THE IMPACT OF OFFICE, RETAIL, AND INDUSTRIAL DEVELOPMENT ON NEIGHBORHOOD CHANGE:

Evaluating Development Alternatives for the Cambridgeport Industrial District

by

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Submitted to the Department of Urban Studies and Planning on May 27, 1981 in partial fulfillment of the requirements for the Degree of Master of City Planning

ABSTRACT

This study analyses the effect non-residential development has on the labor and housing markets in surrounding neighborhoods. By distinguishing who is likely to be employed in different types of development, and who is likely to want to live nearby, the impact of non-residential development on neighborhood stability can be predicted.

The client for this research was the Riverside-Cambridgeport Community Corporation (RCCC). RCCC operates a range of housing and economic development programs that are designed to promote neighborhood stability. In order to assure that the effect of new development on the existing residential neighborhoods of Riverside and Cambridgeport is not overstated, the estimates of labor and housing impacts have been made based on conservative assumptions and methodologies throughout the analysis.

Based on a detailed market study of the Cambirdgeport Industrial District, a 160 acre site bordering the Massachusetts Institute of Technology in the southeastern corner of Cambridge, two development scenarios are proposed. These scenarios are then evaluated in terms of their labor and housing market impacts on the adjoing neighborhoods of Riverside and Cambridgeport. The two scenarios, one which emphasizes office uses and the other which emphasizes industry, are also evaluated for their traffic and fiscal impacts.

The study predicts that new development would create between 150 and 250 jobs for residents of Riverside and Cambridgeport over the period from 1980 to 1990. Office development would create more jobs but the jobs in industry would pay better and would offer more stability and training for semiskilles and unskilled workers. The direct impact of development on housing prices (assuming no new construction) would add between $15 and $55 to the average households annual housing costs by 1990, with office development leading to greater price changes. The speculative effect of new development on housing prices is likely to be greater than this direct effect. Both scenarios would be likely to cause serious traffic congestion, but office development would have far worse effects than would industrial development.

Thesis Supervisor: Philip Herr

Title: Associate Professor of Urban Studies and Planning

Acknowledgements

Much of the original research that this report is based upon was supported by the Riverside-Cambridgeport Community Corporation and the Boston Neighborhood Network. I hope the basic methodology followed here will be useful to RCCC and other neighborhood groups who are confronted with major development proposals with the potential to effect the stability of their communities.

Several individuals have been particularly helpful with their guidance and constructive criticisms that kept me on track. Jeanne Myerson at RCCC helped to form the concept of what an impact assessment at the nieghborhood level would look like, and provided substantial input for the market analysis and employment impacts chapter. Professors William Wheaton and Tunney Lee helped work out the chapter on housing impacts.

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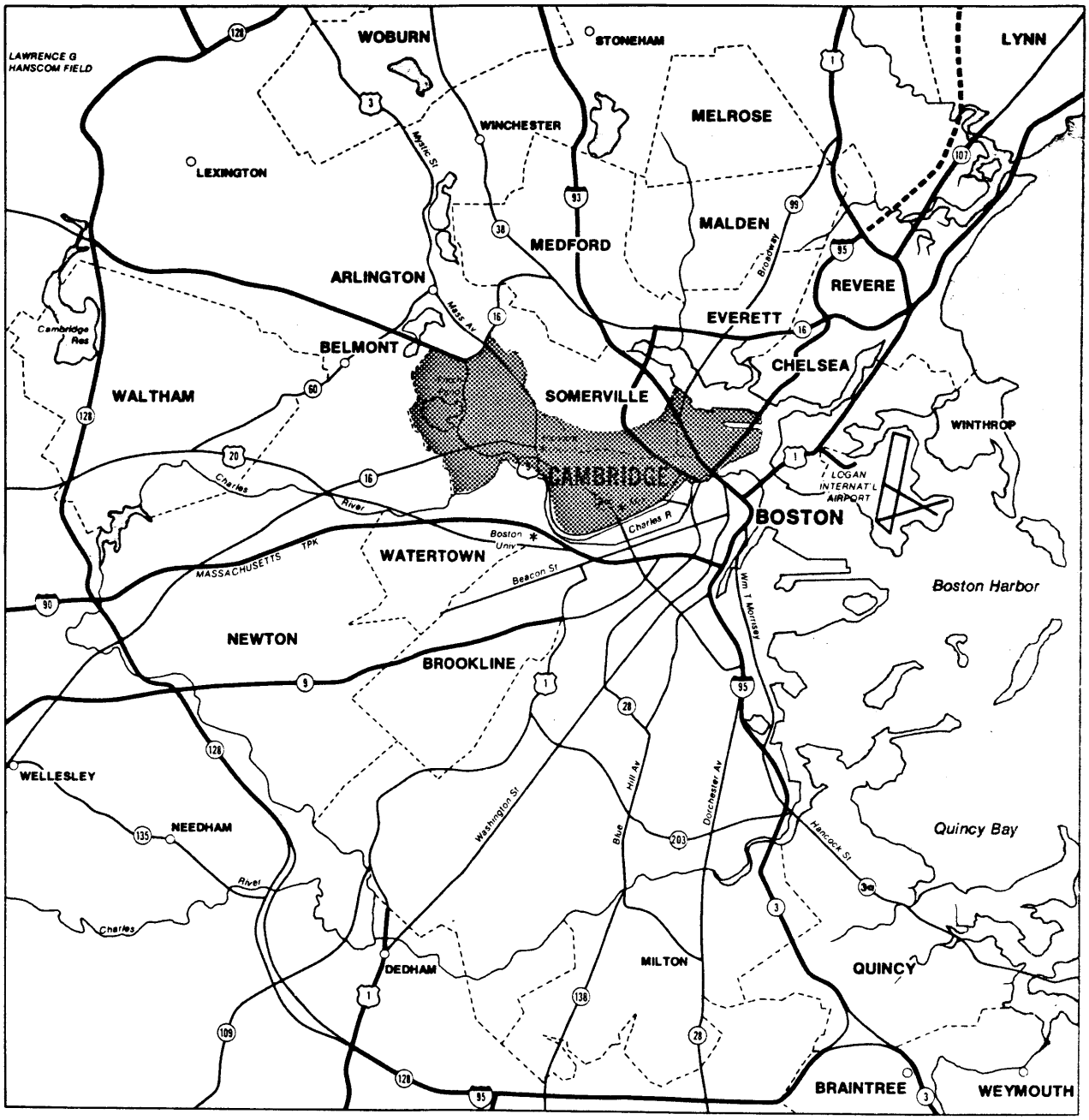
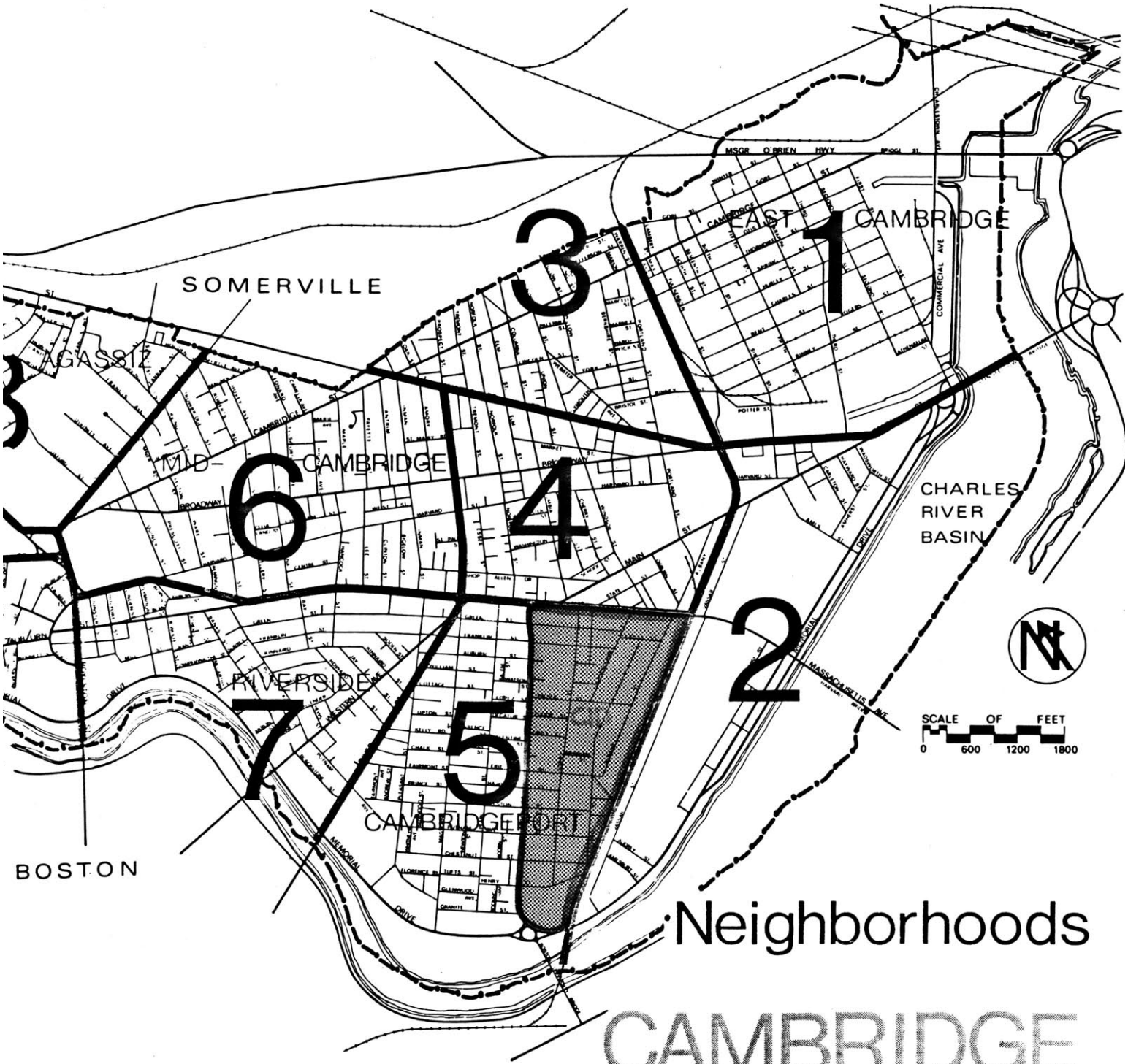
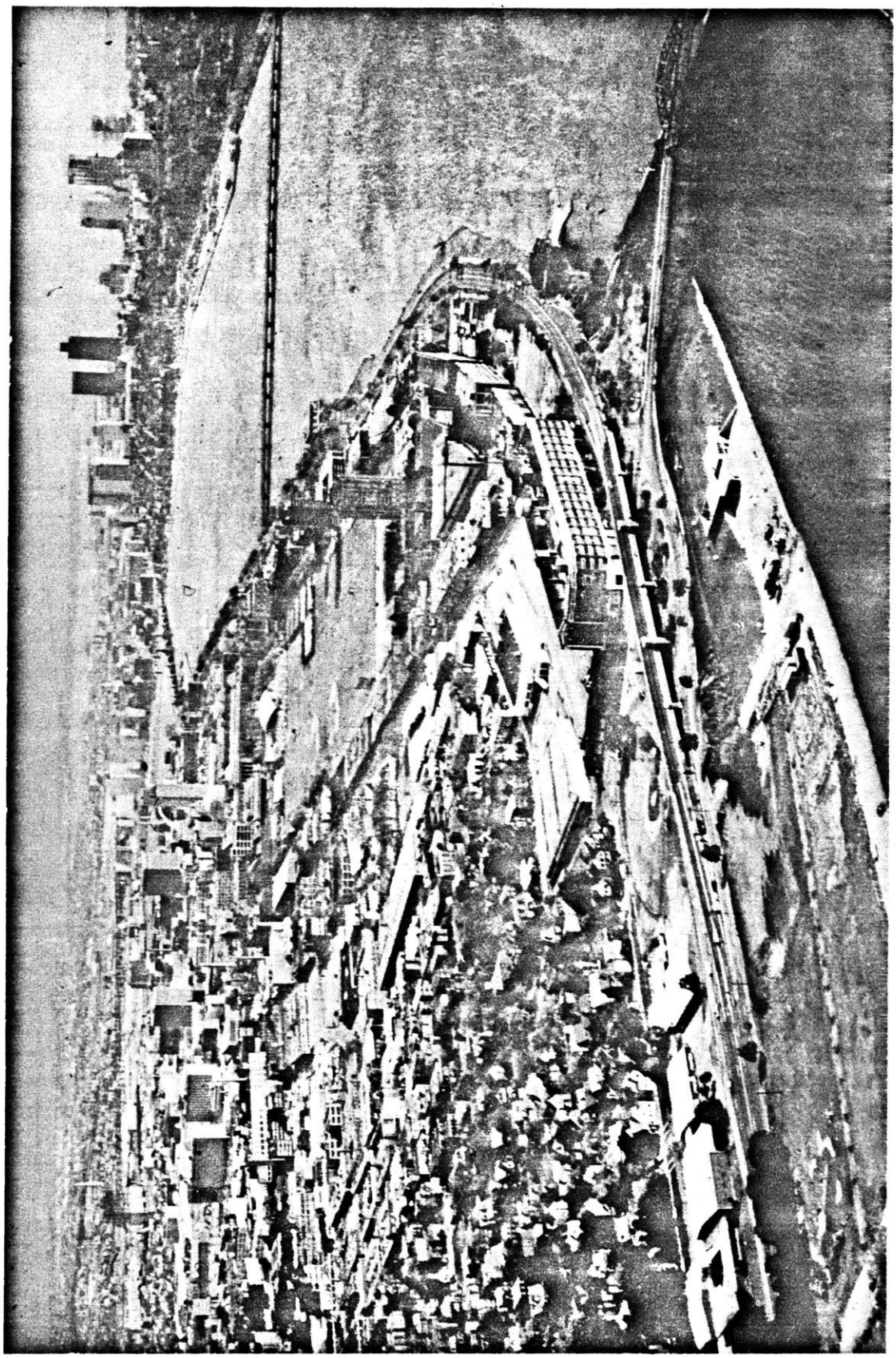




Neighborhoods

CAMBRIDGE

Community Development Department 1976



INTRODUCTION

With over two million square feet (47.5 acres) of land that could be developed for new uses, the Cambridgeport Industrial District (CID) holds enormous potential to affect both the residential neighborhoods which surround the district, and the city of Cambridge as a whole.[1] By 1990 new development in the CID could result in the creation of between two and three thousand jobs and lead to the demand for up to 240 housing units as a direct result of development. At such a large scale, new development will affect who lives in and around Riverside and Cambridgeport. Through the jobs new companies provide, and through the impact of additional income on prices and rentals, those households with low or unstable incomes could come under increased pressure to move. The issue of which development alternatives to favor in the Cambridgeport Industrial District ultimately comes down to a decision about who should live in the neighborhoods in and around the CID.

The population of Riverside and Cambridgeport has already changed greatly over the last thirty years. The population of the two neighborhoods combined has dropped by an estimated 20 percent since 1950, from 20,699 to 16,310.[2] This decline has occured even while the number of housing units has increased.[3] The decline is due primarily to the exodus of families and their replacement with students and single workers who are using more dwelling area. The drop in the percentage of the population living in families is most evident in Cambridgeport, since Riverside has always had

a smaller family population due to the influence of Harvard student housing.

