips on the busway. The second on-line station opened a few months later at the huge Los Angeles County/University of Southern California Medical Center near downtown Los Angeles. The resulting total patronage generated on the entire line reached a peak of 19,500 daily one-way trips.

Recently a portion of the busway has been made available to carpools as well as the buses. In May 1978, Caltrans and SCRTD will evaluate the busway's future use, i.e., whether the lanes should be used exclusively by buses or continue to be shared by carpools.

No land use-related impacts have been documented by SCRTD officials or are apparent on observation. SCRTD cites the fact that the two on-line stations serve institutional destinations (a campus and a hospital) and would be unlikely to demonstrate any market impacts. The suburban El Monte terminal has also not appeared to introduce or support any significant land use imapcts. The terminal was located in a triangular old mixed industrial area with little potential for major redevelopment in the immediate station area. The area west of the terminal is primarily undeveloped parkland extending to the Rio Hondo River. To the east of the terminal is small strip commercial development along Santa Anita Avenue, which serves an old single-family residential neighborhood just east of the arterial. The southern part of the triangular terminal area is bounded by the San Bernardino freeway (I-10).

Seattle "Blue Streak" Express Bus Service

The Seattle "Blue Streak" was an express bus demonstration project, implemented in 1970, to test the effects of increased levels of service on transit routes and the overall impact of a 500-space park-and-ride lot with express service to downtown. The buses utilize reversible lanes of Interstate 5 and an exclusive reversible Columbia-Cherry Street on-off ramp in the southern part of the Seattle CBD for its approximately eight-mile service. The Blue Streak system extends to seven other previously existing routes in the north part of Seattle, some now taking partial advantage of the reversible roadway.

The northeastern area of Seattle served by the Blue Streak service is primarily residentially developed. The population density in this area is higher than most of the other metropolitan areas of Seattle, thus making it particularly attractive for transit.

Very little detailed published information is available on this project. One federally-funded impact analysis was conducted in 1971 after Blue Streak had been in operation for a year. The analysis focused on a survey of operations-related information such as comparisons of bus and auto travel times, O-D characteristics of auto and bus users, bus passenger volumes, and a transit cost and revenue analysis. No development impact-related issues were addressed. The analysis concluded that

Blue Streak was a successful demonstration of express bus service given that it produced patronage increases in the face of systemwide ridership losses and a general decline in area travel.

The fact that the Blue Streak express service is only one of several lines serving the northeastern metropolitan area, and that this area is very densely developed, suggests that little opportunity existed for any development-related impacts. The bus service has essentially offered an alternative means of travel to the CBD without necessarily affecting established travel patterns.

U.S. 1/South Dixie Highway "Blue Dash" Express Bus Service

On July 22, 1974 Metropolitan Dade County and the State of Florida Department of Transportation initiated a project involving a contra-flow bus lane, a carpool lane and traffic signal improvements on a 5.5-mile segment of the U.S. 1/South Dixie Highway. The South Dixie Highway is the main arterial linking downtown Miami and the central Miami area with the southern suburban portions of Dade County. The 5.5-mile bus lane segment extends from S.W. 72nd Street in South Miami to the entrance of Interstate 95, one mile south of the Miami Central Business District. The project was initiated to reduce peak period congestion on the hgihway and encourage commuters to use the "Blue Dash" express buses or carpools to get to work.

An evaluation program was designed to determine the positive and negative results of the demonstration project. The evaluation included various field studies conducted over a nine-month period on different aspects of the project. Two tasks attempted to address development-related issues.

A business telephone survey was administered to determine whether complaints that the project was hindering business volume drastically were actually due to the project, or due to general economic conditions, or a combination of the two. Several business groups had earlier contended that the new restriction of left turn movements off the highway was reducing the accessibility of their establishments to such a degree as to decrease profits, and thus decrease employment. However, the survey revealed a minimal impact of the project on the business community. Approximately three percent of the businesses surveyed in the U.S. 1 project corridor indicated a decrease in business due to the project's left turn restrictions.

A residential impact survey was also included in the project evaluation program. However, this survey was finally eliminated from the work program for several technical reasons. First, because of the diverse residential areas which could be affected by the project, it was felt that an accurate sample would have been virtually impossible to obtain with the resources available. Second, it was felt that the costs of a home interview survey would have been prohibitive and that less costly telephone interviews would not yield sufficient reliability and validity. Although this evaluation task was formally deleted, no evidence has been reported which would suggest any residentially-oriented impacts.

Evaluation

So far, the evidence available indicates no land use impacts attributable to busway systems, including some which compare favorably in patronage to many commuter rail lines. This may be inherent in such systems, arising from their comparative lack of facilities of a fixed character. However, the results observed to date may also reflect a lack of planning to encourage such impacts, attributable in large part to the lack of any expectation of such potential on the part of transit and city planning officials.

If a highly publicized and credible commitment to intensive operation were made, backed up by investment in substantial terminal facilities at locations amenable to intensification of development and complemented with appropriate zoning or other development incentives, it is at least conceivable that some impact could occur. However, as with the recent "light rail" improvements, the new busways existing for study in this country do not provide fair examples of such conditions, since there was no attempt to influence land use in any of these cases.

Our conclusion at present must be that busways have had no land use impact; moreover, it seems unlikely that even under the best of circumstances the development effects of future busways will compare with those possible with higher-capacity fixed-route systems. At the same time, as with light rail, no fair test has been provided by recent American experience.

Chapter VI
THE EUROPEAN EXPERIENCE

Although this study is oriented to the analysis of recent transit improvements in the United States and Canada, the simultaneous experience with the interaction of transit and land use in other countries provides a useful comparison. In seeking to present such a comparative perspective, this chapter is not intended to be exhaustive. Instead, it concentrates on a number of specific examples in several different countries, and draws from these some principles which distinguish European approaches from American.

The information presented is drawn partially from recent literature; the reader is urged to consult the Bibliography for an extensive list of references on this topic. However, this review is based primarily on personal observation and interviews with European planners and other officials in late 1976.

THE NETHERLANDS

In the major cities of the Netherlands there has been considerable urban development since World War II, which has slowed down somewhat in recent years because of lower population growth. Interaction between urban development and public transporation is noticeable mostly with respect to two major types of planning:

a. Major modernization and improvements of the central urban areas: European cities typically do not have such an extremely high concentration of activities in a small area as typical for "CBD" in U.S. cities; their central areas are spread somewhat wider and more evenly. The movement outward, stimulated by private automobile, has been kept in balance by improvements of central areas. This policy has been related closely to the improvements of public transportation with a rather straightforward reasoning: outlying areas depend primarily on the auto; the central city cannot compete with outlying areas in convenience of auto travel. The central city has, however, the advantage

*Much of this chapter was prepared for this study by Dr. Vukan R. Vuchic of the University of Pennsylvania.

that it can be served much better by transit than can the outlying areas. A well designed and coordinated transportation system utilizing a combination of auto and transit in central cities is felt to be superior to the heavy reliance on auto and very limited transit service in the suburbs. Improvement of transit is thus a sine qua non of maintaining viable city centers and their central role in metropolitan regions.

b. Suburban settlement development: Major outlying residential areas have been built which require a high quality public transportation link with the central city. Other developments, such as single family housing in suburbs, did not require a close coordination with transit planning.

In all three major Dutch cities, The Hague, Amsterdam and Rotterdam, efforts were made to separate transit from other traffic in order to keep its service fast, reliable and easily identifiable. There has been a general consensus that the logical choices are, for many reasons, rail modes; but there has been less strong consensus as to which rail modes should be used. Streetcars had many drawbacks because of their vulnerability to traffic congestion. Therefore new lines have been built mostly on private rights-of-way with at-grade crossings and grade separations only at most critical intersections. During the period between the early 1960's and early 1970's, several light rail transit (LRT) lines were built in each one of the three cities, mostly as extensions of existing lines; however, plans were to eventually substitute this mode on most routes in Rotterdam and Amsterdam by rapid transit. The Hague was planning LRT tunnels in the center city. In recent years these plans have been modified.

A brief review of transit planning in the three Dutch cities follows.

Rotterdam built a rapid transit line to provide a good connection between the city center north of the river Maas with industrial and residential developments south of it (Maashaven, Zuidplein, Hoogvliet and others). Stimulation of growth of these developments was dependent on this line. Its stations were planned not only for integration with these traffic generators, but also with bus services (buses come to the elevated train level by special ramps for across-platform transfers with trains) and park-and-ride (located on a level below storage tracks within station areas). The second line which was planned as rapid transit will now be designed as a high-quality LRT line. Existing LRT lines are being modernized, so that there is a trend toward blurring of differences between LRT and rapid transit. What is evolving is a system of rail lines with characteristics varying in length, required speed, capacity and reliability of service.