Table #1: % of the Population Living in Families in Riverside and Cambridgeport

	1950	1960	1970	1980
Riverside	35.3%	55.9%	48.6%	NA *
Cambridgeport	91.0%	88.7%	75.6%	59.0%*
Cambridge	82.7%	75.9%	66.0%	NA

Source: 1970 U.S. Census of Population and Housing, and the Cambridge Community Development Department, Cambridgeport Industrial District Study, Technical Report #9, Housing in Cambridgeport.

*Estimated by the CCDD based on historical trends.

Riverside and Cambridgeport also contain large low income populations. In Riverside the median income in 1970 was $7,765, 12th lowest among the 13 neighborhoods of Cambridge.[4] In Cambridgeport the median income in the same year was $9,708, closer to the city average, but the neighborhood had a very large proportion of households earning below $5,000 (38.6% of the households as compared to 18% for the city as a whole).[5] The city estimates that in both neighborhoods the low income population has increased slightly (in percentage terms) over the last ten years.[6] A large proportion of low income households, and the apparent pressure on families to leave Riverside and Cambridgeport, means that the neighborhood is especially sensitive to external pressure such as that which could be created by new development in the Cambridgeport Industrial District.

The city of Cambridge explicitly recognized the shift in population

from working class families to younger, single professional and service workers as a concern in the first step of its comprehensive planning process begun in 1973.[7]

> In Cambridge, explicit population policy is negligable. Nevertheless a few policy positions are stated so often by a wide variety of public officials and private groups that they can be assumed to represent sentiments of a large portion of the population. First, extreme diversity of the city's population -- ethnically, socially, racially -- is deemed to be one of Cambridge's most unique and valuable qualities, one which contributes imensely to the city's vitality. Secondly, in recognition of the fact that this diversity is threatened by a variety of internal and external pressures, great emphasis has been placed on the need to preserve within the community the position of several specific population subgroups: the middle income family with children, and persons with low and moderate income, particularly the elderly....
>
> ...[V]arious groups are under pressure for various reasons. However, a few critical factors dominate in an individual's decision or ability to remain in Cambridge. An unemployed blue collar worker MUST find work, and he will eventually move elsewhere if he cannot find a job here. A welfare family faced with an intolerable rent increase MUST find housing somewhere. A middle income family with two or three children MUST find more space than is provided in a two-bedroom apartment. The city's resources and effort should be concentrated first and foremost on these critical factors which will determine who will or can remain in Cambridge.

Since 1971 the Riverside Cambridgeport Community Corporation has been promoting neighborhood stability through several housing and economic development programs. These programs have been in response rising housing costs and falling incomes which have left the community open to increased turnover as long term residents are forced to move elsewhere and are replaced by more transient populations. In keeping with its concern for the stability of its neighborhood, RCCC formed a working committee in the Fall of 1980 to consider what the organizations's objectives should be concerning future development in the Cambridgeport Industrial District. This committee of 25 neigh-

borhood residents and local business owners evaluated two rezoning petitions for the CID and formulated a separate statement regarding desired land uses and densities for the district. Both the need to encourage new development and the desire to maximize the compatibility of development with existing businesses and residents guided the committee. The position paper which came out of that effort was adopted by the RCCC Board of Directors and is summarized below.

Figure #2: RCCC Goals for the Development of the Cambridgeport Industrial District.

1) Maximize the development of affordable housing

   -Development should reduce pressure on the housing market
   -Development should provide homeownership and rental opportunities for low and moderate income residents
   -Development should be consistent with the scale and density of the neighborhood

2) Encourage employment opportunities

   -Maintain a diversified economic base which is more stable and supports a variety of job opportunities
   -Increase the number of job opportunities for current residents of Riverside and Cambridgeport, and for the remainder of the Cambridge population
   -Emphasis should be on increasing entry level job opportunities which provide for advancement through training, and which provide job security

3) Encourage the expansion of existing businesses in the CID

   -Retain existing employment
   -Support new job opportunities by facilitating the expansion of companies now in the district through ensuring the availability of space.

4) Improve traffic and transportation flows

   -Focus traffic flow away from residential areas

5) Protect the existing neighborhood

   -Concentrate dense development away from residential areas

In each of the chapters that follow, the effect development in the Cambridgeport Industrial District could have regarding RCCC's goals is examined. In the first chapter the market for different types of development is analyzed so that a realistic level and form of development can be evaluated. Chapter 2 examines the employment generated by different development scenarios in terms of the number of resident jobs that would be created, and in terms of the desirability of these jobs according to occupation, income, and career mobility. Chapter 3 analyses the effect nonresidential development could have on the demand for housing in Riverside and Cambridgeport, and the degree to which this demand would change housing costs given no net increase in housing supply. Chapters 4 and 5 contain brief estimates of the traffic and fiscal impacts of development.

The combined impact of office development versus industrial development is summarized in chapter six. Special attention is given to the neighborhood level impacts of these different types of development. The final chapter gives some brief recommendations for RCCC based on the type of development that appears to be most favorable for the two neighborhoods, and the housing and economic development policies that could mitigate some of the negative effects of nonresidential development in the Cambridgeport Industrial District.

References: Introduction

[1] Riverside/Cambridgeport Community Corporation, Survey of Developable Sites in the Cambridgeport Industrial District and the Riverfront Area (Cambridge, MA: RCCC, 1981), mimeo.

[2] U.S. Bureau fo the Census, Census of Population and Housing, 1980 - Public law 94-171 Counts (Washington: U.S. Government Printing Office, 1981).

[3] Cambridge Community Development Department, Cambridgeport Industrial District Study, Technical Report #9: Housing in Cambridgeport (Cambridge, MA: CCDD, 1980), p. 2.

[4] Cambridge Community Development Department, Riverside Neighborhood Profile (Cambridge, MA: CCDD, 1975), p. 8.

[5] CCDD, Cambridgeport Industrial District Study..., op. cit, p. 6.

[6] Ibid., p. 6.

[7] Cambridge Community Development Department, Comprehensive Planning for Cambridge, The City's People (Cambridge, MA: CCDD, 1974), pp. 11-12, 19.

MARKET ANALYSIS

Until the middle of the nineteenth century the Cambridgeport Industrial District was a marsh separating the higher, residential parts of Cambridgeport from the Charles River. Industry came to Cambridgeport when a rail link with Boston was built and the marshes were filled, creating millions of square feet of inexpensive sites to lure manufacturers from Boston. The companies that came to Cambridgeport located in the eastern half of the community, now known as the Cambridgeport Industrial District.

The location of a large industrial district next to an overwhelmingly residential neighborhood has meant that there has always been a tension between noncomplimentary land uses in Cambridgeport, but it has also meant the creation of a large number of job opportunities for local residents. Today, the balance between the economic benefits the CID provides to local residents and the land use conflicts it creates is at a major tipping point. Over the past fifteen years the Massachusetts Institute of Technology, located on the eastern edge of the CID, has aquired over 40% of the useable land area in the district, and has cleared much of the land in preparation for new development. The form this new development takes, the types of jobs it leads to, the demand for housing it creates, and the traffic it produces will all affect and alter the way in which businesses and residents interact. Ultimately, new commercial and industrial development will be a force in determining who lives in the surrounding residential areas.

As a first step in evaluating the effect different types of development in the Cambridgeport Industrial District would have on people now living in Riverside and Cambridgeport, this chapter analyses the market for office,

industrial, and retail development in the CID. With a better idea of the probability of different types of development, the range of alternatives dictated by the market are then evaluated in terms of the impact each would have on the Cambridgeport and Riverside neighborhoods.

Format for Analysis

The method used to analyze the market for development in the CID is based on an assessment of the share of regional growth that can be captured by Cambridgeport. Thus, the first section of this analysis focuses on recent and projected trends in the New England regional economy, while the second section covers the factors that influence a company's location once it has selected the general region where it wants to operate. The subsequents parts of the analysis detail how locational advantages and disadvantages apply to different sectors of development, namely retail, office, and industrial. Based on this analysis, the final section presents two alternative development scenarios for the Cambridgeport Industrial District, representing both the range and scale that the market is likely to bear, and providing concrete examples that can be evaluated for their effects on neighboring residential areas.

Recent and Projected Trends in the Regional Economy

The dominant two images of the New England economy since the end of WWII have been the abandonment of shoe and textile mills on the one hand and the rapid growth of many service and high technology manufacturing companies on the other. It is widely held that most employment growth will come from

a combination of durable manufacturing industries, producing capital goods for other businesses, and export-oriented service firms who sell insurance, medical and educational services, and technical research to the rest of the nation and the world.[2] What is not so widely recognized is the strength of the manufacturing sector in New England.

> ...Manufacturing increased its share of New England's employment between 1975 and 1979, reversing a downward trend that started at least as long ago as 1947. Looking ahead, it is quite possible that manufacturing will continue to grow as rapidly as the economy as a whole. The employment categories which have had the largest increase in the past have been services and retail trade. However, these areas will probably not continue to expand so rapidly in the future.... For example, the medical services area has increased its employment by over 200,000 since 1967; this has been by far the biggest factor in total services growth. But much of the growth over this period was an adjustment to the Medicare and Medicaid programs. Considering that the facilities for these programs are now largely in place and the the current drive is to contain overall medical costs, it is doubtful that medical services will continue to expand as rapidly as in the past.[3]

Of course, many service areas will contiue to expand rapidly, especially the so-called professional services, including engineering, accounting, programming, and other functions where demand is high.

The main reason for the resurgence of manufacturing in New England and the continued growth of some services is a common dependence on highly skilled labor, the region's one major competitive advantage. In the nineteenth century, the region relied on abundant water power, immigrant labor, and a supply of capital from Boston's merchants to build massive shoe and textile mills; today it is the universities and superior secondary schools that provide a relatively large pool of skilled labor which innovative companies in all sectors rely upon to maintain their position on the leading edge of new markets. Even those companies, such as the many electronics firms, that folded in the 1974-75 recession, are a source of skilled labor for companies in new and rapidly expanding markets.[4]

The ability of the region to sustain growth into the future will depend more on the continued availability of skilled labor than the market for any particular industry. With domestic and foreign competition, and vunerability to national business cycles (due to a concentration of capital goods industries which are more prone to curtailment in demand during a recession) some companies will close over time, but, so long as there is skilled labor in New England, new companies will be attracted to the region. The types of companies that rely on skilled labor are usuall involved in a new market where production processes of service networks are not yet well established and mass production is not yet feasible. Once industries reach a more mature stage they will tend to expand in areas where labor costs are lower and markets are closer in order to reduce total costs.[5]

The New England region also holds some disadvantages relative to other regions as a location for doing business.[6] First, the region is now relatively far from consumer markets concentrated in the mid-Atlantic, the southwest, and the west coast. This makes it more expensive to ship goods from the northeast, especially when the product has a low value-to-weight ratio. Secondly, energy costs have risen dramatically in New England due to dependence on imported oil (although the area now has more excess electrical genrating capacity than most other parts of the country). Finally, for producers of standardized products and services that require little labor skill, labor costs are lower in some other parts of the country, and especially in developing countries. These disadvantages mean that the manufacturing of consumer goods, both durable and nondurable, is not likely to return to the region in any large proportion in the forseable future.[7]

The projected growth rates for some of the industry groups expected to expand in Massachusetts over the next several years are shown in Table 3 below.

Table # 3: Selected Growth Industries in Massachusetts

Industry	Employment		
	Actual 1976	Projected 1985	% Change
Electronic Computing Equiptment	20,980	43,740	+108.5%
Optical & Medical Instruments	14,730	22,080	+ 49.9%
Electrical Machinery, NEC*	64,240	88,960	+ 38.5%
Hospitals	140,250	187,430	+ 33.6%
Engineering & Archt. Services	19,910	26,480	+ 33.0%
Commercial Reasearch & Devlpmnt.	4,680	6,050	+ 29.4%
Eating and Drinking Places	114,630	142,630	+ 24.2%
Banking	39,530	47,600	+ 20.4%

Source: Massachusetts Division of Employment Security, Job Market Research Employment Requirements by Occupation, by Industry 1976-1985. December, 1979.

*NEC refers to goods or services that are not classified elsewhere, in this case primarily electronic components.

Factors Influencing Intraregional Location

Once a company has decided to start up or to expand in a region a site still must be selected. There are at least five major influences on the site selection decision: the cost and availability of labor, the cost and availability of land, the location of the company's market -- coupled with the cost and availability of transportation, the quality of residnetial life in the community surrounding the site, and the political climate or attitude towards businesses.[8] The importance of each of these factors differs greatly between industries, and even for individual companies within an industry. However, for each industry, there are some common criteria.

For a manufacturer of printed circuits, the image a site has may not be particularly important, and attention will focus on lowering costs by finding less expensive land and areas where there is an available labor pool.

Before analyzing the market for different broad sectors of development, the following section evaluates the performance of the Cambridgeport Industrial District in each of the five factors influencing site location.

Advantages and Disadvantages of The Cambridgeport Industrial District as a Site for New and Expanding Companies

A central constraint on development is the cost and availability of property. A recent RCCC survey of the Cambridgeport Industrial District identified 47.5 acres of property that could be developed in the next ten years. Current land prices average about $\$7/ft^2$ and range from \$5 to \$12 per ft^2.

Table #4 : Underutilized Property by Current Land Use

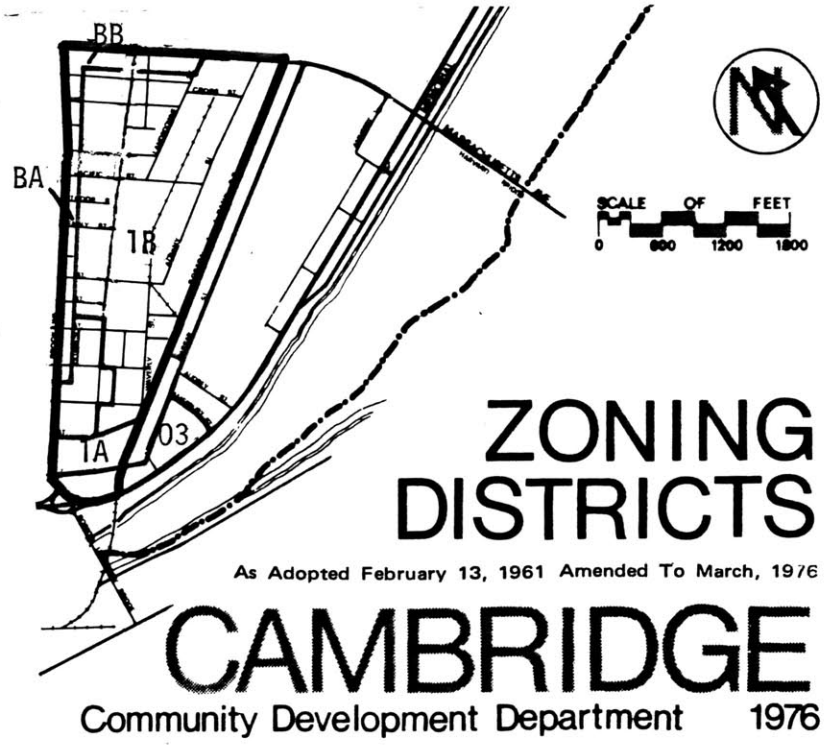
Use	Acres	% Total
Parking	16.5	34.9
Vacant Land	15.5	32.7
Underused Buildings	6.6	12.7
Vacant Buildings	5.0	10.5
Buildings Being Rehabilitated	3.9	8.2
Total	47.5	100

Source: RCCC Land Use Survey of the Cambridgeport Industrial District and the riverfront area. February, 1981.

Another key constraint on development is the zoning in the CID. Current zoning is shown below (note that two petitions have been filed with the Cambridge City Council to rezone the CID; both petitions call for lower density and lower heights). As it now stands, the zoning allows a wide range of industrial, office, and commercial uses at a very high density.

CAMBRIDGE ZONING SUMMARY

		FAR	Max Height
BA	Business Retail; office, multi-family res.	1.	35
O3	Offices Also multi-family res.	3.	none
BB	Business General; offices, multi-family res.	4.	none
IA	Industry Light; warehouses, retail bus., offices	2.	none
IB	Industry Light and heavy; retail bus., offices	4.	none



The second major influence on site selection is the cost and availability of labor. Between 1970 and 1980 Cambridge's population declined from 100,361 to 95,322.[9] At the same time, however, labor force participation rates have been rising so that the city's workforce has probably remained stable in terms of its size. The most recent occupational breakdown for the city was done in a 1975 citywide census.

Table #5: Distribution of Cambridge Workers Among Occupational Groups

	% 1975 State Survey
Professional	31.6
White Collar	34.8
Skilled	16.3
Semi-skilled	17.5
Unskilled	1.0
Blue Collar & Service	33.5
Skilled	7.7
Semi-skilled	14.3
Unskilled	11.5

Source: Beatrice, Ellen E. Cambridge Mid-decade Census/Household Survey 1975. City of Cambridge, 1976.

In 1978 the average wage in Cambridge was $14,483 compared with an average of $13,128 for the Bostob SMSA.[10] The unemployment rate for Cambridge tends to stay slightly above the figure for the Boston SMSA, in 1979 the rate was 6.0% in Cambridge and 5.3% in the Boston SMSA.[11] What these figures indicate is that Cambridge has a balanced workforce that could be attractive to a wide range of companies. Since the city contains both a large number of highly skilled professional workers, and a relatively (to many suburban communities) large low income population, its ability to draw a wide range of service and industrial development is enhanced.

For some firms the most important locational criterion is proximity to the market. Retail establishments, in particular, must locate close to where their customers live or work in order to assure sales. Some manufacturing companies which produce very heavy products, or perishable products, must also locate close to their ultimate consumers. In this sense, Cambridge, and Cambridgeport in particular, are ideally located in the middle of the Boston metropolitan area, with both good highway and public transit linkages to all other part of the city. Many of the companies now in the Cambridgeport Industrial District list location as one of its major advantages.[12]

For many companies, however, site selection depends on the public image a community holds, an image that is made up of a series of physical, political, and economic factors. Physical factors include the maintenance of streets, other buildings, and open land, along with the appearance of neighborhoods surrounding a site. Each community also holds a set political image for the developer in terms of the predictability and willingness of

local government to encourage new businesses. Often this takes the form keeping permit and regulatory processes to a minimum. For larger companies, it may mean willingness to grant land cost writedowns, or to make tax exempt revenue bonds available.[13]

Another major determinant of the image a community holds for an executive choosing a site is the desirability of the area as a place to live in.[14] In small companies especially, the owner or chief executive may base site selection on where he or she wants to live if all other factors are equal.

Finally, the types of companies neighboring a site will set the form for future development. In Cambridgeport, the decision of American Science and Engineering to locate in the middle of the CID and to substantially rennovate the building they will locate in, changes the image that area holds for private developers and individual companies.[15] Other research oriented companies may now be more willing to locate in that part of the district.

In the past the image Cambridge has held for businesses has not been particularly favorable. This has been due primarily to the unpredictability and agressiveness of land use policy under the city council. Physically, the parts of the city which have been dominated by industry are not generally well maintained either in terms of private property or public. In the Cambridgeport Industrial District, MIT has demolished many older structures that might have been rehabilitated, while conducting minimal maintainace on the vacant land it created. Apparantly, the university has been able to take a casual approach to the marketing of land in the district due to a lack of pressure on its endowment. Now that much of the property has lain idle for fifteen years the university is starting to prepare a comprehensive

marketing strategy and will presumably increase the level of maintainance for its holdings.[16]

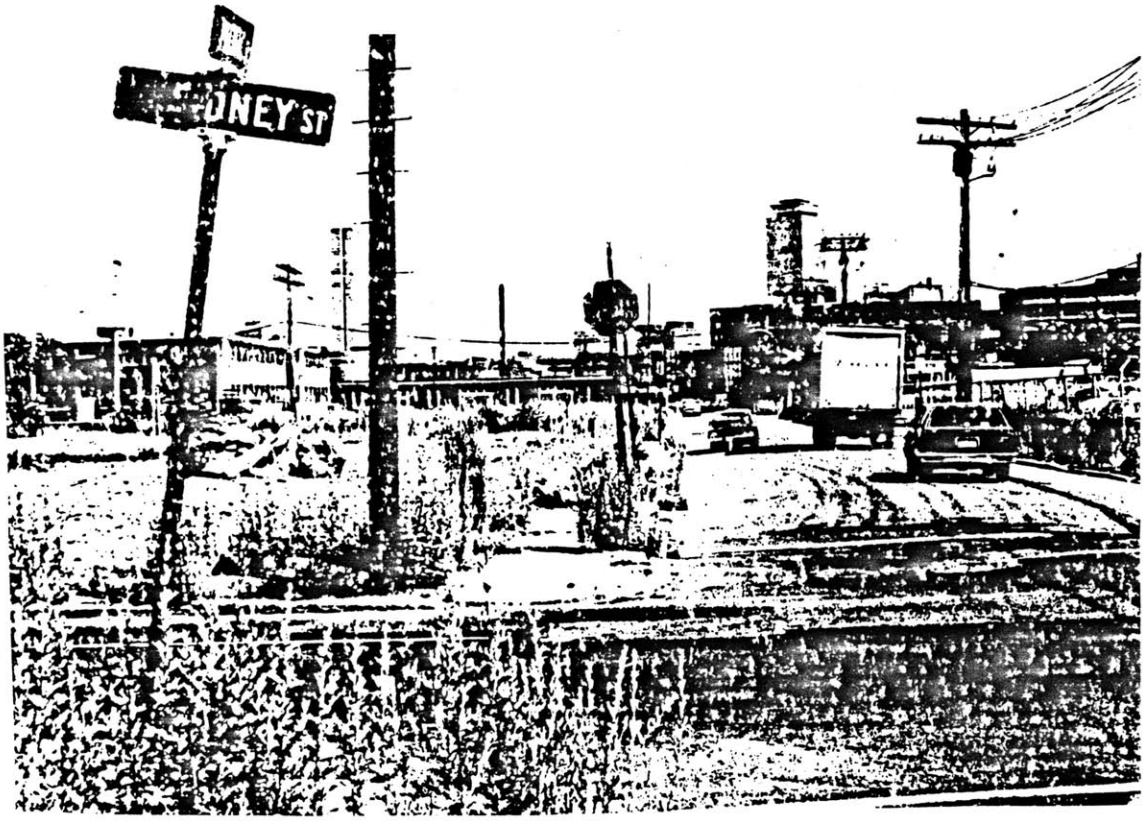


Photo: Credit of Cambridge Community Development Department

The city's primary advantage in terms of its public image is its attractiveness as a place to live. The housing market throughout the Boston area has been extremely tight for the past ten years, and the market in Cambridge is one of the tightest with a vacancy rate of below three percent.[17] For companies trying to attract skilled professionals, a Cambridge location is often an advantage, and the Cambridgeport area benefits from this attraction.

The Market for Retail Development

In the abscence of a formal market study no definite projections can be made of the demand for retail space in the Cambridgeport Industrial District. There are, however, several indirect indications that the market for new stores and restaurants is not strong.

The most important indication of weakness in the retail market is an absolute decline in the population of Cambridgeport and other neighborhoods surrounding the Cambridgeport Industrial District between 1970 and 1980.[18] Cambridgeport lost 500 residents over the ten year period while neighborhood 4, to the north of the CID lost 900 people. At the same time the city of Cambridge lost close to 5,000 people. Taken together, this loss of population represents a decline in the purchasing power of the primary market for most retail establishments (incomes have risen only slightly during the same period in real terms according to city estimates).[19]

Any retail expansion would be most likely to develop as an extension of the Central Square business district along Massachusetts Avenue. In fact, over the past year two storefronts have been substantially rennovated and new businesses have moved in along the section of Mass. Ave. bordering the CID. But Central Square has suffered from a declining sales volume (in real dollars between 1967 and 1977) as specialty stores (i.e. apparel, furniture, hardware, etc.) have been replaced by convience stores.[20] Convience stores are especially dependent on local residents as a market and so are even more vunerable to population changes than specialty stores with a larger market area.

The one form in which there might be significant potential for retail

expansion would be in conjunction with residential and office development that would bring in additional purchasing power to the area. Retail development might also be marketed in conjunction with hotel development as has been tentatively proposed along Mass. Ave.

Corner of Mass. Ave. and Albany Street

The Market for Hotel Development

The market for additional hotel development in the Boston area is very strong. A recent study by the Boston Redevelopment Authority outlines the extent to which there is pent up demand for more hotel rooms.[21]

> The analysis and projections of demand presented in later chapters of this report suggest the need for approximatly 1,000 new hotel rooms a year for the next twelve years. This is made up of the present deficit of 1,830 rooms, the need to replace 1,125 rooms, and the projected increase in demand for 8,257 rooms, including 2,969 rooms for predominantly

business visitor use, 2,138 rooms for tourist use, and 3,150 rooms for convention delegate use.

The projected need for 1,000 rooms per years is on top of a current level of 7,000 hotel rooms in Boston.[22]

The market for hotel expansion in Cambridge is different from the Boston market, but several recently constructed hotels including the Hyatt Regency on the edge of the Cambridgeport Industrial District, have served the Boston market. Design proposals for the East Cambridge riverfront revitalization district include hotel development indicating that Cambridge is expected to capture some of the demand for hotel space generated in Boston.[23] And, in addition to the need created in Boston, MIT has also indicated that it would like to have a hotel constructed close to its campus to serve visitors to the university and its research facilities.

The Market for Office Development

At the metropolitan level the market for office development is experiencing a major expansion as the result of the need to replace older buildings and as a direct result of the major expansion of service industries such as banks and insurance companies in the region. This boom can be seen clearly in Cambridge where 980,000 square feet of first class office space is expected to be completed by 1982, from a current base of 1,789,433 square feet (an expansion of 55% in two years).[24] In comparison, the first class office market in Boston, which is considered to be very strong itself, is expanding by 19% over the same period.[25] Rents for office space are expected to reach and surpass the $20 per square foot level for the first time in Cambridge over the next year, bringing top rents up to the level for first class rehab space in Boston's downtown market.[26] It is

also notable that the two office buildings which will be the next to come on the market (one in late 1981 and one in the spring of 1982) are already 71% leased.[27] Clearly, developers feel that for at least the next several years there is a very strong market for first class office space in Cambridge. Table four shows the growth rate in the Boston, Cambridge, and suburban first class office markets.

Table # 6: Growth in First Class Office Space

Area	Ft^2 Existing (000,000)	Ft^2 To Open 1981 (000,000)	Ft^2 To Open 1982 (000,000)
Boston	17	1.3	1.1
(%)		+8%	+6%
Cambridge	2	0.4	0.6
(%)		+22%	+27%
Suburban	9	1.9	1.4
(%)		+22%	+13%

Source: Spaulding and Slye Corporation, The Spaulding and Slye Report. January, 1981.

First class office space is only one submarket of the total market for new office development. Developers active in the Cambridge market feel that the strongest demand for additional office space is in the area of technical offices.[28] In fact, there is some concern that the first class office submarket is being overbuilt,and that resources should be concentrated on less expensive office space for the many new and expanding technically-oriented companies which Cambridge spawns. With the high rate at which new companies are formed in Cambridge, the long term demand for second class offices may have better long term prospects than the first class submarket where the current expansion is based on a replacement cycle.[29]

In the Cambridgeport Industrial District the physical appearance of

the current mix of companies favors office development that is less sensitive to the public image of its location. There are two exceptions to this generalization. First, the Ford Assembly plant at the southern edge of the district and next to the Charles River, is a desirable site due both to its riverfront location and the ease of access it enjoys to Boston and the Massachusetts Turnpike. The second exception is along Massachusetts Avenue, where first class offices could be marketed (judging from the construction of first class space along Main Street and further along Mass. Ave. towards Harvard Square).

The cost of land in the CID is one of the five major factors influencing a company's site selection, as set out in the beginning of this chapter. Land costs in the district range from a low of approximatly $5.00 per square foot in the center of the zone to a high of $10.00 to $12.00 per square foot along Massachusetts Avenue.[30] Several months ago the Community Development Department in Cambridge analyzed the rent levels that would be required given land costs in the CID.[31] This analysis assumed an FAR (floor to area ratio) of up to 2.0, long term land rents of @$1.00/ft^2, and interest rates of between 13 and 15%. The range of rents that would folow from these assumptions is compared to rents in other parts of the metropolitan area below.

Table #7 : Comparison of CID Office Rents With Competing Locations

Area	Rent per Ft^2
New Development in the CID	$16.80-23.20
Existing Prime Space in Central Square	$13.00 (mean)
Existing Prime Space in Harvard Square	$18.00 (mean)
Projected New Development in Downtown Boston	$25.00 (mean)

Source: Cambridge Community Development Department Cambridgeport Industrial District Study Technical Report #6: Economic Development in the Cambridgeport Industrial District, December, 1980.

The construction cost assumptions included in this exercise are for relatively high quality office space (between $55.00 and $65.00 per sqare foot for construction costs not including site preparation) and the cost of building technical office space of a lower density would be between $10.00 and $15.00 less per square foot -- resulting in rents ranging from $13.00 to $20.00.[32] Nevertheless, given high land costs, market rate office rents are no cheaper than in competing locations in Cambridge and Boston, and large scale office development would have to depend on other advantages such as the proximity of MIT, the desirability of Cambridge for professional workers, and the superior access of the CID to regional highway and public transit networks.

The Market for Industrial Development

Of all the types of development considered in this chapter, industry is least tied to any one location by the need be close to customers. Not all industry is "footloose" but those companies that are tied to an area are usually bound by the desire to lower labor and other input costs. With cost reduction the primary goal, land and labor costs become much more important in site selection, and the appearance of a site and the quality of life in the surrounding community become less important.

A study by the Urban Land Institute of intrametropolitan industrial location, identified 14 factors that were important in determining site selection for companies that located in the inner part of the metropolitan area.[33] The five criteria that were the most important were: a high

proportion of skilled employees, willingness to share space with non-manufacturing activities, an intensive employee to building use ratio, a high building to site area ratio, willingness to locate in older buildings, and a low ratio of parking spaces needed per employee. The industries that met these criteria were: printing, furniture, machinery, apparel, transportation equipment, and electrical machinery (instrumentation was included with electrical machinery).