The first rapid transit line in Amsterdam, presently close to completion, connects city center with a large new residential development to the southeast, Bijlmer. There is no doubt that this and several other planned rapid transit lines are functionally justified. However, extremely

difficult tunneling conditions and considerable potential environmental damage, primarily due to the unique character of Amsterdam, have been recognized and have led to the decision, after several years of lively and nearly violent discussions, not to undertake construction of other rapid transit lines.

Auto traffic is also strongly discouraged in the city, while extensive and very imaginative preferential treatments are being given to LRT and buses. Several extensions (e.g. Osdorp, Geuzenveld, Slotervaart) have been built with private rights-of-way and crossing controls which minimize delays. This provides service which is more similar in speed and reliability to rapid transit than to streetcars, and yet at a much lower investment cost and no environmental problems. All extensions are closely related to city planning for the served areas with respect to right-of-way reservation, station locations, and timing of line construction.

Generally similar developments have taken place in The Hague. Rail transit is planned and treated as the main transit carrier and its improvements have been made continually in both the central city and in new developments in outlying areas (Leidschendam, Melis Stoklaan). The plans for construction of LRT tunnels in the center have been replaced by intensification of overall transportation system operations improvement measures with the particular goals of increasing speed and reliability of transit service. These improvements are closely related to other measures for central area modernization, including major buildings, shopping areas, office complexes, pedestrian areas and controls of auto traffic.

OTHER EUROPEAN CITIES

The developments in Dutch cities summarized here are typical for several other European countries. Following is a brief review of such examples from several other cities of particular interest.

Frankfurt had a particularly interesting case of development of a new urban area with transit. A large satelite development was built in the north-west suburbs of the city: this development, Nordweststadt, has been designed for a population of about 40,000 persons. The design is for large apartment complexes with an office, shopping and civic area in the center, under which a rapid transit terminal and bus stops have been accommodated. As the development was nearing completion in the second half of the 1960's, there was great pressure to construct a rail link with the central city; it was simply inconceivable to most officials that such a large development would not have a fast, reliable, high-capacity transit service.

Since planning and financing of rapid transit line was lagging behind the construction of Nordweststadt, a compromise was made. The line that was constructed (A-1) is a mixture of LRT and rapid transit, since

it operates in tunnel under the center city, but then crosses several street intersections along the wide Eschersheimer Strasse. The compromise was made mainly for the purpose of opening the line in time for the opening of Nordweststadt.

Mannheim, on the right bank of the Rhein River, with Ludwigshafen on the left bank, forms the core of a metropolitan area with a population of 1.6 million. Both cities have worked continuously on expansion of their LRT system and achieved some remarkable results. For example:

- The two systems are fully integrated by lines which have been constructed on two new bridges across the Rhein. LRT rights-of-way have been designed together with highway approaches and freeway interchanges at both ends of the bridges.

- LRT in Ludwigshafen goes not only through shopping streets, but even through a department store building, i.e. entirely separated from street areas. A passenger stop is at ground level, but within the department store building.

- Planken, the main shopping street in Mannheim, has been reconstructed and opened in 1975 as a pedestrian/transit mall. The street is now a lively area with intensive shopping activity until late evenings. The stores have increased their business volume and in general the mall is considered to have greatly improved the economy, environment and thereby attractiveness of the central city.

- Mannheim has built a number of extensions of its lines to new outlying developments. The best example of this is a large residential area, Vogelstang, which has high rise apartments with a complex of schools, stores and recreational facilities in its geographic center. An extension of an LRT line was built to Vogelstang through a large undeveloped area, mostly in a median of a highway with excellent alignment and intersection controls, as well as on entirely separated rights-of-way. This line extends physically through the development's central complex on its ground floor.

Implementation of this coordinated scheme of transit and urban development is the result of a process somewhat typical for many other projects. The need for full coordination between land use and transportation planning is widely recognized in Germany; a law requiring such coordination has recently been inacted. Yet, planners were designing Vogelstang without any considerations for rail transit. The transit agency, however, was alert to notice that such a design would lead to problems. There is strong pressure from the city government and from the public itself to provide good transit service to major new developments, and the transit agency realized that it would face a serious problem in trying to provide service after Vogelstang was designed without any facilities for it. The agency director then insisted that the design be modified so that it would incorporate a rail line. The result is an extremely successful solution, often mentioned in European professional literature.

Illustration 6.1
Mannheim Transit Station on Overpass

Illustration 6.2
Mannheim - Shopping Center with LRT Beneath

Cologne planners answer the question of city planning/transit interaction by displaying their new suburban development, Chorweiler, some 10 km north of the city center. A major residential area with supporting shopping, school and recreational facilities, Chorweiler incorporates an underground station for a regional rail and an LRT line, both new in operation. It is obvious that there was a simultaneous, coordinated design of transit access with the other facilities.

Illustration 6.3
Cologne - View of Chorweiler and its LRT Line

Bremen has also built new residential areas connected by LRT lines on private rights-of-way, at grade or aerials. An example is Arsten West.

Gothenburg (Sweden) has during the last 15 years built several suburban residential areas and simultaneously extended its LRT lines to serve them. Several of these extensions are fully controlled rights-of-way. In one case a major transit tunnel has been bored through a hill, with the buildings on the top of the hill connected with an LRT station via long escalators.

Stockholm has had extensive and most complete coordination between new town development and construction of its rapid transit network. New towns Vallingby and Farsta are often quoted in literature as the best examples of joint development in outlying areas: rail transit stations are in the centers of these towns. Bus feeders are brought to them; a commercial area with parking is in the immediate vicinity; residential

areas are in its background, decreasing in density from high-rise to single family farther out. Among the newer generation of suburban new towns around Stockholm, Skarholmen is probably the best example of the evolution of the concept. Several times larger than the earlier new towns, it includes both rapid transit and freeway access for its large population.

Illustration 6.4
Vallingby, Sweden - New Town Auto-free Center with Transit Beneath

Hamburg also attempts to apply the same design principles. The Hamburger Verkehrsverbund (Transit Federation) developed in 1970 a model of residential densities in relation to rapid transit and surface transit lines, which even specifies numbers of floors and distances numerically. Naturally, the model was neither expected nor intended to be rigidly followed; it represented a general guideline for design. The "Hamburger Model" was used and discussed for several years. Planners now consider that its numerical values should be somewhat reduced because of decreased population growth and decreasing housing densities, but the basic concept remains valid.

The Billwerder Allermoehe development, adjacent to an existing regional rail (S-Bahn) line in Hamburg, is considered to be the best example of fully integrated planning for joint development: an interdisciplinary team including city planners, engineers, architects, economists and others worked as a project team from the beginning. The project has now been postponed, however, because of financing problems.

The examples just sited are among the most successful ones. This should by no means imply that such coordination in planning exists in all cities and functions always smoothly. Actually, most of these projects are results of painful efforts of many agencies to overcome administrative and organizational difficulties which lasted for many

years. But examples of the lack of coordination and failures in the planning of different developments or towns and the design and construction of rail transit are also quite numerous.

Berlin began to construct in the early 1960's two new developments which would ultimately have 50,000 inhabitants each. Gropiusstadt was planned together with a new rapid transit line, and the line was opened to traffic simultaneously with completion of the first stage of the new development. Not only was planning coordinated, but also the timing of construction was precise. The other development, Markische Viertel, was less successful in both planning and timing. The new town is now open, but rapid transit has not yet been provided. It will be constructed in several years.

Cologne, in contrast to its successful Chorweiler, also has Konrad-Adenauer-Siedlung with 4500 apartments and 16,000 inhabitants. Located 8 km from the city center, this development is still without an adequate transit connection although it was constructed in the mid-1960's. Another development, Bocklemuend-Mengenich, has a population of 13,000 and it is also without direct transit service.

Hamburg has a rather poor transit service for its extremely ambitious City-Nord area. Although the city has an extensive transit network, the planning of City-Nord was done largely independent of transit planning.

JOINT DEVELOPMENT

Joint development of rapid transit and other facilities in inner, built-up urban areas and city centers has been increasing in the last two decades. First of all, rail transit is considered to be a strong supporting force in stabilizing, improving, or preventing decay (depending on local conditions) in areas it serves. It should be noted that the intended influence of rail transit in Europe is not always major intensification of activities, but sometimes merely improvement of an area's environment (stabilization of a residential neighborhood, for example). In centers of cities, however, intensification of activities is often intended and achieved.