Although low property costs were not included as a determinant of location in this study, most of the criteria that stand out revolve around the ability of the industry to minimize land costs by using older space more intensively. Unfortunately, many of the older manufacturing buildings in the Cambridgeport Industrial District have been demolished over the last fifteen years, removing a major resource for industrial development. Some space remains that could be rehabilitated for new companies, and, in fact, several hundred thousand sqare feet of industrial loft space is currently being rehabilitated. However, once this area is brought back into use new development will have to rely on new construction.

The Cambridge Community Development Department analyzed the rents that would be needed to support new industrial development at the same time it conducted its study of office rents.[34] The major assumptions used in the calculation of industrial rents were: long term land rents of $1.60 to $2.40 per square foot, construction costs of between $25.00 and $30.00, and interest rates of 13 to 15%. The rents that would be needed to achieve a proper return on this development are compared with rents in other industrial locations in table .

Table # 8: Comparison of CID Industrial Rents to Competing Locations

Area	Rent per Ft^2
New Development in the CID	$6.20 - $8.80
Existing Building in the CID	$2.40 (mean)
Existing Building in Alewife	$3.00 (mean)
New Development along Route 128	$5.50 (mean)
Existing Building in EDIC Property -- Boston	$2.00 (mean)

Source: Cambridge Community Development Department Cambridgeport Industrial District Study Technical Report # 6: Economic Development in the Cambridgeport Industrial District, December, 1980. And the Economic Development and Industrial Corporation of Boston, mimeos, November, 1980.

At these rents, new development in the CID will again have to rely on other advantages, such as the availability of skilled labor, to encourage companies to build and expand. One mitigating factor is the probable availability of industrial revenue bonds for many companies building in the CID. These tax exempt bonds allow banks to finance construction at interest rates between 60 and 75% of the prime and would result in market rents of between $5.20 and $7.80 per square foot.[35] Lower construction costs, or the provision of subsidized parking would lower rents, but lower construction costs could only be achieved through less intense or lower quality development that would be less attractive to most companies, and the city is unlikely to subsidize parking (federal programs have also been curtailed).

The higher cost of land in the CID is an obstacle to new industrial development, but this obstacle is offset by the availability of space. Other than several sites in Boston, and in North Cambridge, the Cambridgeport Industrial District is one of the few areas in the inner belt of cities

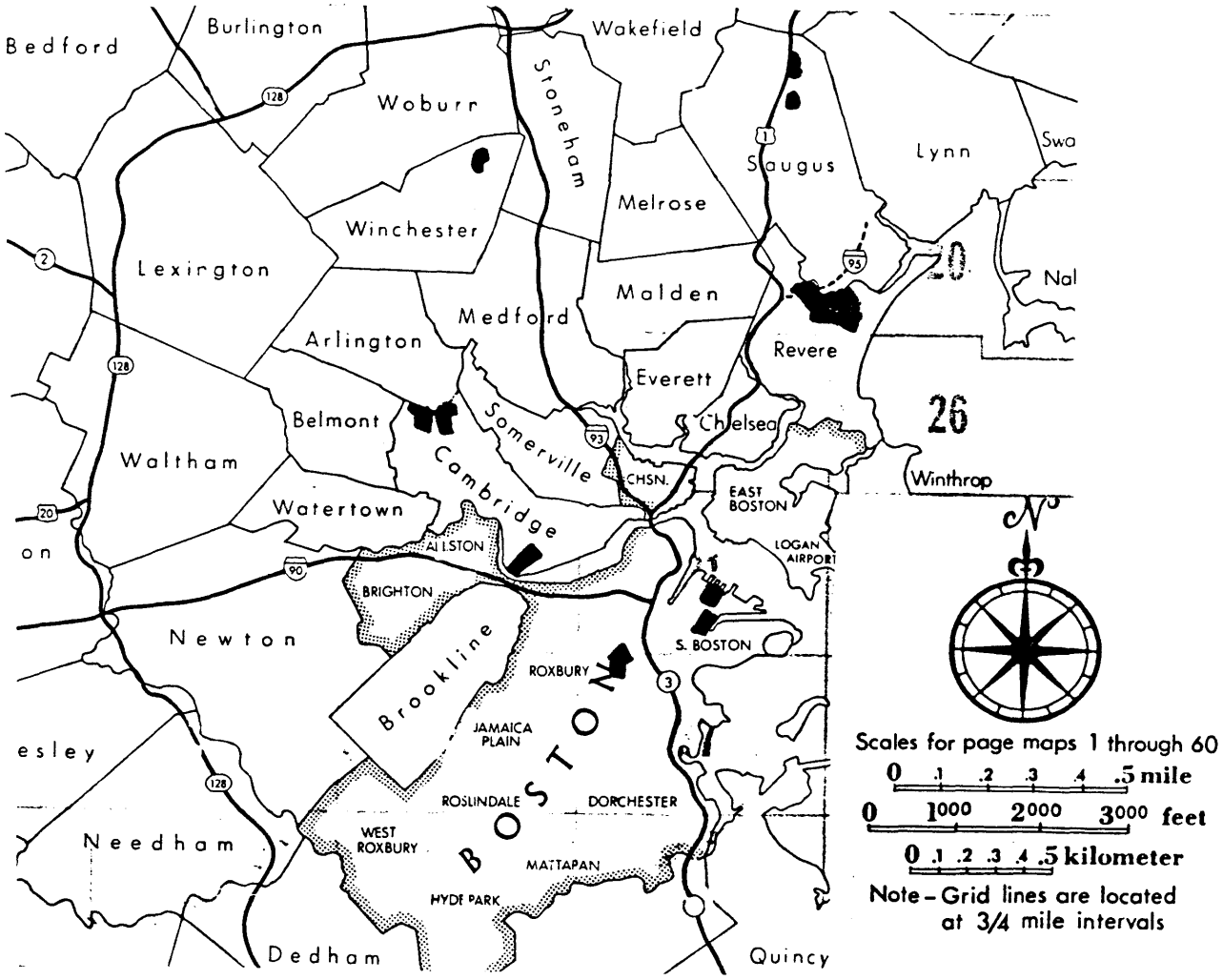
surrounding Boston where there is a large amount of land zoned for industry. The only other inner ring city with a major industrial site is Revere.

Table #9 : Industrial Sites in the Inner Boston Metropolitan Area

City	# Sites	Total Acreage
Boston	3	75
Cambridge	4	125
Revere	1	450

Source: Metropolitan Area Planning Council Industrial Site Survey: An Inventory of Commercial and Industrial Land of 25 Acres or More November, 1980.

Table #10: Industrial Sites of 25 or More Acres Within Route 128



Finally, high land costs in the CID will also be offset by the higher proportion of professionals and other skilled labor living in Cambridge. Thirty two percent of the Cambridge residents in the workforce are classified as professionals, compared with nineteen percent in the Boston SMSA.[36] Harvard and MIT supply many of these workers and, by providing the opportunity for commercial applications of research, serve as a draw to technically oriented industry.

Summary and Conclusions

Due to high land costs most forms of new development in the Cambridgeport Industrial District will rely on the availability of labor and Cambridge's attraction as a place to live in order to successfully market the area. Given the current physical appearance of the CID, office and hotel development will have to overcome the negative image the district holds for many developers. The key points from which the districts' image could work to bring about a change in the market are the riverfront, Massachusetts Avenue, and the proximity of MIT. Major retail development is unlikely unless it is done in conjunction with other development that increases the size of the market for stores and restaurants.

The current mix of companies and the appearance of the CID favor industrial or technical office development since these forms are less sensitive to image problems. However, the district is likely to appeal primarily to companies that are willing to pay somewhat higher rents in return for an in-town location or proximity to the universities. Industry which has no compelling need of specialized labor, and which is not tied to any particular location in the metropolitan area is more likely to chose a site in the suburban ring between routes 128 and 495.

The following projections of potential demand for space in the Cambridgeport Industrial district are based on the share of regional employment growth that the district has been able to capture in the past. Where new development differs significantly from existing uses in the CID, the share of growth that the CID captures was based on the strength of the market as detailed in the preceeding sections (primarily for hotel development). The projections of state employment are based on DES projections through 1985 and an application of annual percentage increases in the 1979-1985 period to estimate growth from 1985 to 1990.[37] DES employment figures are used throughout the exercise in order to maintain consistency in reporting proceedures.

Table #11: Projected Demand for Space in the Cambridgeport Industrial District

Sector	Total Demand in the Period From 1979-1990, Ft^2	
	Low	High
Durable Manufacturing	71,000	435,000
Nondurable Manufacturing	3,000	38,000
Wholesale	5,000	57,000
Retail	18,000	80,000
Business Services	43,000	261,000
Education	0	106,000
Hotels	0	320,000
Total	140,000	1,298,000

See technical appendix # 1 for methodology and definitions of the industries included in each sector.

These projection are net estimates of growth, they include expected closings in the industries included. This growth compares to the following approximate floor area by use for the Cambridgeport Industrial District which can also be considered as the baseline for these projections.

Table #12 : Current Floor Area of Existing Uses in the CID.

Sector	Current Floor Area (ft^2)
Durable Manufacturing	450,000
Nondurable Manufacturing	520,000
Wholesale	20,000
Retail	18,000
Services	180,000
Education/other Institutions	200,000

Source: RCCC Survey of Land Use in the Cambridgeport Industrial District and the Riverfront Area, 1981.

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CHAPTER 2

EMPLOYMENT IMPACTS OF DEVELOPMENT IN THE CAMBRIDGEPORT INDUSTRIAL DISTRICT

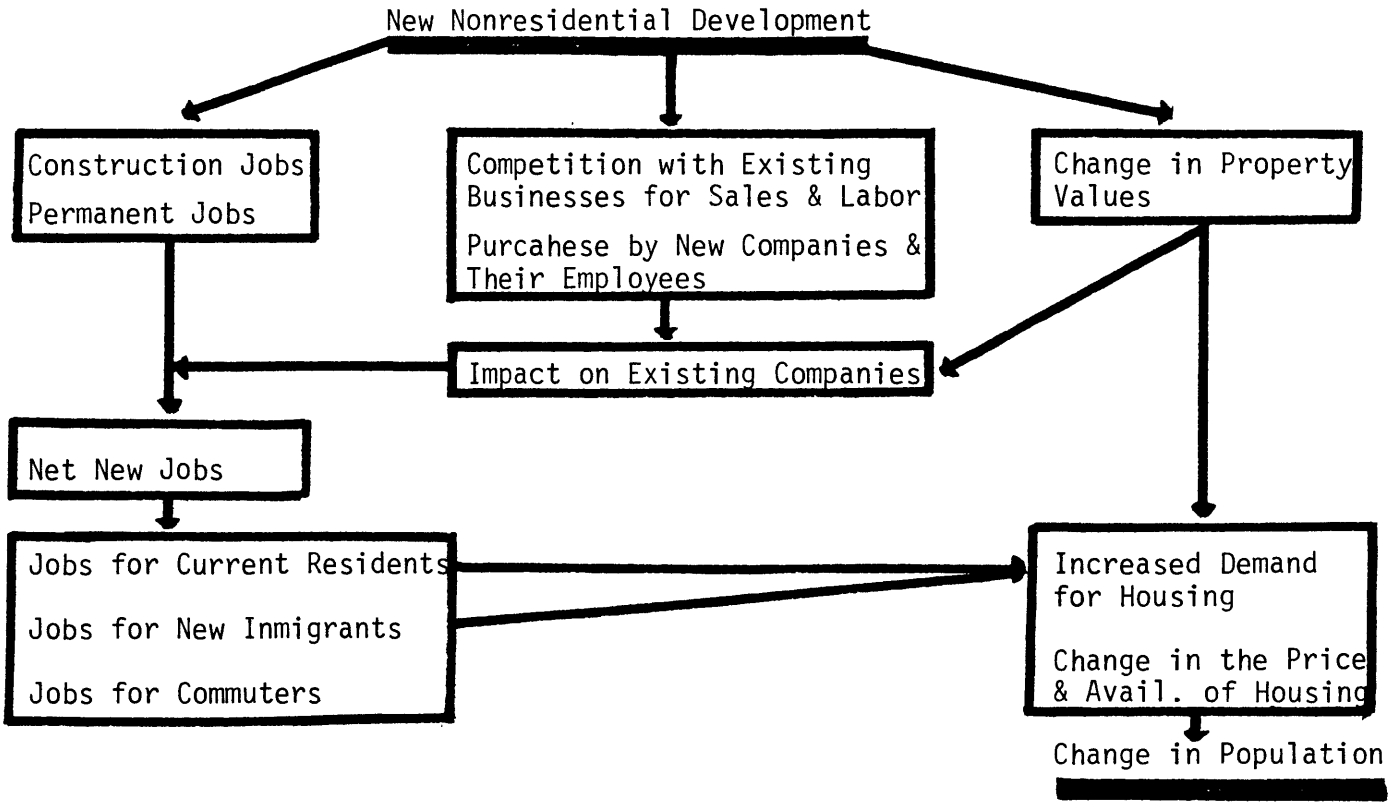
The foundation of any community is the income that supports the housing, clothing, food, and other basic needs of the population. When the flow of income into a community is increased the expenditures of people living in the community can be increased and/or more people can be supported in a given area. The purpose of this chapter is to explore the extent to which different types of development would increase the flow of income into the Riverside and Cambridgeport neighborhoods of Cambridge, and to identify to whom the income would go.

Income from new nonresidential development will go to three distinct groups: currents residents of Riverside and Cambridgeport, new residents who are attracted to the area by job opportunities, and commuters who work in Cambridgeport, but live elsewhere. Given RCCC's concern over neighborhood stability, the balance between the share of income going to each of these three groups is critical. If most new wage income is captured by commuters, little new income will flow to the Riverside-Cambridgeport neighborhoods, and development will have little direct effect other than the traffic generated by commuters. On the other hand, if many of the new jobs created are taken by people who now live in Riverside and Cambridgeport, development will have substantial positive benefits for those with access to the jobs. The income earned by workers employed in new businesses in the Cambridgeport Industrial District will also support additional retail and service employment through the purchases workers are enabled to afford. Thus, through the expenditure of workers, the initial increase in wage income will be multiplied through each new transaction made. To the extent that the new jobs go to commuters, and the purchases

of resident workers are made outside of Riverside and Cambridgeport, the new income will "leak" out of the community. If the leakage in a community is small, an initial increase in wage income can be multiplied several times over so that the final impact on the community is substantially greater than it would seem on the surface.

Who new income goes to is also important since it can change the relative wealth of different demographic groups in a community. In Riverside and Cambridgeport, where the proportion of the population living in families has declined dramatically, a substantial inflow of income could either speed the decline by raising the income of nonfamily households, or it could slow the decline by giving family households new and higher paying jobs with which they could withstand rapidly escalating housing prices. The main elements and linkages of the model used to analyze these possibilities are summarized below.

Figure #13: Income Flows Resulting From Nonresidential Development



The market analysis in Chapter 1 identified the potential demand for development in the Cambridgeport Industrial District for seven broad sectors (see P. 21). The degree to which the potential for development in each sector will be met is interdependant with the amount of development that occurs in each other sector. For instance, large scale office development in the service sector will support hotel and retail development since these uses are better able to support high land costs than industrial development. On the other hand, large scale industrial development would tend to discourage higher class office and hotel uses since these depend heavily on a 'clean' image in marketing their services (and presumably industry does not generally have a 'clean' image).

On the basis of an assessment of the types of development that would be complimentary, and the uses that are likely on particular sites (such as a mixture of retail and office development in the Ford Assembly building), two scenarios of potential future development in the Cambridgeport Industrial District through the year 1990 are proposed below.

Figure #14 Development Scenarios for the Cambridgeport Industrial District

Scenario #1: Light Industrial Development

Sector	Ft^2 of Floor Area	% of Total Developed
Industry	483,500	66.3
Office	124,000	17.0
Wholesale	57,500	7.9
Retail	40,000	5.5
Educational	25,000	3.4
Total	730,000	100.0

Scenario #2: Office and Commercial Development

Sector	Ft^2 of Floor Area	% of Total Development
Office	320,000	37.9
Hotel	175,000	20.7
Industry	153,000	18.1
Educational	106,500	12.6
Retail	85,000	10.1
Wholesale	5,000	0.6
Total	844,500	100.0

For both of these scenarios the total amount of square feet built falls well within the range suggested in the market analysis (up to 1,300,000 Ft^2) and well below the total amount of land area available for development (2,100,000 Ft^2).[1]

The purpose of these scenarios is not to suggest what will or should happen in the CID, rather, they form two possible outcomes at opposite ends of the spectrum of likely development based on the market analysis in Chapter 1. Neither scenario includes new housing development so that the effects of nonresidential development can be isolated and evaluated.

Methodology, Limitations, and Assumptions

The methodology for predicting the employment and income generated by different types of development is based on state data sources that report the occupational breakdown of each two digit SIC, and federal data that reports the average payroll for each industry by counties.[2, 3] Since each scenario is an aggregation of projections by two digit SICs, this data allows an estimation of the employment generated by occupation as well as the payroll and average wage under each scenario. Data also exists reporting the percentage of part time employment (of total employment) in each industry, so that the proportion of new jobs that will be part time can also be predicted.

Once the direct employment created by new development has been estimated the next step is to calculate the effect of new development on existing businesses and their employment. Positive effects include the purchases new businesses and their employees make from companies now in Cambridge, and potential increases in property values that increases the wealth of those companies which own their own property. Negative effects include competition for sales and labor which increases the cost of doing business (labor) or decreases revenues (sales). If property values are increased, rents may also be increased for companies which do not own their own property. Taken together, the effect these impacts have on employment in companies already in Cambridge is added to the direct employment created by new development to arrive at an estimate of net employment creation.

The final, and most difficult step in estimating the employment impacts of new development is to determine who the new jobs are most likely to be held by. Previous surveys of employers in Cambridge give figures for the percentage of the workforce in each industry sector living in the city and these are used to estimate the number of jobs going to city residents.[4] More difficult, is the estimation of the number of jobs for Cambridge residents that will be held by residents of Riverside and Cambridgeport. Here, the only data source is a recent manpower survey conducted in Cambridgeport that asked how many workers worked within walking distance of their homes. The only other basis for estimating the share of jobs at such a small geographic level is to use a weighted share based on the proportion of the city workforce that resides in Riverside and Cambridgeprot (weighted because the proportion of employees living in Riverside and Cambridgeport is assumed to be larger than the neighborhoods share of the workforce since the neighborhoods are close to the CID).

Among the assumptions inherent in this approach are that state and county data for occupational distributions and wages, respectively, will apply to new development in the CID, that new business and their employees will purchase a set amount of their expenditures in Cambridge (25%), that new office development will increase property values more than industrial development would, and that the residency patterns of workers in the new jobs will follow past patterns. Other assumptions are made explicit in the technical appendix which describes the methodology in more detail.

Given the assumptions needed to carry out this analysis, and the small numbers involved, the potential for error is great. Conclusions will vary substantially depending on the assumptions upon which the analysis is based. For this reason, the following pages point out where conclusions are especially sensitive to changes in basic assumptions and refer the reader to the technical appendix where detailed examination of methodology is warranted.

Direct Employment Impacts

The following table lays out the direct employment impacts of new development in the CID. Impacts on existing companies are not included. Part time employment is included in the occupational breakdowns, while construction jobs are not. For definitions of occupational groupings see technical appendix #2.

Figure #15:Direct Employment Impacts of Development in the CID

Impact	Scenario #1 Industrial Development	Scenario #2 Office/Commercial Dev.
Total New Employment	2,020	2,800
Employment by Occupation		
Managers	170	230
Professional/Technical	540	790
Service Workers	130	590
Manufacturing Workers	760	460
Skilled	420	250
Unskilled	340	210
Clerical Workers	350	610
Sales Workers	70	120
Part Time Workers (included above)	210	570
As a percentage of total employment	10.2%	20.6%
Construction Employment (not included above)	510 man years	690 man years
Total Payroll Generated	$31,410,000	$34,050,000
Average Salary	$15,530	$12,210

See technical appendix #2 for methodology.

While office and commercial development include 16% more built floor area than the industrial scenario, the former generates 39% more jobs due to the smaller amount of space required for each employee in offices relative to industry. As would also be expected, industrial development leads to more jobs for manufacturing workers, both skilled and unskilled. Since manufacturing jobs tend to have higher salaries than many office and retail positions, the total payrolls under each scenario are much closer than the employment figures. The mixed office and commercial development would generate 8.4% more in earnings than the light industrial scenario. The narrowing of the gap between the two is also due to the higher proportion of part time

employees in office and commercial businesses.

Impact on Existing Companies

A portion of each new dollar earned in wages generated through new development will be spent locally. This spending will in turn support additional new employment. In order to assess the full impact of development this and other secondary effects on companies already in Cambridge need to be included. There are three categories of secondary effects: competition with existing companies for sales and labor, purchases by new companies and their employees, and changes in property values brought about by new development. The secondary impacts of each scenario are outlined in the following section.

Scenario #1: Light Industrial Development:

1) Competition/Purchases: Through consumer expenditure surveys, an estimate of the new spending generated by light industrial (and lesser amounts of other uses) development can be made.[5] To the extent that new retail development included in this first scenario requires income over and above the spending generated by new employment, it is assumed that sales will be drawn from other retail establishments already in existence. Based on calculations which appear in technical appendix #2, it is estimated that in Cambridge the spending generated by new development in the CID will just balance the spending required to support the retail development included in the scenario, so that no jobs are lost due to sales competition.

The major assumptions contained in this calculation are that retail spending for new employees will take the same percentage of gross income as is spent nationally, and that employees will spend slightly more than

a third of their retail dollars in the city of Cambridge (75% for residents and 25% for commuters).[6]

Since the current mix of companies in Cambridgeport is largely industrial, new light industrial development would provide some competition in the labor market existing companies draw from. In the two occupational groups where the labor market is under-supplied, namely professional/technical workers, and clerical workers, competition will be the greatest. However, since technical and professional workers are apt to be recruited from a wider area than is clerical help, the competition will be greatest for the latter. Without detailed knowledge of how wages respond to increases in the demand for labor, it is difficult to tell how much of an effect competition will have on existing companies. Faced with this problem one can only guess that the impact will not be large since the number of jobs being created is small relative to the size of the metropolitan labor market. The loss of employment due to increased competition for labor which raises the wages to existing companies is put at 10.

2) Among companies now in the Cambridgeport Industrial District, one of the most widely feared impacts of new development is rising property values (traffic and parking are also serious concerns, which will be dealt with in later chapters). Some companies in the CID are there primarily because of the relatively low rents given the district's central location. These companies along with some older manufacturers who have been in the CID for a long period of time are worried about their vunerability to rising rents.

There is no way of accurately predicting how much rents would rise as a result of different types of development. Even if rent increases could be estimated, the extent to which this would lead to a loss of employment in companies now in the CID varies for each firm according to the proportion of total costs rents take up. Given these obstacles, the approach used is based on detailed interviews that were conducted with each company now in the district, where those companies that are most vunerable to rising rents were identified. An additional assumption is that new light industrial development would support a smaller increase in property values than would be generated by office and commercial development.[7] With these two starting points the companies most likely to lose employees as a result of rising rents are identified. Job loss due to rising rents is estimated on the basis of the most likely impacts alone; companies that might have to lay off marginal numbers of workers are not included.

Two other impacts on existing businesses are noted briefly: rising property values will provide a benefit to companies that own their property and this will tend to offset the negative impact of rising cost for renters, negative impacts will also be offset by the benefit to some companies of having a larger number of similar firms located in the same area which could allow greater economies in the purchase of certain supplies and services such as trucking, computer time sharing, and bulk purchase of general office supplies.[8]

Taking all of the factors discussed in the previous two paragraphs into account, approximately two hundred jobs would be lost as a result of new light industrial development in the Cambridgeport Industrial District. Most of the employment lost would be lost at a wide range of rent increases

so that the analysis is not very sensitive to changes in assumptions about the degree to which new development would change property values in the CID.

Scenario #2: Mixed Office and Commercial Development

1) Competition for Sales/New Spending: As with industrial development, the payroll generated by office/commercial uses can be translated into retail expenditure using national survey data.[9] At the same time the spending required to support the new retail development proposed in this can also be estimated using data reporting sales per square foot in existing businesses. The spending required to support new stores minus the spending generated by new employment yields the amount of spending that would have to be captured from stores already in Cambridge in order to support the new retail floor area in the CID. This calculation yeilds a loss of 80 employees working in retail establishments in Cambridge through competition for sales. The underlying assumptions are the same as those used in estimating the net impact of light indsutrial development (see p. 32-33). The fact that new commercial/office development would lead to a greater loss of employment in existing retail firms makes intuitive sense since the amount of retail space developed is twice that in the industrial scenario while spending generated through new wages is only slightly higher so that only slightly more retail space is supported by the development itself.

The effect of new development on labor costs of existing firms would also be more substantial than the effect under light industrial development. The reason for this is that the direct employment created under office and commercial development requires large numbers of clerical and professional/technical workers, where the labor market is already very tight. New

hotel development would also lead to competition with existing companies in the CID which employ large numbers of cleaning workers. There is no way of predicting how much labor costs will be increased but, again, the impact on employment would probably be marginal compared to the sales competion and property value impacts of new development. The loss is estimated at 20 jobs, twice that under light industrial development.

2) Using the same approach as in the light industrial scenario, the effect of new development on property values, rents, and employment in those companies affected is based on interviews with each company. The companies that would close as a result of rent increases following industrial development would be almost certain to have to close under office/commercial development as well. In addition, since offices and commercial uses are a higher use of land (they support higher land prices) the effect of the second scenario on rents is likely to be even greater.

Those companiew owning their property would net a benefit due to higher property values and this would offset the impacts of rent increase. However, since MIT owns 71% of the land in the district, and much of the rest is held by real estate brokers, the size of this offsetting benefit would be small.[10] Since offices do not conform to the current mix of uses in the district there would also be less opportunity for bulk purchasing or sharing of services.

With property values escalating more rapidly under office and commercial development the number of jobs lost to companies unable to afford rising rents would be increase over the loss occuring in light industrial development. Since the offsetting effects of agglomeration would also be less the total loss is estimated at 250 jobs as opposed to a loss of 200 under industrial development.

When applied to the employment created directly by each of the two scenarios, the effect of new development on employment in existing firms leads to the following net changes in the number and type of jobs created in the Cambridgeport Industrial District.

Figure #16 Net Employment Impacts of New Development in the CID*

Impact	Light Industrial Development	Office/Commercial Development
Total New Employment	1850	2450
Employment by Occupation		
Managers	170	220
Professional/Technical	540	780
Service Workers	90	500
Manufacturing Workers	650	280
Skilled	410	210
Unskilled	240	70
Clerical Workers	320	580
Sales Workers	60	100
Part Time Employment (included in above)	190	500
Total Payroll Generated	$29,430,000	$29,940,000
Average Wage	$15,970	$12,310

*See technical appendix #2 for methodology. Numbers have been rounded and may not total exactly.

Who Gets the Jobs?

Given RCCC's constituency, a critical question is who will be hired for these new jobs?As a preliminary step to estimating the proportion of new employment going to residents of Riverside and Cambridgeport this section deals with the question of how many of the jobs will go to Cambridge residents. To do this several data sources have been relied

upon. The Community Development Department, in its Cambridge Directory of Establishments, has calculated the proportion of the workforce in several sectors that lives in Cambridge.[11] These figures are used as a general guide in estimating the number of new employees in the CID who will live in the city of Cambridge. Additional information on the residency patterns of employees by industry was gathered in RCCC's business survey and this is used to marginally adjust the city's residency data so that it can be applied at a greater level of detail, by two digit SIC. With net employment figures disaggregated to the two digit SIC level in the technical appendix, this data makes it possible to estimate the number of workers who will live in Cambridge for each scenario. Since there is bound to be substantial variation in residency between companies, even those in the same industry, two terms are used here, an expected value and a high value. The high value is based on 120% of the expected proportion of workers living in Cambridge.

Figure #17 Jobs Taken by Cambridge Residents*

	Light Industrial	Commercial/Office
Total Employment		
Expected:	420	720
High:	510	870
Full Time Employment		
Expected:	370	580
High:	450	690
Part Time Employment		
Expected:	50	140
High:	60	170

*See technical appendix #2 for methodology.

The final step in this process is the calculation of the number of new employees who live, or will live, in Riverside and Cambridgeport. Two approaches are used to estimate the proportion of the jobs going to Cambridge residents that will be filled by residents of RCCC's impact area. One approach is to use a Cambridge Office of Manpower Affairs survey which reported where Cambridgeport residents work by industry and occupation.[12] This study showed that it is more likely for manufacturing and clerical workers who live in Cambridgeport to work in Cambridgeport than any other group. The other approach is to use the proportion of the city's workforce living in Riverside and Cambridgeport and to estimate that the two neighborhoods will receive a similar proportion of the new jobs.[13] Since the development is located within Cambridgeport, and within walking distance of Riverside, it is likely that the two neighborhoods will actually capture close to twice the proportion of new jobs that they have of the total Cambridge workforce (since workers will prefer to live closer to their jobs, holding all else constant).

Riverside and Cambridgeport contain approximately 19% of the citywide workforce.[14] Assuming that workers will prefer to live close to their jobs the two neighborhoods may capture one and a half times their share of the city workforce, or approximately 30% of the net new jobs held by Cambridge residents. The high figure used will be twice the share of the workforce, or 38% of the Cambridge jobs created by new development in the CID. These percentages are then adjusted for each occupation, by the results of the COMA survey (Manpower Affairs) reporting the proportion of each occupation which works in Cambridgeport. Thus, if technical workers who live in Cambridgeport are more likely than the average worker to work

in Cambridgeport,then the expected figure of 30% is adjusted upwards accordingly.