Most cities have in recent years coupled rapid transit (or LRT) construction with other changes in the transportation system, particularly auto disincentives and opening of pedestrian malls. Rotterdam was the first city to open a downtown shopping area (Lijnban) as a pedestrian zone, peripheral parking, rapid transit in tunnel and LRT crossing the area. This was followed by many other cities. Munich converted its busiest street, Kaufinger Strasse) chronically congested with autos and streetcars, into a pedestrian mall and built major rapid transit stations at both ends of it. Both cases are considered as extemely successful plans and physical designs which have greatly contributed to very vibrant downtowns.

Hanover opened an LRT tunnel under the central area in 1975. The project was considered extremely significant for the city, and has actually caused such an intensive construction boom that some experts believe that the eight new department stores constructed there exceed purchasing capacity of the potential markets to a substantial degree. Zurich has had a successful redesign of a shopping street (Bahnhofstrasse) since it was converted into a transit/pedestrian mall, served by LRT at grade. Similar success has been achieved in Mannheim (Planken), as already mentioned.

Illustration 6.5
Zurich-Bahnhofstrasse
Transit/Pedestrian Mall

In all these cases great attention has been paid to the design of transit facilities and their connections with stores, office buildings, passages, railroad stations and bus terminals. Experience has shown that poor design can seriously decrease the effectiveness of the basic concepts of joint development. In general, in all visited cities rail transit is considered to be an integral and very important component in improving urban environments and creating a reasonable combination of private automobile and public transportation.

GENERAL PLANNING PROCEDURES

Planning procedures and implementation methods vary among countries and cities, and in some cases even among different areas of the same city (Cologne, Hamburg). There are many examples of excellent coordination in planning, but there are also many limited successes or direct failures. Thus, with the exception of Swedish cities, considerable improvement of procedures could be made to reach a high degree of efficiency through full coordination of planning and implementation.

Generally, however, coordination of land use planning with transit planning is very much stronger than is the case in American cities, particularly in recent decades. The disregard of transit service which is found in many of our recent developments (e.g., Reston opened without a single bus service to Washington, D.C.) is rare in European cities. Pressures from both governmental agencies and the general population in these developments for provision of good transit service is much greater there since awareness of the significance of transit is much higher.

According to European planners interviewed, planning for different jurisdictions within a metropolitan area is coordinated through regional bodies (commissions, agencies). Mutually conflicting plans and policies are reconciled through long negotiations, discussions involving planners and political decision makers, and other means.

There are pressures to deviate from a city's overall plan which often defeat its major goals and purposes. How many such deviations are made in comparison to our cities is not easy to establish precisely. However, discussions and observations give a distinct impression that they are less severe, and that such changes still leave the basic plans and policies more intact than is the case in American cities. Finally, rivalry among some towns does create difficulties in implementation of plans. Again, it is difficult to identify the severity of this problem.

It is acknowledged to be difficult to achieve the cooperation among different agencies, among different design firms, and, finally, among groups of architects, engineers, economists and others, which is necessary for successful planning, just as it is in the United States.

In addition, European developers do exert pressures to modify plans and eliminate services which do not bring direct payoffs. However, developers are usually very interested in adequate transit service since they consider that it adds to the attractiveness of the development. Lack of it is felt to reduce their potential renting market.

There are also problems in getting the various city agencies to cooperate with the transit agency and involve it in planning. At the same time, the city government usually exerts considerable pressure to obtain adequate transit service. The main problem, according to those interviewed, is that the pressure often comes late, when planning or construction have already been brought to advanced stages and construction of transit facilities is either more costly or physically impossible.

Most of the experience gained through this study's interviews and observations, as reported here, has dealt with the Scandinavian, Dutch and German countries. In these countries coordination of land use and transportation planning is mandatory, although generally administered separately (Holmes, 1976; Hillbom, 1971; Colcord, 1974). Of the other European countries, Britain is most similar to the U.S. and

Canada; preliminary impact studies of development along the Victoria subway line have been conducted (Collins and Fisher, 1971), and Wacher (1969) for example, a British analyst, has suggested that London should learn from the Toronto and San Francisco examples in order to improve its coordination of transit and land use along the Victoria and Fleet subway lines.

Other European countries have varied approaches and effects. Writings of Italian observers (Cirenei, 1973; Paschetto, 1975) imply that transit and land development are not closely coordinated in that country. In contrast, the French approach (Sloan, L'Huillier in TRB, 1976) involves a very high degree of governmental control over development, with both transit and urban development functions in the same agency. This occurs both at the local and the Federal level, and the Federal authorities are empowered to override local land use decisions in support of regional and national objectives (Sloan). As Sloan suggests, although the effectiveness of the French model is indisputable, it is unlikely that American traditions will allow its adoption here. However, the French case seems to be an exception rather than the norm in Europe.

CONCLUSIONS

Most European countries have a longer tradition of planning than is the case with most U.S. cities. Sweden differs most from the United States because of its public ownership of urban land and strong implementation controls. However, it is erroneous to dismiss European practices and experiences in urban planning simply because their "conditions are different", including factors such as attitudes toward planning, governmental powers, densities of cities, and auto ownership. The fact is that most of these conditions are far less dissimilar than usually believed. With the exception of Sweden, most West European countries have governmental structures not greatly different from from ours. Problems of fragmented governmental bodies within metropolitan areas exist in most countries and cities. Difficulties in reconciling community interests with those of private developers or owners are similar to those found in our cities. Population densities are higher than those in western U.S. cities, such as Houston and Phoenix, but they are comparable to and often lower than those typical for older U.S. cities, such as Baltimore or Boston. Finally, auto ownership is becoming very similar to that found in many U.S. cities.

How can one then explain the more effective coordination often found between land use and transportation planning? Interviews with experts from several cities reveal one highly significant difference which appears to be the most important factor in achieving different planning results despite similar basic conditions: attitudes toward public transportation, toward all public services and toward cities in general are different in European cities from those typical for their U.S. counterparts. Europeans are used to having a high quality, reliable transit service and they do not tolerate serious interruptions in it; it is inconceivable in Switzerland, Germany or The Netherlands, for

example, that a transit system in a major city would be on strike for more than a day or so. While our citizens take such phenomena nearly as a way of life, similar cities in Europe would have a public uproar and tremendous pressure would be exerted for immediate restoration of service. Similarly, lack of transit in a major part of a city is also considered intolerable. Aware of these expectations of the public, European city governments are very sensitive to transit's importance and take a very active role in all matters concerning operations and planning of transit systems.

This general consensus among the public, governments at all levels, employers and businesses that adequate transit service (which in medium and large cities refers primarily to rail transit) must be provided is a major factor in overcoming the major difficulties and obstacles in achieving this goal. Actually, the public often demands a higher level of transit service than is financially or physically feasible under many conditions. This awareness about transit is very much different from the attitudes found in many of our cities, where a generation of people has already grown up without modern transit service.

Finally, attempts to collect information on the impact which European rapid transit has on land use, in terms of such quantitative measures as increases in land value or the number of households or jobs which have been attracted to transit-served locations, have not been successful since that question is not considered meaningful by the city and transit planners in those countries. Land use and transit are typically planned together, rather than separately. Thus the "impact" of rapid transit on land use is so obvious, in both qualitative and quantitative terms, that it is not the subject of conjecture or argument.

The questions of what impact rapid transit would have on land development is seldom discussed by European planners for two reasons. First, there are few if any places where conditions approach an open market in urban form and land use patterns: too many other influences, both supporting and opposing development, are always involved. Second, building a rail transit system and leaving it separated from desired land uses is considered to be a failure apriori which automatically leads to underutilization of the potential such a transit system has for improving efficiency of urban transportation. Consequently, most discussions on this subject in European cities concentrate not on maximizing "impact" but rather on how to improve the existing planning procedures and implementation methods to insure that the investments in rail transit are properly utilized through their coordination with land use planning. The most potentially useful lesson, then, which can be drawn from the European experience seems to be that public attitudes are a key factor in assuring successful coordination of transit and land use. Differences in approaches to coordination are apparent between the European and American norms. However, these differences are largely the manifestations of differences in the expectations and demands of the European and American public. Certainly historical traditions of government and social structure are also influential.

Still, the European experience suggests that if the attitudes of the American public were to become more favorable toward the use of transit, then substantial improvements in land use-transit coordination might become possible. This might be encouraged, for example, by federally-sponsored demonstrations of such coordination on the model of the German or Dutch transit-oriented suburban residential developments.