Working at such a small geographic level, the potential for error is great, especially given the string of assumption necessary to calculate impacts that are numerically small. To deal with the inherent uncertainty of analysis at this level, expected and high estimates of each impact are used. The high estimate reflects a consistent biasing of the calculations upwards so as to make it unlikely that an actual outcome would surpass this level. The expected estimate represents the best possible judgement, given very limited data of the impacts resulting from different types of development. Low estimates also could have been calculated, but the purpose of this analysis is to illustrate the effects development could have at the maximum likely level. With these points in mind, the following table presents the expected and highest likely impacts of both industrial and a mix of office and commercial development on employment in Riverside and Cambridgeport.

Figure #18 Employment Impacts for Residents of Riverside and Cambridgeport

Occupation	# Jobs: Light Industry		# Jobs: Office/Commercial	
	Expected	High	Expected	High
Managers	10	15	20	25
Professional/Technical	35	40	65	80
Service Workers	10	15	55	65
Manufacturing Workers	50	60	30	35
Skilled	35	40	20	25
Unskilled	15	20	10	10
Clerical Workers	35	40	70	85
Sales Workers	5	5	5	10
Total (full and part time)	150	175	240	290
Part Time Jobs	15	20	50	60
Payroll (expected)	$2,460,000		$3,000,000	
Construction Jobs	25 man years		35 man years	
Average Salary	$16,500		$12,500	

Conclusion

As the city has reported in its technical reports on employment in the Cambridgeport Industrial District, office and commercial development would create more jobs than industrial development. The principal reason for the greater job creation impact of office development is that the amount of space required for each employee is less than with industrial development, in conjunction with the tendancy of office uses to be developed at a greater land density.

What has not been pointed out in the city's technical reports is that a greater proportion of the jobs created by office and commercial uses are either part time or low wage positions.[15] In the service and retail development favored in the office/commercial scenario close to 20% of the total employment is part time, and over 50% of the jobs are likely to be in clerical, sales, and service occupations where average salaries are low. In comparison, only 10% of the jobs created by industrial development are likely to be part time (based on state averages) while approximatly 30% of the positions are in clerical, sales and service occupations.

Many entry level positions in manufacturing are also low wage jobs, however, in most industries companies structure their workforce around defined job ladders that provide both security and the expectation of future increases in income for workers as they move into more skilled jobs.[16] Clerical, service, and sales occupations are not only low paying, they also generally lack job ladders analagous to manufacturing firms. Hotels are a prime example of a workforce that is stratified into a high number of low skill -- low wage cleaning and service jobs, and a small number of skilled managerial jobs, with little or no structured opportunity to move between the two segments.[17]

Discontinuity in the internal labor market of the firm characterizes most service industries, including legal services, consulting services, advertising, financial and insurance companies, and educational institutions. Retail businesses are even more apt to be split into large unskilled workforces, and small groups of managers.[18]

In considering the relative benefit of the employment created under each scenario proposed for Cambridgeport these concerns which can be grouped as concern over job quality, need to be considered along with the absolute level of new employment. The elements which should be considered in evaluating the quality of employment include: salary, stability, on-the-job training, and the potential for promotion. Representative wages for some selected occupations are shown below. (For additional information concerning the quality of jobs in different industries see Whitman, Labor Market Trends in Massachusetts).

Figure #19 Selected Area Wages (Weekly) $1979

Occupation	Median Wage	Middle Range	Ocupational Group
Computer Systems Anlysts.	$393.50	$314-$442	Professional
Machinists	$322.80	$307-$329	Manufacturing Workers
Warehouse Workers	$278.00	$212-$297	Manufacturing Workers
Secretaries	$223.00	$196-$260	Clerical Workers
Clerks	$183.00	$160-$216	Clerical Workers
Security Guards	$128.00	$124-$147	Service Workers

Comparing the employment impacts of each scenario comes down to a tradeoff between the number of jobs created and the quality of these jobs. Office and commercial development in the Cambridgeport Industrial District would probably create the most employment in the least amount of space, but industrial development would generate jobs that, on the basis of their pay, training, and potential for advancement, might be more desirable to those residents of Riverside and Cambridgeport seeking employment.

References: Chapter 2, Employment Impacts

[1] Riverside/Cambridgeport Community Corporation, Survey of Developable Sites in the Cambridgeport Industrial District and the Riverfront Area, mimeo, 1981.

[2] Massachusetts Division of Employment Security, Job Market Research, Occupational Profiles of Selected Industries in Massachusetts [an on-going series], (Boston: D.E.S., 1976-1979).

[3] U.S. Bureau of the Census, County Business Patterns, 1978 (Washington: U.S. Government Printing Office, 1980).

[4] Cambridge Community Development Department, The Cambridge Directory of Establishments, 1980 (Cambridge, MA: CCDD, 1980). p. 13.

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Cambridge Office of Manpower Affairs, Cambridgeport Manpower Analysis, Background Crosstabs, unpublished tables, 1981.

[5] Urban Land Institute, Dollars & Cents of Shopping Centers, (Washington: U.L.I.,1975).

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U.S. Bureau of the Census, Census of Retail Trade, 1977 Area Series, Massachusetts (Washington: U.S. Government Printing Office, 1981).

[6] Given that 25% of those working in Cambridge live in the city as reported in CCDD, The Cambridge Directory of Establishments, 1980, p. 13.

[7] McMahan, John Property Development (New York: McGraw Hill, 1976), pp. 113-115.

[8] Struyk, Raymond J. and Franklin J. James, Interametropolitan Industrial Location (lexington, MA: D.C. Heath and Company, 1975), p.15.

[9] U.S. Bureau of the Census, Census of Retail Trade, 1977.

[10] RCCC, Survey of Developable Sites...

[11]CCDD, p.13.

[12]COMA, crosstabs.

[13]U.S. Bureau of the Census, Census of Population and Housing, 1980 - Public Law 94-171 Counts (Washington: U.S. Government Printing Office, 1981).

[14]Ibid.

[15]Cambridge Community Development Department, Cambridgeport Industrial District Study: Technical Reports (Cambridge, MA: CCDD, 1981).

[16]Piore, Michael, and Peter Doeringer, Internal Labor Markets and Manpower Analysis (Lexington, MA: D.C. Heath and Company, 1971), pp. 41-63.

[17]Whitman, Richard, Labor Market Trends in Massachusetts (Boston: Massachusetts Community Action, 1981), mimeo.

[18]Ibid. See appendix no. 1, labor market indicators.

CHAPTER 3

HOUSING IMPACTS OF DEVELOPMENT IN THE CAMBRIDGEPORT INDUSTRIAL DISTRICT

No matter what mixture of office, retail, or industrial development predominates in the Cambrdieport Industrial District, a substantial flow of income will be generated through the dollars new and expanding companies pay out in wages and purchases of goods and services. In the last chapter the value of the payroll under the two scenarios considered was close to 30 million dollars (p.37). If the workers employed in new and expanding companies in the CID follow the pattern set by those now working in the district, approximately 10% will live in Riverside and Cambridgeport, and 3 million dollars of the income generated by new development will flow into RCCC's impact area.

The introduction of an annual flow of $3 million in gross household income could have a substantial stimulative effect on the local housing market. In addition, physical improvements, which are likely to occur as new corporate and public investment is commited to the area over the next ten years, will increase the desirability of Riverside and Cambridgeport as a place of residence for households in general, and this, too, will stimulate the demand for housing.

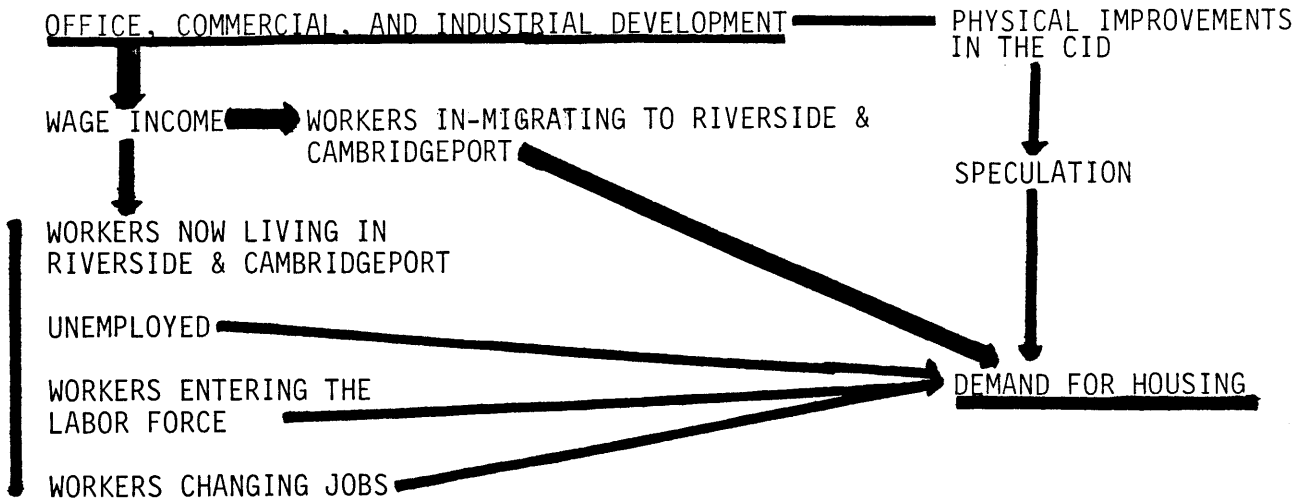
The effect of new housing demand on housing prices in Riverside and Cambridgeport (and on who can afford to live in the neighborhoods) will depend on the degree to which the supply of housing is expanded over the ten year period between 1980 and 1990. During the past ten years, the number of dwelling units in Riverside and Cambridgeport has increased by close to 1,100, but this increase was more than absorbed by an increase

in the amount of space required by each household (the size of the average household decreased from 2.5 to 2.1 persons from 1970 to 1980).[1] If average household size declines throughout the 1980s, more and more housing will be needed just to cover the current population.

The effect new housing demand could have on housing prices will also depend on the proportion of units that are under rent control. By not allowing rents to increase beyond increses in operating expenses, the stimulative effect of new demand may be concentrated on non-controlled units and on the home buying market (which could include the conversion of rental units to condominiums).

The model of housing demand that is used in the following analysis examines the demand generated by each of a number of different population groups. The balance between these different components will determine the actual dollar amount of housing that is demanded since some groups will have more new income to spend than others.

Figure 20: Components of the Demand for Housing Generated by Development in the Cambridgeport Industrial District.



All else equal, the group that will spend the most towards additional housing in Riverside and Cambridgeport are those new employees who decide to move to the area, presumably to reduce transportation costs and commuting time. These workers will spend between 25 and 30 percent of their gross income on housing, assuming they follow national averages.[2] All of the income spent on new housing by in-migrants is money that did not circulate in the community before and represents new housing demand.

Workers employed in new and expanding companies in the CID who already live in Riverside or Cambridgeport are already contributing to the demand for housing. New jobs will bring additional demand if the incomes gained in new jobs are higher than those in existing employment or higher than other income sources such as unemployment insurance or AFDC. The amount these groups will contribute to new housing demand is 25 to 30 percent of the difference between their new and old gross incomes.

For those who switch jobs to take new positions created by development in the CID, the jobs they leave may also be filled by neighborhood residents. Where this happens, all of the income earned by those changing jobs will represent a net gain to the community. However, since neighborhood residents work all over the Boston metropolitan area, only a small percentage of the jobs that workers switch from are likely to be filled by neighborhood residents.

Predicting the Direct Demand For Housing

It is difficult to predict the relative size of each of the three major groups forming different elements of the housing demand created by nonresidential development in the CID (namely: in-migrants, those who already live in R/C and switch jobs, and those who also live in R/C but are unemployed or out of the labor force). Without detailed knowledge of either the distribution of incomes created by the new employment in the CID, or of the range of housing prices in Riverside and Cambridgeport, predicting how many of the new workers will be in-migrants has a high uncertainty. To get around this problem, the following analysis works from two different basic assumptions. In one approach it is assumed that 30% of the workers who reside in Riverside and Cambridgeport and work in the CID will migrate into the area. In the other approach this percentage is assumed to be 70%. It will be shown that this percentage forms the single most important element in determing the extent to which new employment is translated into new housing demand. These two assumptions will form the low and high ranges of the direct demand which is likely to be generated by office, commercial, and industrial development in the CID over the next ten years.

Several other assumptions are required to make the calculations that follow, however the outcome is not particularly sensitive to the values that are selected. The factors which go into the calculations are estimated on the basis of national averages.[3]

Variable	Low	High
% of gross income spent on housing	25%	30%
Income elasticity of demand for rental housing	.5	.8
Average income of those switching jobs	$10,000	$12,000
Average income of the unemployed households	$6,000	$8,000
% of residents working in the CID who are in-migrants	30%	70%

Using the estimates of the number of employees hired by companies in the CID developed in the last chapter, and the average income estimated for workers in each scenario, the direct demand for housing is calculated as follows:

[% Change in income as a result of employment in the CID] X [Income elasticity] X [Current Housing Expenditure] X [# People in Subgroup] = Dollars of new housing demand.

The reason housing demand is so sensitive to the number of workers who are in-migants is that **all** of the income of in-migrants represents dollars that did not circulate in the neighborhood before, while for the unemployed and the underemployed the amount of new income is the difference between the benefits or salary that the household used to receive and the income in their new job in the CID. For this reason, the bulk of new housing demand comes as a result of in-migrants rather than from those already living in Riverside and Cambridgeport.

Using the high and low values of the variables set out for calculating housing demand, the following dollar amount of new demand is estimated.

Figure #21 Estimated Direct Demand for Housing as a Result of Development in the Cambridgeport Industrial District

Scenario	Low	High
Industrial Emphasis:		
Demand due to:		
In-migrants	$185,000	$606,000
Unemployed/New Entrants	$33,000	$37,000
Underemployed Who Change Jobs	$45,000	$46,000
Total	$265,000	$690,000
Office and Commercial Emphasis:		
Demand due to:		
In-migrants	$207,000	$762,000
Unemployed/New Entrants	$53,000	$61,000
Underemployed Who Change Jobs	$72,000	$75,000
Total	$332,000	$ 898,000

[See technical appendix #3 for detailed calculations]

Assuming that new workers will spend somewhere between twenty five and thrity percent of their gross household income on housing (or of the additional income earned) the dollar demand for housing would translate into the following demand for housing units:[4]

Figure # 22 Direct Demand for Housing in Dwelling Units

Scenario	Low	High
Industrial Emphasis	65 units	140 units
Office/Commercial Emphasis	105 units	2 0 units

Based on this analysis, then, the impact of new development in the CID on the direct demand for housing in Riverside is extremely sensitive to the proportion of new employees who decide to move into the area as a result of their new jobs. Housing demand is less sensitive to the amount of new income that is spent on housing (income elasticity of demand for housing) or to the current earnings of the unemployed and underemployed. This has direct implications for the type of housing that should be built if demand pressure on the Riverside/Cambridgeport housing market is to be minimized. By increasing the number and range of housing opportunities for current residents relative to the housing available to in-migrants, pressure on the housing market will be reduced. RCCC's current housing programs, which are all targeted to current residents of Riverside and Cambridgeport, exemplify the way in which the housing supply could be increased to enable people now living in the neighborhoods to stay and work in the Cambridgeport Industrial District. [For further policy implications see chapter 6]

Price Effect of the Direct Demand for Housing Generated by Development in the Cambridgeport Industrial District

The impact the demand for housing generated by new employment opportunities in the Cambridgeport Industrial District will have on housing rents and prices throughout Riverside and Cambridgeport will depend on the pre-development level of demand for housing and the sensitivity of prices and rents to increased demand. Each year close to 1200 dwelling units change hands (not including Harvard student housing). This turnover

represents almost all of the effective demand for housing in Riverside and Cambridgeport (new housing represents about 100 units per year but, again, this is offset by a decline in the number of people per each dwelling unit).

The amount of new demand that would by added by development in the CID is likely to be concentrated towards the end of the ten year period from 1980 to 1990, as the market for development is strengthened by earlier successes. Assuming that two thirds of the demand generated by development would be concentrated in the 1985-1990 period, and that housing prices will increase by between .89 and 1.1% for every percent increase in demand (the national rate for the price elasticity of demand for housing), the following price increases are predicted.[5]

Figure 23 Housing Price Impacts of Nonresidential Development in the CID

Scenario	1980-1985		1985-1990	
	Low	High	Low	High
Industrial Emphasis	+.03%	+.06%	+.05	+.12%
Office and Commercial Emphasis	+.05%	+.11%	+.09%	+.20%

For the average household in Riverside and Cambridgeport, these increases would mean between $ 1 and $ 7 per year in additional housing costs as a result of the direct demand generated by development in the CID and assuming that there is no new housing construction beyond that required to absorb continued increases in the amount of space required by those households already living in Riverside and Cambridgeport. If housing supply could be targeted only to those working in the CID, an increase of between 65 and 240 units would absorb this demand and negate its price effect. However, since new housing construction would inevitably be attractive to households

other than those working in the CID, housing supply would have to be increased by substantially more than 60 to 240 units to avoid the price increases expected (following current patterns for residents of Cambridgeport that shows that 15% of the resident workforce works in Cambridgeport the actual increase needed would be up to six times 60 to 240 units).[6]

Induced Demand for Housing

In addition to the demand for housing generated through the income of new workers in the CID, physical improvements in the Cambridgeport Industrial District, resulting from public and private investment, could lead to increased demand for housing as the image of the area as a place to live is improved. Induced demand depends on the compatability of new development with housing and the degree to which housing prices are currently depressed in the areas closest to where new development will occur.[7] In some areas of the South End of Boston, for instance, property values around the Prudential Center increased 110% over the three year period during which construction started on the project.[8] In the western portion of Riverside, where improvements in the Harvard Square area made the neighborhood a more desirable location, rents rose by up to 70% more during the period from 1960 to 1970 than they did elsewhere in Riverside.[9] If development in the Cambridgeport is at a scale and mixture of uses that enhances the physical appearance of that part of Cambridgeport, induced demand for housing could raise housing prices by substantially more than the direct demand generated by new income would.

Conclusion

Since the increases in housing prices generated each year by the additional demand for housing for new employees hired in the CID are cumulative, the increases in housing prices over the ten year period from 1980 to 1990 are more substantial than the very small price effects predicted on an annual basis. At the low end of the estimated direct price effect, new development in the CID would add fifteen dollars to the average household's annual housing costs. At the high end fifty five dollars would be added.

On the average, the direct effect of the income created by new development in the CID is not large. Where new workers are particularly drawn to one part of Riverside or Cambridgeport, the price effect of their demand may be larger. Judging from the Prudential development in Boston, the largest price impacts of new development are likely to occur as a result of speculative demand for housing that occurs as physical improvements are being made in a neighborhood.

Given the possibility of speculative demand resulting from physical improvements in the CID, and the difficulty of finding housing anywhere in Cambridge, it would be a good idea for the city to encourage low and moderate income housing as a part of the overall development of the Cambridgeport Industrial District. Even if the direct price impact of development is not very large, it will create between 1500 and 2000 new jobs as envisioned, and up to 40% of these could be for low and moderate income workers who would have a hard time finding affordable housing anywhere in Cambridge or surrounding communities. For these workers, as much as current residents of Riverside and Cambridgeport, the city should

write requirements for low and moderate income housing into its zoning and Planned Unit Development regulations now being considered for the Cambridgeport Industrial District.

References: Chapter 3, Housing Impacts

[1] Cambridge Community Development Department, Cambridgeport Industrial District Technical Report #9: Housing in Cambridgeport (Cambridge, MA : CCDD, 1980), p.6.

[2] Ibid, p. 5.

[3] Wheaton, William C. Income and price elasticities are as reported in as series of interviews.

Also: Average incomes were estimated on the basis of metropolitan area averages reported in: U.S. Bureau of the Census, Current Population Estimates and Projections Series (Washington: U.S. Government Printing Office, 1979).

[4] Interviews with Ross Blouin, Brendan Noonan, and Peter Daly, March 1981.

[5] Wheaton, op. cit.

[6] Cambridge Office of Manpower Affairs, Cambridgeport Manpower Analysis (Cambridge, MA: COMA, 1980), unpublished tables.

[7] Economics Research Associates, Copley Place Housing Impact Study (Boston: E.R.A., 1979), p.71.

[8] Ibid, p. 71.

[9] U.S. Bureau of the Census, 1970 Census of Population and Housing, Census Tract Summaries as Reported by the Cambridge Community Development Department (Washington: U.S. Goverment Printing Office, 1972).

[10] Cambridge Community Development Department, op. cit., p. 6.

CHAPTER 4

TRAFFIC IMPACTS OF DEVELOPMENT IN THE CAMBRIDGEPORT INDUSTRIAL DISTRICT

One of the main concerns voiced by members of RCCC's Cambridgeport Industrial District task force was the amount of new traffic that could be generated by new development in the CID. Detailed analysis of the traffic impacts of development would require review by professional traffic engineers. However, using relatively simple techniques a rough estimate can be made of the possible effect of development on traffic congestion and the resulting quality of life along well traveled streets.[1]

The analysis that follows is based upon city data regarding the current volume of traffic on streets in and around the CID, on national data regarding the capacity of different types of streets, on previous estimates of the square feet of floor area expected to be developed by different uses, and finally, on national figures reporting the average number of trips generated per 1,000square feet of gross floor area.[2,3,4] Dividing the number of square feet developed by the trip generation figures, the total number of average daily trips can be estimated. Similar calculations yield the amount of traffic generated at AM and PM peak hours.

The more difficult part of the traffic analysis process involves predicting what proportion of the new traffic will use particular routes in and out of the district. Where the traffic will go depends, of course, on where new development occurs in the CID, and this can only be guessed at now. An additional problem is estimating the number of new employees who will use

public transportation to get to and from work. This number may change as gasoline costs continue to rise, but for now it is assumed that 25 percent of the workforce employed in new and expanding companies will use public transportation or walk to work. With this assumption, the following estimates are made for the amount of traffic that could be generated by the two development scenarios outlined at the beginning of Chapter 2.

Figure #1: Traffic Generated by Development in the CID

Scenario #1: Industrial Emphasis

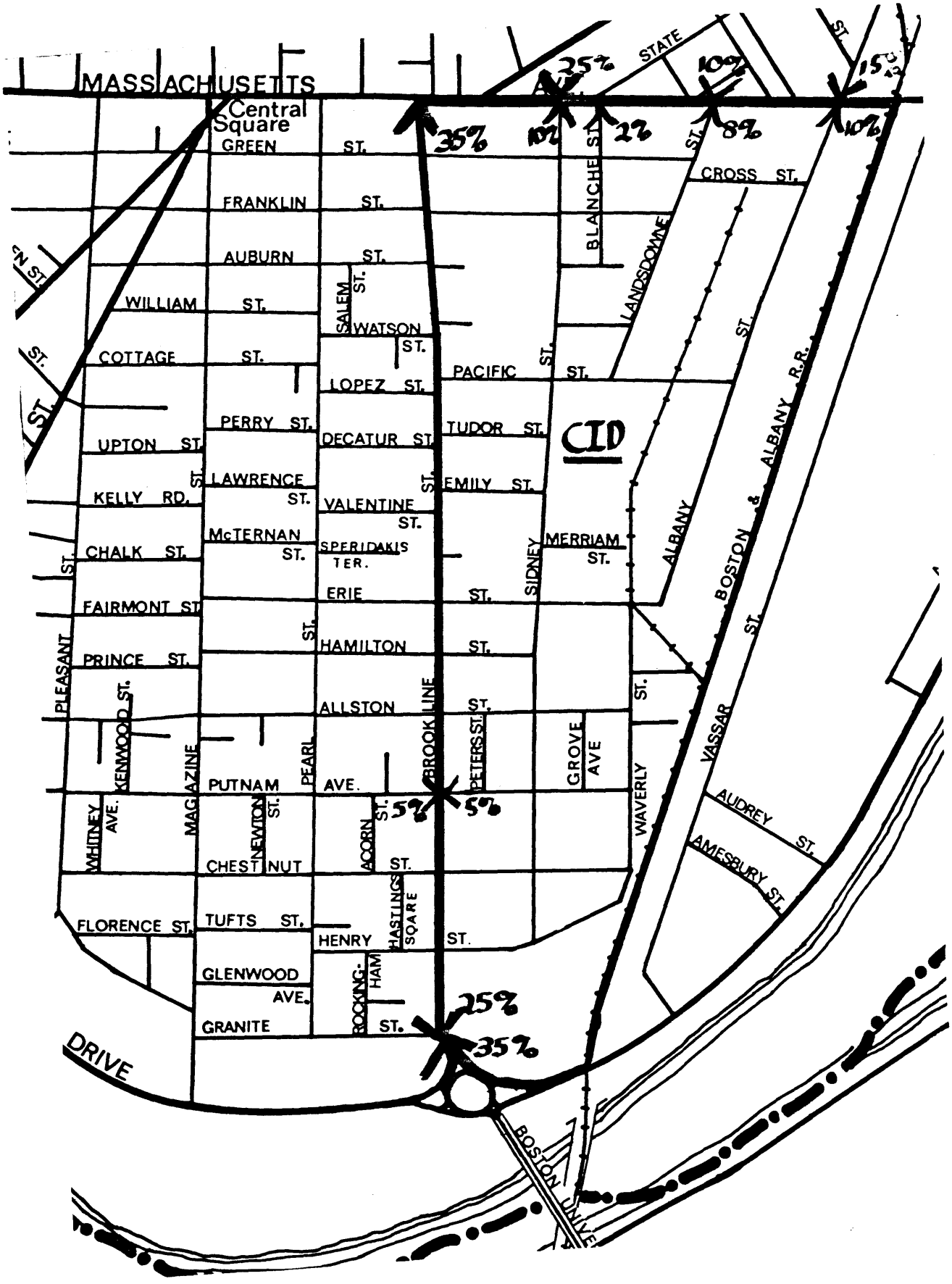
Increase in Average Daily Trips: 7750
Increase in Peak Hour Traffic: 1600

Scenario #2: Office and Commercial Emphasis

Increase in Average Daily Trips: 14700
Increase in Peak Hour Traffic: 2350

See Appendix #4 for calculations, and trips/1,000ft^2 by use

This increase in traffic is distributed over the existing street network as shown in the following map.


MASSACHUSETTS
Central Square
STATE
GREEN ST.
FRANKLIN ST.
AUBURN ST.
WILLIAM ST.
COTTAGE ST.
PERRY ST.
UPTON ST.
KELLY RD.
CHALK ST.
FAIRMONT ST.
PRINCE ST.
PLEASANT ST.
KENWOOD ST.
MAGAZINE ST.
WHITNEY AVE.
PUTNAM AVE.
PEARL ST.
NEWTON ST.
CHESTNUT ST.
FLORENCE ST.
TUFTS ST.
GLENWOOD AVE.
GRANITE ST.
DRIVE
LAWRENCE ST.
McTERNAN ST.
SPERIDAKIS TER.
SALEM ST.
WATSON ST.
LOPEZ ST.
DECATUR ST.
VALENTINE ST.
ERIE ST.
HAMILTON ST.
ALLSTON ST.
BROOKLINE ST.
ACORN ST.
HASTINGS SQARE
HENRY ST.
ROCKINGHAM ST.
PETERS ST.
PACIFIC ST.
TUDOR ST.
EMILY ST.
SIDNEY ST.
MERRIAM ST.
GROVE AVE
BLANCHE ST.
LANDSDOWNE ST.
CROSS ST.
CID
ALBANY ST.
BOSTON & ALBANY R.R.
VASSAR ST.
WAVERLY ST.
AUDREY ST.
AMESBURY ST.
BOSTON UNIVE
35%
10%
22
8%
10%
15%
25%
5%
5%
25%
35%

Given the distribution of new traffic as shown, the following increases in daily traffic at critical locations are predicted.

Figure #24 Increase in Daily Traffic at Critical Locations

Street	Expected Traffic	Traffic From Industrial Development	%Increase	Traffic From Office Development	%Increase
Entrance to Brookline Street, northbound	8200	2700	+33%	5000	+60%
Southbound	3800	1875	+49%	3600	+95%
Brookline St.	5400	1725	+32%	3300	+61%
Mass. Ave.					
Eastbound	8500	1875	+22%	3600	+42%
Westbound	7000	1575	+23%	2925	+42%
Putnam Ave.					
Eastbound	2300	375	+16%	710	+31%
Westbound	2800	375	+13%	710	+25%
Henry St.					
Eastbound	4000	750	+19%	1425	+36%
Westbound	2000	1500	+75%	2890	+144%
Sidney St.					
Northbound	4500	1150	+26%	1650	+37%
Southbound	4500	1150	+26%	1650	+37%
Albany St.					
Northbound	2800	1150	+41%	2170	+78%
Southbound	2800	750	+27%	1440	+51%
River St.	11300	1340	+12%	2360	+21%

Increases in traffic volume of the order shown in figure #2 would lead to substantial decreases in the level of service. In the following widely accepted definitions of service levels a 15% increase in traffic volume results in a decrease of one level of service.[5]

Figure #25 Definitions of Service Levels

Level of Service	Description
A	little traffic, no delays or speed reductions due to traffic, relatively free flow
B	slight reduction in speed due to other cars on the road
C	satisfactory speeds, reasonably stable flow, speeds and maneuverability restricted by other cars, occaisional minor delays
D	occaisional serious delays, little space for maneuvering, some cars may have to wait for signal to turn green twice before going through an intersection
E	unstable flow, continuous backups at many intersections creating intolerable delays, hard for traffic to enter from cross streets
F	very low speeds, cars backed up from one intersection to another, jammed.

Source: Herr, Philip Evaluating Development Impacts and Highway Research Board, Highway Capacity Manual, 1965.

The following table shows estimated current levels of service for critical streets, and the change in service levels predicted for each development scenario.

Figure #26 Change in Service Levels Due to Proposed Development

Street	Current L.O.S.	%Increase Industrial Development	New L.O.S.	%Increase Office Development	New L.O.S.
Entrance to Brookline St.					
Northbound	C/D	+33%	E/F	+60%	F
Southbound	B	+49%	E	+95%	F
Brookline St.	A	+32%	C	+61%	D
Mass. Ave.					
Eastbound	D	+22%	E	+42%	F
Westbound	C	+23%	D	+42%	E
Putnam Ave.					
Eastbound	A	+16%	A	+31%	C
Westbound	A	+13%	A	+25%	B
Henry St.					
Eastbound	B	+19%	C	+36%	D
Westbound	A	+75%	C	+144%	D
Sidney St.					
Northbound	A	+26%	B	+37%	C
Southbound	A	+26%	B	+37%	C
Albany St.					
Northbound	A	+41%	B	+78%	C
Southbound	A	+27%	A	+51%	B
River St.	C	+12%	C	+21%	D

In addition to these impacts on daily traffic volumes the following serious increases in peak hour volumes are also predicted for the two scenarios.