Chapter VII
CONCLUSIONS

Preceding chapters have presented a very large quantity of observational and statistical information concerning the land use impacts of rapid transit. In addition to historical American experience and modern European contrasts, nearly every major rapid transit improvement in the United States and Canada since 1945 has been considered. Within those chapters the role of transit in each situation has been analyzed; conclusions have been drawn regarding both the degree of land use impact and the importance of other factors in interaction with each transit improvement.

The purpose of the present chapter is to bring together the results of these city and system-specific studies and seek out more general conclusions which might be relevant elsewhere in the future. The chapter addresses in turn each of the major issues defined in the Introduction, and also suggests needs and directions for future research in this field. A final chapter, following this one, goes beyond these conclusions to present policy implications suggested by the study's results.

Can a major transit improvement increase the overall economic or population growth of a metropolitan area relative to competing ones?

Recent experience provides no evidence that any rapid transit improvements have led to net new urban economic or population growth.

Because of the many ways in which cities differ, it would be impossible to isolate and identify with any confidence the effect of a specific transit improvement on a metropolitan area's population and economic vitality. Any comparisons would be seriously confounded by the effects of factors not related to transit. The one case found in which this was attempted was in the BART Impact Program, where despite the use of a variety of approaches no difference attributable to the transit system could be found (MacDonald & Grefe, 1977).

Some earlier writers (e.g., Heenan, 1968) have cited Toronto's growth during the first decade after the initial subway opening as an example of a major increase in regional property value largely due to transit. As shown in Chapter III, however, this growth was mainly due to other factors. In addition, the portion which might be attributable to the subway was most likely to have been a shift from other parts of Metro Toronto into the areas along the subway. Kovach (1974) also pointed out that although Toronto grew rapidly during the 1960's, several other Canadian cities without transit exceeded its rate.

Other evidence includes the changes in population growth rates among cities in recent years. U.S. Census figures indicate both in 1970 and 1975 a shift away from the country's major cities to smaller cities, none of which have rapid transit systems. (Population is also continuing to shift from central cities to their suburbs, but these are not inter-regional movements.)

Historical data suggests that early major transit improvements such as the New York City subway were essential for the continued expansion of the city's population and economy. If these major improvements had not been provided in one of these major East Coast cities, it is possible that much of its subsequent economic growth might have instead occurred in another city not so constrained. Under similar growth pressures, perhaps this could occur today. However, there appears to be no prospect for such expansion of urban economies in the foreseeable future.

In general, the migration of population is more likely to be motivated by considerations more immediate than transit, such as the possibility of better employment or a safer and more attractive place to live. It is therefore probable that transit's interregional effects depend on its ability to influence the rate of job-creating investment in its metropolitan area. However, relatively little of the country's basic employment is free to migrate, being fixed by prior plant investment, materials supply, and regional markets. Of the employers who can choose to establish facilities in one city rather than another, it is hard to imagine that one city's rapid transit facilities could be a decisive and consistent element in their choices.

Can a major transit improvement strengthen the Central Business District and subsidiary business districts in the neighborhoods of stations?

Recent major rapid transit improvements have been important inducements to downtown development near stations, but only when supported by other powerful forces.

The Toronto, Montreal and San Francisco studies concluded that the transit improvements there were significant forces in the extent and nature of the intensive high-rise commercial office development in the CBD. In Toronto and Montreal, in particular, the new subways provided a much-needed increase in the accessibility of the downtown area and thus assisted its growth.

In such cases, where inadequate prior access was actually a recognized constraint on downtown growth, the evidence indicates that transit has been a virtual necessity for intensification of development to occur. At the same time, it is clearly not sufficient; if the New York subway had been built in Kansas, a city like New York would not have resulted. In San Francisco, the BART subway and the associated beautification of Market Street were partly responsible for the expansion of the financial district southward across Market, revitalizing that declining area. As in Toronto and Montreal, BART also enhanced the CBD's accessibility by providing additional commuter capacity in some major congested radial corridors. However, in all three cases, other factors were also essential in this downtown development.

In subsidiary centers outside the CBD, recent transit improvements have so far had relatively mixed effects. Largely transit-induced commercial development has occurred in several such centers, notably in Oakland and Berkeley along the BART system, Haddonfield on Philadelphia's Lindenwold Line, and at several stations on the Toronto system. At the same time, much of this development has been less than had been hoped. Moreover, no significant commercial development attributable to transit improvements has occurred at other subcenters such as Boston's Quincy Center and Malden, San Francisco's Mission Street, and other BART-served subcenters such as downtown Hayward.

The primary factor behind such impacts has been the existence of a strong and effective demand for new office and retail space. This appears to have been determined by social and economic forces of regional and national scale. A related factor present in all instances was an already healthy and active downtown area, which encouraged both consumers and developers of land. If subsidiary business centers throughout a metropolitan area are stagnating, there is little reason to expect that transit service to one of them will generate development. In a period of slow or no economic growth, little impact can be expected under the best of circumstances.

Timing of such new development appears to have been determined largely by these same economic forces, such that new development (downtown and elsewhere) cannot be predicted to occur within a short time after the transit system is announced or built. In Toronto, Montreal and San Francisco the downtown subways were opened in 1954, 1966 and 1973 respectively, but intensive downtown development began at about the same time (1958-1960) in all three. Consequently, decisionmakers should not expect similar development to occur just after a transit improvement.

The availability of land for development has also been a major factor. This refers not only to nearby open or underutilized parcels but also to the feasibility of their assembly into a site large enough for economically viable development. In many instances in this study it was observed that fragmented or clouded ownership of otherwise highly attractive sites absolutely prevented development that otherwise would have occurred. The most striking example is at the intersection of Toronto's two subway lines north of the CBD, where interspersed with new development are block-long areas right at the station in which complexities of ownership are likely to prevent development indefinitely. This suggests that this factor should be a consideration in the early stages of transit planning, particularly in the location of stations.

Another similar factor was the placement of the station with respect to the business district. At Boston's Quincy Center station, the commercial district is actually several blocks away. This is also the case in Hayward on BART. In contrast, BART stations are located in the center of the Berkeley and Oakland shopping and office areas, where related development has occurred.

Other public investments coordinated with the transit improvement also appear to have been influential in encouraging transit-oriented development, although in many instances their effect has been overshadowed to date by opposing forces such as the lack of consumer demand. Typical of such investments are the Malden Government Center in that Boston suburb, the Federal government's Social Security complex near BART's Richmond station, the Oakland Museum and Laney College at the same system's Lake Merritt station, the Canadian government's large office complex now being completed at Toronto's York Mills station, and the convention center planned near Metro Center in old downtown Washington, D.C.

Formal urban renewal activities coordinated with transit development have been an important aspect of this public investment in several cases. Even without the construction of public facilities the simplification of land assembly for private developers has in some instances led to redevelopment, as in downtown Oakland. In others, such as Oakland's Lake Merritt (and downtown) area, the combination of publicly-assembled land and the presence of new public buildings has proven attractive to private developers. This is especially significant since the area involved was otherwise deteriorated and without significant development for many years.

Similar efforts at public-private renewal activity around transit stations have been attempted elsewhere, notably Washington. Although development appears inevitable, a variety of forces including lack of economic demand and the general unattractiveness of the specific areas involved have restrained action by developers.

Can a major transit improvement lead to an increased concentration of residences and activity, particularly in such a way as to create land use patterns more favorable to transit?

Recent major rail transit improvements have played a key role in intensification of land use in station areas not in the CBD, but only when joined with other favorable forces.

Examples include the high-rise apartment development at several suburban Toronto subway stations, the location of large office complexes at Boston's suburban North Quincy station, and the intensification of use at small existing subcenters. This latter is best illustrated by the Yorkdale station on Toronto's not yet completed Spadina line, where the owner of a suburban shopping center whose parking lot adjoins the station is planning to build a series of connected office buildings to join the station and the main shopping mall.

Here just as for the other issues discussed earlier, such development has of course not always occurred. Little has happened at most suburban BART stations as well as most of those in Montreal, Boston, Chicago, Cleveland, and some in Toronto. Philadelphia's Lindenwold Line presents an in-between case; extensive low-density residential development partly attributable to the transit line has occurred in the corridor, with thousands of commuters driving to the transit stations. However, even most of the apartment developments nearby are not within walking distance,

and there is no high density development of the type most complementary to rapid transit.

As with downtown development, a number of forces have been influential in complementing or counteracting the development potential provided by transit improvements. These include several already discussed as well as others. Among them are neighborhood opposition, social and physical characteristics of the area, ease of access to the station site, availability of developable land, and public policies toward development. Each is considered in the following paragraphs.

Neighborhood Opposition

In existing low-density residential areas, the placement of a transit station seems almost certain to generate strong opposition among residents. This has often led to the official imposition of tight controls on development in the area. As a result, irrespective of other factors favoring more intensive development, few if any changes in land use have occurred.

This factor has been powerful at several BART stations (e.g., Rockridge, El Cerrito Plaza), as well as the areas surrounding some Lindenwold stations and others in suburban Washington -- almost everywhere stations have been or are to be sited in such areas. Even in Toronto, where transit-related development has been most intense, such areas are typically protected by zoning. In some cases the neighborhood residents have not been successful in combatting other forces such as the city's desire for increased taxes, but this is much less so today than it was during previous decades.

This suggests that if such intensification of land use is desired as a complement to rapid transit service, such established residential areas are poor choices. In such areas if redevelopment does occur the resulting disruption of the social environment can be severe, while if it is prevented much of the transit system's potential benefit is lost.

Social and Physical Characteristics

Transit's effect on land use appears to have been minimal when development of a scale and type necessary to be economically viable was not complementary to the surrounding land uses. For example, the stations of Montreal's north-south subway line are situated largely in working-class neighborhoods of three and four-story apartment blocks. Air rights on the cleared areas above the stations are available and more intensive uses are permitted, yet almost no development has occurred. According to some local officials and observers, the primary reason is that construction costs allow only luxury hi-rise apartments, and prospective tenants would prefer to live in other parts of the city.

Physical characteristics, particularly blight, have sometimes been added to social problems to render areas even less likely to be developed into

uses complementary to the transit station. Malden Center in Boston is the scene of intensive and imaginative public efforts at renewal near the new transit station, but its generally aging and unattractive character has so far limited success. The BART stations in older, disadvantaged neighborhoods in Oakland are unlikely to attract private investment despite their high-accessibility locations. Areas around Lindenwold Line stations in Camden have similar problems.

Ease of Access to the Station Site

Where new transit stations are isolated from surrounding activity or available land, little development has occurred. This factor's effects are seen most clearly in Chicago and Cleveland. In Chicago, the location of the three newest rapid transit extensions in freeway medians has resulted in a separation of the station from any land which might be used for complementary development. This separation is as dramatic psychologically as it is physically; the station is connected to its surroundings only by bridges over heavy traffic, escalators, and long ramps.

In Cleveland, much of the rapid transit line parallels a wide railroad switching area, substantial earth embankments and a heavy industrial corridor. Development in these station areas is as yet nil, with the main potential for activity resting in the station's parking lot air rights.

Availability of Developable Land

This factor has already been discussed in some detail. Further examples of lack of development attributable in part to the difficulty of land assembly or the high cost of conversion could be given here; there are many. However, it is more useful to complement the earlier discussion with some examples of how this factor has been used to advantage.

In Toronto, several station sites adjoined obsolete and underused wood and coal yards. These large tracts were in single ownership and were quickly developed into hi-rise apartment and office structures compatible with their direct access to the subway. In Chicago, the Burlington Northern Railroad is planning a hi-rise development at one of their suburban commuter stations on their own underutilized land. In Montreal, the Longueuil station is on a large tract originally a military post, which after the subway opened was used first as a parking lot for Expo '67 (one subway stop distant, on an island) and afterwards was developed into hi-rise apartments as well as office and hotel space.

Similar examples occur elsewhere. The point, however, is clear; where large-scale land assembly was facilitated the potential for transit-oriented development was much enhanced.

Public Land Use Policies

Whether influenced most by neighborhood preferences, infrastructure capacity, or other forces, the local government's objective and

policy concerning the preferred or permissible forms of station-area development has in some cases been a particularly powerful determinant of what land use impacts actually occur. In Toronto, allowance of very high densities of development (up to 12:1 in floor area ratio) in many areas around transit stations provided a strong incentive to intensive development. The fact that relatively small and well-defined areas were so designated, in contrast to the low densities allowed throughout most of the rest of the Metropolitan area, further enhanced the power of this incentive. Since the region's demand for such development was strong, much of it then had to occur around the stations - where transit access provided an important added inducement. Thus transit and land use policy were fully complementary.

This subject is treated more fully in the following paragraphs.

What role do public land use policies, such as zoning or tax incentives, play in this process either as a cause or as a result?

Local land use policy changes have often been instrumental in facilitating transit's land use impacts. At the same time, the transit improvement itself has often provided the rationale needed for acceptance of such policy changes.

As just noted for Toronto, land use policies have often been instrumental in determining whether and to what degree complementary development would occur around transit stations. The same is true, though to a lesser extent, with downtown development in San Francisco. A reverse situation is found in Washington, D.C. where strict height limits have restricted the degree of density incentive which can be offered to prospective developers; some local planners and developers believe that relaxation of height limits at transit stations would result in rapid development.

An important aspect of these situations and some others in which zoning and related incentives have been successful is that their power has depended on the degree of advantage they provided for the station site versus others elsewhere in the city. If a city was already overzoned (or if variances were easily obtained) to allow intensification of existing development at many competing locations, the inducement to develop at the transit station was correspondingly less. Both in Toronto and San Francisco, the transit station-area zoning incentives were part of a city-wide rezoning. In San Francisco, this included strict new limitations on development in many places. In Toronto, hi-rise development of the intensity allowed around transit stations and along their feeder routes was not permitted at many other locations, and the city was not already overzoned for intensive development in the manner of many cities in the United States.

Land use policies have also effectively prevented development at transit stations, by restricting land uses to such low densities that no allowable development was economically viable. The Rockridge BART station area is an example of this. Other public policies have also restrained development;

New York's 1908 attempt to tax away speculative profits on land along subway routes, resulting in a stagnation of development, is extreme but still the only example of such a policy applied on a large scale.

Land Use Policies of the Transit Authority

Actions of the transit authority itself with respect to the sale or use of excess land and air rights are another important form of land use policy. These may have important effects on the degree to which such land is redeveloped to complement the transit system, for example by offering long term leases in lieu of sales to reduce developers' initial capital requirements (Toronto).

Toronto also encouraged intensive land development near some central stations by designing the subway structure to include provisions for support of very heavy buildings. This amounted to a "land use policy" encouraging developers to build such buildings, since no unusual foundation costs were then required during their construction. This was a gamble on behalf of complementary development which cannot always be expected to pay off; in one instance on the Bloor line, TTC spent $750,000 for such strengthening of the subway but subsequent development was not intensive enough to take advantage of it.

Conditions of excess and air-rights land sale or lease have also acted as implicit land use policies. Toronto's approach has been to get the land back into use as quickly as possible, and so has encouraged development in many ways (although revenues from land leases have still been very significant). Other rapid transit systems such as BART have had similar although less aggressive policies. One contrasting example is Washington, D.C., where the METRO operator has negotiated one air rights lease with provisions for profit-sharing with the developer. This approach may restrain development if not sensitively applied, but the Washington case deserves careful attention as a possible model.

Feedback: Effects of Transit on Land Use Policy

Evidence shows that transit has often influenced land use policies. In many cases the inauguration of a major new transit improvement has provided the rationale for changes in land use policy to complement the transit service. In fact, this has occurred in most instances of new intensive development around transit stations, and may represent one of the most important ways in which a transit improvement may influence land use.

Land use policies generated largely by the advent of a new transit improvement include examples in Toronto, San Francisco, Philadelphia, Boston and Washington. In Toronto, as already noted, the rezoning for intensification of development at transit stations arose several years after the first subway segment's completion and was directly attributable to it. In San Francisco, the 1966 rezoning in the CBD was heavily influenced by BART, as were similar station-area rezoning efforts in

several suburbs along the BART lines.

Also on BART (in downtown Oakland) as well as with the Center City Commuter Connection in Philadelphia, support for downtown renewal plans for intensive hi-rise redevelopment were largely dependent on the transit improvements. In the Boston suburb of Quincy, zoning was changed specifically to complement the transit system's potential to induce more intensive office and apartment development. In Washington, many of the communities to be served have conducted detailed studies of METRO's land use impact potential and altered their zoning in response.

Not all of these transit-induced land use policy changes have been complementary to transit. Downzoning has been mentioned for BART's Rockridge station, and has occurred elsewhere as well. In fact, the power of zoning is most significant when it is used in this manner, since its effect is absolute: development is forbidden, no matter how it may be encouraged by other forces including transit. This is a substantial loss in potential regional development impact, and suggests that locations likely to have such constraints should be avoided as transit station sites wherever possible if major new station-area development is a central objective.

Are land use impacts limited to conventional rapid transit, or are other modes such as light rail, commuter rail and bus/busway capable of such effects?

Some recent major commuter rail improvements were found to have led to significant land use intensification, but evidence on light rail and busways was inconclusive.

The bulk of the evidence on commuter rail impacts is derived from Toronto's "GO" system, an an all-new service (although on existing track) begun in 1968. Hi-rise apartment buildings are beginning to appear at a number of suburban stations. This contrast with the typically low density of development in the rest of Toronto's suburban fringe, and occurs despite generally low levels of use (fewer than 1,000 trips per day) at most stations. Reasons for this new development seem to include the low cost and ease of assembly of land, encouragement through zoning, and high cost of housing elsewhere in addition to the ease of access to the CBD by both "GO" and nearby highways.

Little can be concluded from recent North American experience concerning light rail and bus/busway's potential for land use impact. No land use impacts attributable to recent improvements were found. However, few such improvements have been made on this continent in recent years, and even these available for study tend to be unrepresentative of future systems. Despite this lack of direct evidence, the study's findings on rapid rail impacts permit some conjecture on this subject.

Most important is the finding that even with conventional rapid rail systems, land use impacts depend largely on the coordinated action of

many other factors in addition to the transit improvement. This implies that other rapid transit modes might also lead to significant land use impacts if the same other factors could be brought to bear. For example, both the promise and the actuality of a major rapid rail transit improvement were seen to have acted often as catalysts to the development process, providing the needed support for efforts at local zoning and land use policy changes needed to encourage land development. The new accessibility provided by the transit improvement was important, but significant land use impacts were seen to occur sometimes with only small increases in transit accessibility. Hence it is possible that other transit modes providing less rapid or high-capacity service -- such as light rail and busways -- might in some cases be able to serve as effective catalysts for desired land use changes. The same is true of commuter rail improvements. This could be demonstrated for a particular city through evidence of the successful coordination of the many non-transit factors in land use impact along with a planned light rail or busway improvement.

Summing up, how do major rapid transit improvements seem to interact with land use?

A consistent set of factors is involved in the generation of transit's land use impacts, forming an empirical model on which predictions of impact may be based.

Formal and informal theories abound regarding the relationship of land use and transportation. None is of adequate scope, precision, and empirical relevance for practical use in the study of transit's land use impact. From among these this study has adopted the hypothesis that such impacts are dependent on many non-transportation factors in addition to the access, travel time and cost benefits of the transit improvement. Moreover, the study has focused on the decisionmaking process of the land developer rather than the ultimate consumer. Thus the study has sought to identify the factors of significance to the developer and the combinations of factors under which development is likely to occur or not occur.

As described earlier in this chapter, recent experience with transit's apparent land use impact was found to exhibit some common properties from city to city and case to case. Many of the same causal factors were found again and again despite many differences in specific conditions from one example to another. These recurring factors may be combined to suggest a general model of the land use impact process.

A diagrammatic view of such a model is presented in Figure 7.1. In this model each major factor which was found in this study to encourage land use change following a transit improvement is shown with its various components. The model illustrates clearly the scope of such factors in addition to the transit improvement itself.

This conceptualization of impact is still incomplete, for it excludes interactions among factors -- such as the effect of an impending or recent transit improvement on land use policy. More generally, the

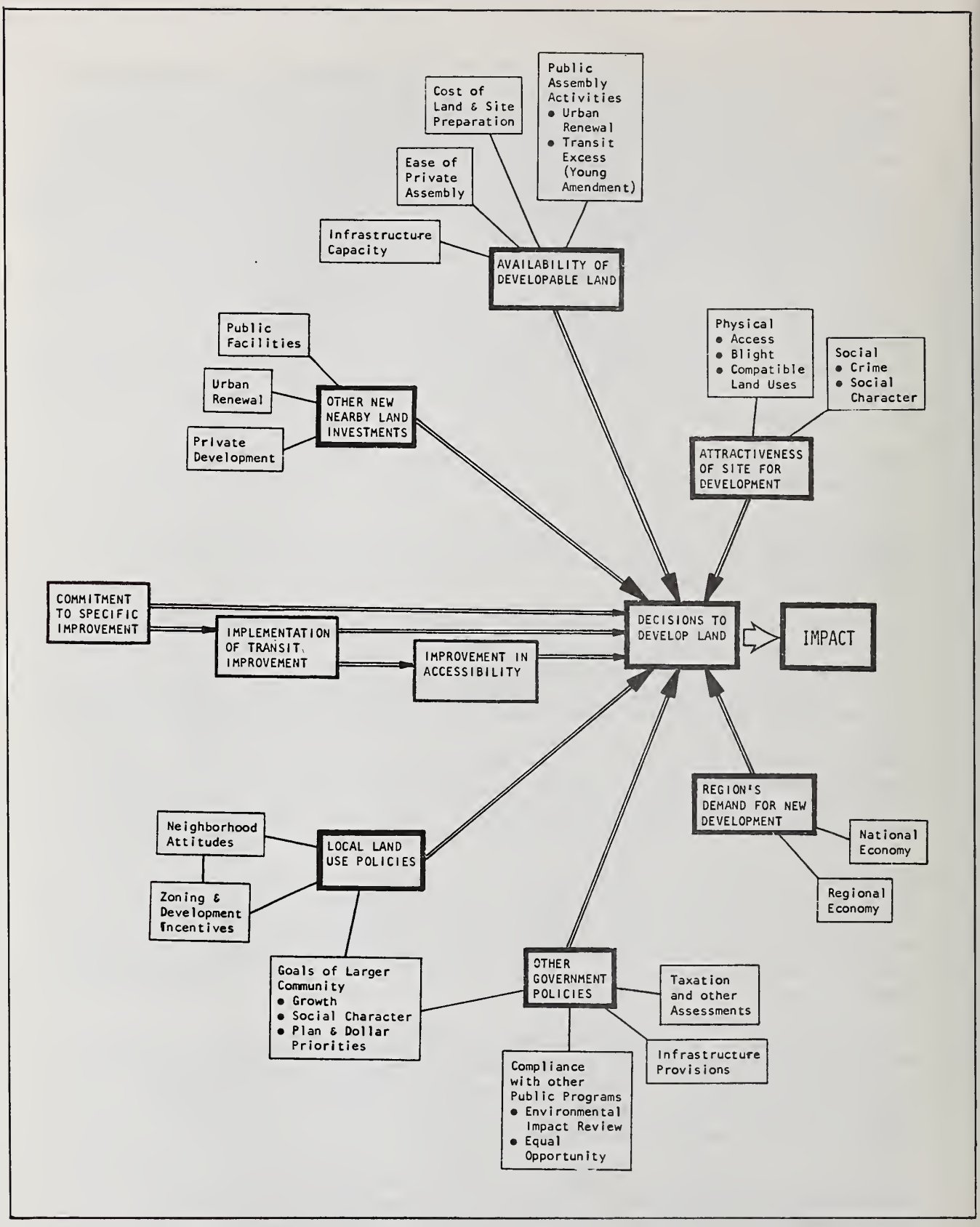


Figure 7.1
FACTORS INFLUENCING LAND USE IMPACT

beliefs of citizens, developers, and public decisionmakers in the likelihood or desirability of impact and the effects of such beliefs on many of the model's factors are also omitted. Such effects are of course important, but are unique to each situation.

For purposes of prediction of land use impacts of a proposed transit improvement or for guidance of the process, each factor may be treated independently. Where interactions among factors occur, knowledge of the local situation should permit their identification.

Clearly the relative importance of each factor varies from one case to another. In general, however, the study's findings indicate that none can be ignored, for a serious deficiency in any one appears to be capable of limiting or even preventing land use impact. Thus to achieve desired land use impacts, all the factors should be made as favorable as possible. In some cases this may involve moving a proposed transit station to a more advantageous location; in others there may be a need to coordinate policies in land use, taxation, urban renewal, and infrastructure with the transit investment.

With such an approach, various transit alternatives can be evaluated on the basis of their ability to take advantage of each of these factors and their consequent relative likelihood of land use impact. Even more important, an understanding of the workings of these factors permits the use of rapid transit as an effective component in the continuing, integrated process of planning and guiding the development of our urban areas.

FUTURE RESEARCH NEEDS

Needs for further research related to the transit-land use relationship fall into three general groups. All are useful; they differ primarily in their immediacy and risks of payoff. The first of these is an extension of the avenue of research begun in this study, emphasizing aspects of the subject which have immediate policy relevance and a high probability of payoff in useful results.

Second are studies of topics which have some current policy relevance but involve the development of new study methods or data. These therefore have a lower probability of payoff and some will require longer efforts.

The third and final group is composed of efforts which seek to strengthen the theoretical underpinnings of our understanding of land use impact and the broader dynamics of land use-transportation interaction.

Immediate Policy-Relevant Studies

The most productive avenue for further research is a continuation of the cross-system evaluation begun by this study. The literature assembled here is a new and major resource, and the case descriptions provide ample foundations for further work. Much more could be learned

from such an effort, and could be used immediately to further inform policymaking both by confirming or improving on this study's findings and by going beyond its scope.

A particularly useful effort could be made by developing and maintaining a more formal catalogue of case studies than was possible in this project. Each of these would represent a particular corridor segment or station area. The many cases reported in this study provide a significant initial body of data, and more could be added as experience expands. Cases could be cross-referenced on any number of attributes, to allow their use in model development and testing as well as in policymaking studies. In view of the volume of data involved and the importance of the topic, this effort at organization seems both valuable and timely.

A detailed compilation and evaluation of foreign experience in the coordination of urban transportation and land development is long overdue. The present study's brief review of European experience was tangential to its main focus (recent experience in the U.S. and Canada), and only suggested the value of a more careful investigation. Such a study could be similar to this one in approach, comparing national policies and specific cases of transit and land use coordination or impact to identify the unique and common factors which control the process in different countries. A further comparison with American and Canadian experience, perhaps based on the present study, could also be incorporated. This type of study could do much to illuminate -- and perhaps eliminate -- the commonly held belief that the experience of other countries is irrelevant here because of nebulous differences in governmental powers or philosophies. At the very least, it would identify for a broad audience the actual differences and similarities of American and various foreign experiences, including the processes of transit and land use development as well as their results. Some foreign approaches to "impact" or coordinated development might also prove to be surprisingly relevant in the United States.

Longer-Term Policy Studies

The land use impacts of different transit modes should be studied in order to fill a key gap in recent American and Canadian experience. This would involve monitoring of the effects of light rail, commuter rail and bus/busway improvements as they appear over the next several years. The nearly-complete light rail system in Edmonton, Canada is the first example which should be included. The results of such studies would have immediate relevance for transit mode choice and funding priorities.

This study's inconclusive results concerning whether transit can cause net economic or population gains for the metropolitan area indicates that research is needed on the interregional flow of development capital and population. In view of the current consideration of public transit investment as a means of inducing other private investments in declining metropolitan areas, this is an especially important topic. The objectives of such research should be to estimate the quantities, rates, and determinants of such movements among cities. Shifts of capital from real

estate development into other economic sectors should also be addressed. Success in such research would provide the basis for better-informed judgments concerning transit's possible influence and public policies to optimize that influence.

Empirical evaluations of specific land use policies related to transit are difficult methodologically but would be valuable resources in the continuing refinement of such public policies. Issues for such studies should be identified at the policymaking level to assure relevance, but might include some of the following: How do tight CBD height limits (such as those of Washington, D.C. or many European cities) compare with skyscraper zoning in attainment of efficient transit access and other aspects of a high-quality environment? What is the scope of public costs and benefits attributable to low, moderate and high-density zoning around outlying transit stations? Evidence to support such studies has now accumulated sufficiently to permit some of them, and as new transit-related development grows, more will be possible. Recent improvements in quasi-experimental research methods also facilitate such studies.

Another area in which research is needed is the operation of the real estate development process, particularly with respect to the role of transit and other forces. In our work we were repeatedly struck by the extreme lack of communication and mutual understanding between transit planners and private-sector real estate interests. Research into the tools and decision-making processes within the real estate market would provide a valuable resource for planners. This should, in fact, lead to development of improved curricula for planners to eliminate this ignorance of the practical workings of the land development process.

Finally, work on financial policies related to land use impact should be encouraged, ranging the gamut from tax incentives for joint development to value capture tactics. The current (1977) UMTA efforts in this direction are exemplary. More experience with actual applications of various value capture approaches is especially needed, and is a logical topic for research and possibly demonstration program support.

Background and Theory-Building Studies

Empirical land value research should be continued. The work of Boyce and his colleagues on the Lindenwold Line has made a significant contribution to methodology as well as knowledge on transit's land value impacts. Such work now needs to be replicated for other transit improvements, and the scope should be broadened to include commercial property. This is an important element in building an adequate understanding of the real estate development process; among its benefits would be a much strengthened empirical base of information on the nature of location rent and the importance of transportation and transit access in that component of property value. On a more pragmatic level, the results would provide estimates -- heretofore virtually nonexistent except for the Lindenwold work -- of the approximate size and timing of land value changes attributable to transit improvements. This would be

highly useful in evaluations of the size and distribution of property value benefits attributable to a transit improvement.

Testing of a variety of hypotheses and theories of impact cause is a much-needed research activity in order to sharpen our understanding of the process. Such hypotheses abound, although formal theory is sparse and general, and empirical testing would do much to speed the development of defensible predictive models. Useful tests could be made now by arraying this study's data against these available hypotheses and conjectures. This screening would indicate the degree to which this newly-assembled evidence either supports, contradicts, or suggests modifications in each of the alternative explanatory constructs, and serve to focus subsequent research more efficiently.

Chapter VIII
POLICY IMPLICATIONS

This chapter's purpose is to suggest implications of the study's findings for current policy development. These implications seem justified by the findings, but should be received with caution; a study of the past can provide only a part of the guidance needed to respond to future concerns.

These implications are directed primarily toward Federal policy in urban land use and public transit. They are relevant in the development of local policy as well, however, since the Federal and local concerns here are essentially the same: Can rapid transit influence urban land use? To what degree? Under what conditions? How can desired impacts be encouraged through policy action?

GENERATION OF NEW GROWTH

The lack of evidence of net regional growth in population, jobs or wealth due to recent transit improvements seems to imply that such effects should not be expected. However, such an implication is not wholly justified. Reliable data and methods for a reasonable test of this effect are lacking, and in addition future approaches to achieving such effects may be different and more effective than those which were available for study here.

An example of an approach which may prove to be more effective is the recent UMTA strategy of requiring cities to match Federal fixed-guideway transit subsidy grants with related local land development commitments. This approach has been applied recently in Detroit, Philadelphia, Buffalo, and elsewhere. In effect, it is an attempt to require demonstration of land use impacts before the Federal transit funding commitment is made. This strategy may have merit, but its newness made its evaluation impossible in the present study.

Another situation for which this study's findings on net regional growth impacts have little bearing is that of a major all-new rapid transit system (rather than a suburban extension) in a city with a declining CBD and an inability to attract investment capital. If coordinated with other initiatives to revitalize the local economy (possibly including the UMTA strategy just mentioned) such a major transit investment might conceivably be an effective catalyst for renewal. The current Detroit case is perhaps an example of this kind of attempt. However, no such efforts were available for investigation at the time of this study. The Washington, D.C.

example is closest among those cities included here, but it is too early to attempt such conclusions there yet.

Despite these limitations, this study's findings do imply that net regional growth impacts directly attributable to new transit improvements are probably not going to be large in comparison with the transit investment. Evidence for this is found both in the BART Impact Program's study in San Francisco (which was unable to find any such impact at all despite the very large rapid transit investment) and in the present study's general finding that many positive factors, fortuitous as well as planned, are required in addition to a transit improvement even for any major land use restructuring to result. It seems that so many other forces are involved that any net gain in regional wealth or economic vitality is likely to be hard to identify and cannot fairly be attributed to the transit improvement alone. Thus Federal policy might reasonably support the use of major transit improvements as one element of a coordinated package of efforts to revitalize a declining urban economy and social order, but should not rely upon transit investment as the sole or primary tool for such purposes.

FOCUSING OF DEVELOPMENT

This study's results indicate that rapid transit can be used as one factor to help shape land use patterns. This appears to be largely a process of influencing the location and nature of development in a metropolitan area rather than its net amount, as already noted. However, transit cannot create desired land use patterns by itself, and Federal policy should encourage the coordinated use of the many factors which have been shown to be involved.

Urban Development Objectives

The coordination of transit (or the broader urban transportation system) and land use should not be restricted to a one-time rapid transit development planning effort. If rapid transit is to be an effective policy instrument for shaping urban development, its application should be based on urban development objectives which are themselves accepted policy and which are compatible with rapid transit. Basically such objectives tend to involve a focusing of development and intensification of density near transit stations or in corridors served by transit rather than a more spread-out, lower density pattern.

It is conceivable that rapid transit planning might be done specifically to prevent rather than encourage a focusing of development. This could be done fairly easily by locating the system to avoid complementary factors and by blocking such effects via land use policy, infrastructure limitations, and other institutional constraints. In a few specific station areas this might be reasonable. In general, however, it seems unrealistic to seek the benefits of rapid transit service for an area without also encouraging the intensive nearby development which complements the transit capacity with large numbers of potential patrons. Without such positive interaction the transit investment may be hard to justify.

This suggests that Federal policy should encourage a more precise definition of local land use policy objectives prior to consideration of rapid transit. This is typically done now in a general way through adoption of comprehensive land use plans at the regional level. However, this study's results indicate that greater specificity is required. In too many of the cases reviewed, a rapid transit system was built with its stations in neighborhoods or communities which were actually unwilling to allow complementary intensification of development. The typical result is either underutilization of the station, serious station access problems, or both. To avoid such misuse of the costly transit resource, planning -- both as a continuing comprehensive process and in the specific studies in preparation for a major transit improvement -- should include assessments of the feasibility of land use intensification in the small, specific areas to be proposed for transit access.

Coordination

Once local urban development objectives are defined, supporting policies and programs -- including rapid transit -- can be developed. Here the key is coordination, as shown by this study's findings. Land use objectives are difficult to meet largely because of all the diverse forces which influence development. Federal policy must acknowledge these many forces and the need for their coordination. This is not an abstract goal; if land use, energy, and environmental objectives are to be met, this study's findings argue convincingly that it is a practical necessity. Without coordination, urban development will continue to be essentially unplanned and the land use impacts sought from transit improvements will seldom be realized. This is the central fact of the experience reviewed in this study.

The required coordination is not an idle hope. Much can be done now through existing mechanisms and institutions. Three general elements of a reasonable approach will be discussed in the following paragraphs:

- Site-specific assessment of all factors
- Land use and related local policies
- Community and developer involvement in planning

Site-Specific Assessment of Factors

In specific transit improvement planning the criteria for corridor and station site selection should be expanded to include the full range of land use impact factors identified in this study (Figure 7.1). General planning should include a similar assessment as a prerequisite to setting of land use and density divisions. Whether or not the effects of specific factors can be changed, this type of assessment provides a much more realistic basis for planning than is often used now.

In particular, the land use impact potential of a rapid transit station could often be improved dramatically merely by moving it a few hundred feet

to a new location where other factors are more favorable. Federal policy should encourage the use of such site-specific assessments as an important element in the demonstration of likely land use benefits.

Land Use and Related Local Policies

Recent experience has indicated that land use policies have often been instrumental in the generation or prevention of land use change around transit stations. Policies regarding provision of infrastructure (such as streets, sewerage and water), property taxation, and plan approval procedures have had similar effects. These specific policies should support overall urban development objectives; if for example an "objective" of focusing future development into subcenters is contradicted by zoning regulations which allow equally intensive development in many locations outside the subcenters, the objective is not likely to be met successfully.

In most cases reviewed, the presence of a transit station was not enough to attract a major share of new development when in competition with an excess of other similarly zoned locations. Federal policy should urge the rationalization of land use and other local policies with transit-related land use impact objectives as much as possible within legal constraints. At the very least, zoning and infrastructure provision in most transit station areas should allow intensive development, and efforts to further liberalize zoning in other areas counter to growth-focusing objectives should be denied as a matter of consistent local policy. Ideally, this should be demonstrated for all local jurisdictions which are to receive transit service; this does not seem unreasonable in view of the level of Federal support involved and the need to obtain maximal public benefits for that investment.

Community and Developer Involvement in Planning

A phenomenon observed frequently in this study was downzoning of transit station areas at the insistence of the local residents. Often this happened just after the system began operations. The result was the loss of an opportunity to focus development and a weakening of the transit system's viability.

Certainly property owners and residents should have a high degree of control over their neighborhood environment. Regional growth-focusing objectives can easily conflict with local neighborhood preservation objectives. However, where such dangers exist this study's results suggest that they should be confronted as early in the planning process as possible. Residents should be involved directly and intensively. Federal policy should stress the need for demonstration of favorable local land use regulations before a major transit investment is made.

The views and knowledge of the land development industry should also be incorporated into comprehensive urban planning as well as the specifics of transit planning. In transit planning in particular, this study's

results indicate that early involvement of the development perspective in the system location process would ensure proper consideration of a number of key factors in land use impact which are not now commonly included.

Favoritism toward special interests could be avoided by using independent real estate market appraisers, not just for acquisition value appraisal (as now practiced) but for identification of specific factors in alternative sites favorable or unfavorable to achievement of the desired land use as set by policy. Some of these, as noted earlier in the report, include the ease of land assembly for redevelopment, access to the site, cost of site preparation, and development potential of the immediate surroundings. Federal policy should strongly encourage this use of knowledgeable land development expertise wherever land use impacts are sought.

TIMING OF LAND USE IMPACT

Recent experience reviewed in this study shows that the length of time from commitment, construction, or initial operation of a major transit improvement to the generation of significant related land use change is completely unpredictable. In most cases a period of five years or more is involved, and in others it may be much longer -- if ever. As noted earlier, not only must conditions at the site be opportune; the general area's levels of demand for development and capital to meet it must also be healthy. This indicates that Federal policy toward rapid transit financing should not, in general, be based on a presumption of public revenues from early land use impacts being available to finance subsequent system expansion. This would be so even if effective mechanisms for capture of part of the "unearned increment" were available; these funds would in most instances be very slow and uncertain in appearing.

SUPPORT OF DIFFERENT TRANSIT MODES

Despite the lack of direct evidence of the land use impact potential of modes such as light rail, bus/busway and commuter rail, the study's findings do have implications for Federal policy toward such modes. Specifically, the finding that identifiable factors other than the presence of (or access provided by) a rapid transit station so heavily influence its impacts suggests that such factors might also be applicable to other transit modes. Until more actual experience with land use impacts of such modes is available, then, Federal policy should not deny the possibility that fixed transit modes other than conventional rail might contribute significantly to urban growth-focusing.

POLICY FEASIBILITY

Clearly Federal policies such as those derived and presented here must not be so unrealistic at the local level as to be impossible to implement. There are real limitations to the immediate success of even these modest proposals. The fragmentation of local authority in most cities, the ever-present conflicts among jurisdictions and the differences in the priorities of their constituencies, natural though they are, loom

large as frustrations in the achievement of meaningful regional objectives and enforceable, consistent policies. In the face of these realities, the Federal government's policies must be realistic. Hence with this study's opportunity to suggest new Federal policy directions comes a responsibility to show the reasonableness of these suggestions.

The thrust of the policy implications which have been presented here is straightforward: The Federal government should use its influence to encourage every possible means of local coordination of the factors which this study has found necessary to achieve desired land use impacts from major transit improvements. Complete control over these factors is not a possibility, nor is it ever likely to be in this society -- nor should it. But much can be done now to improve the chances of achieving desired land use impacts -- where they are desired -- simply by stressing the early identification of situations in which the needed factors are favorable or not. Beyond this, local policies in fields such as land use and infrastructure can be better coordinated with transit planning, at least by realizing and avoiding further inconsistencies as policies evolve and are implemented from day to day. Finally, there is no reason that the private land development perspective could not now be incorporated into public land use and transportation planning.

These implications must be used with great care in the making of Federal policy toward support of local initiatives in urban development and transit improvement. The Federal government already places many requirements on local authorities seeking financial aid for such initiatives; this study's results should not be interpreted simply as a call for more difficult, slow and costly analyses prior to a Federal commitment. There are other ways to encourage the needed attention to land use impact. For example, the recommended transit station site analyses can be done in stages as projects are planned and implemented, beginning with a screening of general locations and a review of other factors such as local policy during initial alternatives analyses. More precise site selection studies and initial local policy coordination could be made during preliminary engineering, after an initial Federal commitment. Demonstration of previously-promised progress in local land use-transit policy coordination could be made a condition of initial and continued construction funding, based on periodic review. In this way the implications of this study could be implemented without unreasonable difficulty at the local level.

As years pass and the benefits of even such rudimentary coordination appear, further steps may become feasible. Mandatory arbitration of conflicting local policies, perhaps by ultimate appeal to the local electorate in the form of tradeoffs, is an example. Unified authority for all regional infrastructure is another, based on emerging experiences with experimental "Metro" levels of government in places such as Toronto. In comparison with such possibilities, the policy implications derived here for Federal consideration are mild and reasonable indeed. They are implementable now, and should help to realize significantly more of the land use impact potential of major rapid transit improvements.

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APPENDIX

- PERSONS CONTACTED IN STUDY OF RECENT TRANSIT IMPROVEMENTS
- PERSONS CONTACTED IN STUDY OF PRE-WORLD WAR II IMPACTS
- SPECIAL LIBRARY SEARCHES CONDUCTED

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