Figure # 27 Change in Peak Hour Congestion

AM PEAK

Street	Current Peak L.O.S.	L.O.S. of E or F under Industrial Development	L.O.S. of E or F under Office Development
Brookline Entrance	D	E/F	F
Brookline St.	B	-	E
Mass. Ave. East	D	E	E
Mass. Ave. West	C	D/E	F
Henry St. East	B	-	E
River St.	C	-	E

PM PEAK

Brookline Entrance	D	D/E	F
Brookline Street	C	D/E	F
Mass. Ave. East	D	E	F
Henry St. West	C	-	F
Sidney St. South	B	-	E

Conclusion

If the rough estimates of traffic impacts carried out above are anywhere near correct, serious congestion will occur at the entrance to Brookline Street from Memorial Drive, and along Mass. Ave. regardless of the type of development that occurs in the CID over the next ten years. If development is predominated by office and retail uses traffic congestion will be widespread, especially at peak hours (most of the difference in traffic generation between the two scenarios is due to the larger amount of retail development in the office scenario, and to the inclusion of hotel development). Even though these conclusions are tentative, they underline the need for the city to consider more detailed traffic analyses of any concrete proposals that emerge for the CID.

It also should be noted that increased traffic along Brookline St., and Putnam Ave. will negatively affect housing values along these routes. This will partially offset the speculative demand for housing generated by physical improvements in the CID, although it will not affect the direct demand for housing generated by new employment.

References: Chapter 4: Traffic Impacts

[1] Herr, Philip, Gene Slater, and Robert Bluhm, Evaluating Development Impacts (Cambridge, MA: Laboratory of Architecture and Planning, Massachusetts Institute of Technology, 1978), pp.22-45.

[2] Cambridge Community Development Department, Current Traffic Volume Maps Based on Cambride D.P.W. surveys, 1980.

[3] Highway Research Board, Highway Capacity Manual (Washington: U.S. Government Printing Office, 1965), pp.36-50.

[4] Maricopa Association of Governments, Trip Generation By Land Use, Part 1, A Summary of Studies Conducted (Phoenix, AZ : Maricopa Association of Governments, 1974), pp. 185-191.

[5] Herr, Philip et. al., op. cit. p.38.

CHAPTER 5

A BRIEF CONSIDERATION OF THE FISCAL IMPACT OF DEVELOPMENT IN THE CID

Drawing from the estimates of floor area built in each scenario in Chapter 1, and existing city data on the cost and revenue generated per square foot of different uses, a very rough estimate of the fiscal impact of development has been carried out.[1] The results of this analysis are likely to change in the next few years as the revenue structure of cities and towns throughout Massachusetts are altered in response to Proposition 2 1/2. This analysis assumes 100% valuation which is soon to be completed in Cambridge.

Figure #28 Cost/Revenue Balance of Industrial Development as Proposed in Chapter 1

Use	Cost/Ft^2	Ft^2 (,000)	Cost	Revenue/Cost	Revenue
Factory	.342	273.5	93.5	1.95	182.4
Technical Office	.324	240	77.8	4.18	325.0
General Office	.465	84	87.2	4.69	409.0
Hotel	.409	0	-	-	-
Wholesale	.443	57.5	25.5	1.49	38.0
Retail					
Small	.801	20	16.0	1.13	18.1
Rstrnt	2.878	15	43.2	0.68	29.4
Auto	.205	5	1.0	5.17	5.2
		Total Cost	$344,000	Total Revenue	$1,007,000
		Fiscal Balance:	$663,000		

Source: Minuto, James T., Cost-Revenue Study (Cambridge, MA : CCDD, 1976), tables VII and VIII.

Figure #29 Cost/Revenue Balance of Office and Commercial Development as Proposed in Chapter 1.

Use	Cost/Ft^2	Ft^2(,000)	Cost	Revenue/Cost	Revenue
Factory	.342	103	35.2	1.95	68.6
Technical Office	.324	130	42.1	4.18	176.0
General Office	.465	245	113.9	4.69	534.0
Hotel	.409	250	102.3	4.37	447.1
Wholesale	.443	5	2.2	1.49	3.3
Retail					
Small	.801	35	28.0	1.13	31.6
Restaurant	2.878	20	57.6	0.68	39.2
Auto	.205	5	1.0	5.17	5.2
Depart. St.	.801	25	20.0	1.13	22.6

Total Cost: $402,000 Total Revenue: $1,328,000

Fiscal Balance: $925,000

Source: Minuto, op. cit.

Since general office space has a higher cost per square foot than industrial development, most of the difference in fiscal balance of the two scenarios is due to the increased revenue that would be brought into the city from hotel development. The fiscal balance of equal amounts of pure office and industrial development would not differ markedly.

It must also be noted that the increases in property values for Riverside and Cambridgeport calculated in Chapter 3 would also have some fiscal benefits for the city. Given a current median sale price of $61,000 in the two neighborhoods, an increase in property values of 1 % over the ten year period for industrial development, and

2% under office development, 38% valuation, and the current tax rate, the increased property tax revenues that would be generated would be $90,000 for the scenario emphasizing industry, and $150,000 for an office emphasis. Adding these revenues to the direct revenue/cost balance of development the expected fiscal balance of each scenario, not including the effect revenue would have on state aid, is as follows:

Industrial Emphasis: + $750,000

Office Emphasis: +$1075,000

Reference: Chapter 5

[1]Minuto, James T., Cost-Revenue Study (Cambridge, MA. : CCDD, 1976), tables VII and VIII.

CHAPTER 6

A SUMMARY OF DEVELOPMENT IMPACTS

The expected effects of the two proposed scenarios for development in the Cambridgeport Industrial District over the next ten years are shown below.

Figure #30: Summary of Development Impacts

Impact	Industrial Emphasis	Office/Commercial Emphasis
Riverside/Cambridgeport Impacts		
1)Residents Employed, Total	150	240
-Full time	135	190
-Average salary	$16,500	$12,500
-Total Payroll Generated	$2,460,000	$3,000,000
2)Housing Demand		
-Dwelling Units Demanded (low estimate)	65	140
(high estimate)	105	210
-Direct Effect on Prices (high estimate over a ten year period)	+$25/year	+$55/year
-Speculative demand	low-moderate	moderate-high
3)Traffic Generated (daily)	7750	14,700
-Streets with serious congestion (daily)	4	8
-Streets with serious congestion (peak hours)	5	11
General Impacts		
1)Ft^2 of Floor Area Built	730,000	845,000
2)Total Employment Expected	1,850	2,450
-Full time	1,660	1,950
-Average Salary	$15,970	$12,310
-Total Payroll Generated	$29,430,000	$29,940,000
2)Fiscal Impact		
-Expected Revenue	+$1,100,000	+$1,475,000
-Expected Cost	-$350,000	-$400,000
-Fiscal balance	+$750,000	+$1,075,000

Neighborhood Impacts

-Employment: Since it is built more densely and requires less floor area per employee, office development will generally employ more people than industry will. The greater aggregate job creation of office uses is offset ny the large proportion of part time jobs included in this total, and a greater number of low paid positions generally. Industrial employment is higher paying, more stable, and usually provides more opportunity for training and advancement.

-Housing: Both scenarios would probably put pressure on an already tight housing market. The demand for housing generated by new wage income alone would add up to 27% to the annual cost of rental housing by 1990. Price impacts are especially serious from office development, due to the higher number of employees it would generate, but pressure would also be put on the local housing market from industrial development. If development is compatible and supportive of an improved quality of life prices will be driven up even more as the neighborhood becomes perceived as a more desireable place to live.

-Traffic: It appears that any large scale development in the CID would lead to serious congestion at the entrance to Brookline Street and along Mass. Ave. Office, and especiallyretail development would lead to widespread traffic congestion in and around the district. Rush hour traffic would be even worse. Industrial development would not have nearly as adverse traffic impacts, but would cause relatively more truck traffic.

CHAPTER 7

RECOMMENDATIONS TO RCCC

1) Since any development will have negative effects of the Riverside and Cambridgeport housing markets, and on traffic congestion, it is important for RCCC to work to reduce the density of allowable development in the Cambridgeport Industrial District. Rather than doing this on an ad hoc basis for each proposed development, it would be more effective to push for zoning that reduces the allowable floor to area ratios as far as is possible given the objections of landowners.

2) Given the very negative traffic impacts of retail development, any major new retail construction should be actively discouraged, even along Mass. Ave. Hotel development would also add significantly to traffic congestion along Mass. Ave., Sidney Street, and at the entrance to Brookline Street along Memorial Drive.

3) In conjunction with any major new development, the city should be encouraged to construct a new connecting street between Waverly and the entrance to Brookline Street.

4) One way of accomodating new development without adding as much as this analysis shows to housing costs would be to require that current residents of Riverside, Cambridgeport, and Neighborhood 4 receive a set percentage of the new jobs created. Requiring that jobs be set aside for current neighborhood residents maximizes the amount of income that will go to RCCC's constituency and will give some households the increased income with which they could withstand inevitable pressure from in-migrants and those attracted by improvements in the perceived quality of life in the neighborhood.

5) Pressure on the local housing market could also be relieved by adding to the supply of housing available to neighborhood residents. If housing were targeted only to current residents, an increase of two to three hundred units would absorb most of the increased demand projected as a result of development in the CID. If housing was not targeted, up to six times this amount would be needed to absorb new demand. These increases in supply are over and above increases that may be needed as the average size of households

declines, and to absorb other factors increasing the demand for housing in Riverside and Cambridge.

6) RCCC's current housing and employment programs will buffer a portion of the residents who are vunerable due to low or unstable income, from some of the negative housing impacts of new development in the CID by stabilizing their housing costs and by providing higher and more secure incomes. But if development is at the scale shown feasible in market analysis these programs will have to reach more people in order to avoid substantial displacement of lower income households from Riverside and Cambridgeport.

Technical Appendix #1: Market Analysis

The potential demand for space in Cambridgeport is estimated on the basis of the share of growth in state employment that could realistically be captured by the district. The capture rate is based first on the share of state employment that the city of Cambridge has held in the past, and then on the share of city employment located in Cambridgeport over the last ten years.

Projections of state employment growth have been carried out by the Division of Employment Security for each two digit SIC (Standard Industrial Classification) industry group. These projections are available through 1985. Past 1985, to the target year 1990, employment growth is estimated on the basis of annual growth from 1965 until 1985. The estimates for individual industries are aggregated into sectors in order to reduce the random error resulting from application of historical growth rates to the 1985-1990 period.

Aggregation of Industries:	Durables including	-SIC 35 Nonelectrical Machinery -SIC 36 Electrical Machinery -SIC 38 Scientific Instruments
	Nondurables	-SIC 27 Printing & Publishing -SIC 283 Drugs
	Wholesale Trade	-SIC 50 Nondurable goods -SIC 51 Durable goods
	Retail Trade	-SIC 53 Department Stores -SIC 54 Food Stores -SIC 56 Clothing Stores -SIC 58 Restaurants
	Hotels	-SIC 70 Hotels and Motels
	Business Services	-SIC 73 Business Services -SIC 89 Professional Services -SIC 8071 Medical Laboratories
	Educational Servs.	-SIC 822 Colleges & Universities

These sectors were selected on the basis of the strength of their growth at the state level and the potential for their expansion in Cambridgeport as identified in the market analysis.

The following projections for growth between 1979 and 1990 were made.

Projected Growth in State Employment

Sector	1979 Employment	1990 Employment	%+	Abs. Change
Manufacturing				
Durables	265,400	342,300	29.0	76,900
Nondurables	45,350	50,900	12.3	5,600
Wholesale Trade	128,100	143,200	11.8	15,200
Retail Trade	318,100	365,000	14.5	46,000
Services				
Business	146,200	188,800	29.1	42,600
Educational	71,200	79,600	11.8	8,400
Hotels	21,800	27,300	24.9	5,400

Note: Columns may not add exactly due to rounding.

Source: DES. Employment Requirements by Occupation, By Industry 1976-1985, and projection based on historical trends for 1985 to 1990.

Cambridge's share of this growth is then estimated on the basis of past shares of state employment in each industry.

Cambridge Share of State Employment

Sector	Share 1960	Share 1970	Share 1978	Estimated 1985		
				Low	Moderate	High
Manufacturing						
Durables	3.7%	4.5%	3.6%	2.0%	3.3%	4.6%
Nondurables	3.1%	2.9%	2.7%	2.1%	2.5%	2.9%
Wholesale Trade	8.8%	7.4%	2.7%	0.6%	1.6%	2.6%
Retail Trade	2.8%	2.2%	2.5%	2.1%	2.6%	3.1%
Services						
Business	8.4%	8.6%	9.9%	6.7%	10.8%	14.9%
Educational	NA	NA	29.3%	24.8%	29.3%	33.8%
Hotel	1.8%	2.4%	4.6%	5.0%	7.4%	9.8%

Source: DES. Annual reports on covered employment for each city and town.

Moderate level shares were based on a straight line projection of the change in past city shares of state employment. Low and high estimates are plus and minus 25% of the moderate share, weighted by the extent to which the sector is projected to grow faster or slower than state state employment in the aggregate. Thus, for nondurable manufacturing, where growth is slow compared

to other sectors, the variance around the moderate share is estimated to be less than 25% since employment change is less volatile. The actual variance is calculated as follows:

Estimation of ranges for city share: $\frac{\text{sector growth rate}}{\text{average growth rate}} \times .25 \pm \text{estimated share}$

Using the low and high share estimated on this basis, the following growth in the city of Cambridge is projected.

Cambridge Absolute Share of State Growth

Sector	Low	High
Durables	1550	3550
Nondurables	120	260
Wholesale	90	390
Retail	970	1430
Business Services	2850	6350
Educational Srvcs.	2090	2830
Hotels	270	530

No historical data exists to project the share of city employment growth that could be captured by Cambridgeport. On the basis of industry employment reported by RCCC's survey of businesses in Cambridgeport and Riverside, and on the basis of some of the marketing potential and problems identidied the following shares are estimated. Recognizing the liklihood of error in estimating employment growth at such a small area level, the ranges are broadened to $\pm$50% of the expected share. Even so, these estimates are only guides as to the possible growth in the CID rather than a projection of what will happen.

Cambridgeport Share of Cambridge Employment Growth, 1979-1990

Sector	% of City Emp. 1980	Expected % Share 1985	
		Low	High
Durables	17.0	10.9	28.9
Nondurables	13.5	5.5	29.2
Wholesale	6.7	3.7	10.5
Retail	10.0	5.0	15.0
Business Services	10.7	6.0	16.4
Educational Services	NA	0.0	15.0
Hotels	0.0	0.0	40.0

Source: RCCC Survey of Businesses in Riverside and Cambridgeport, 1981.

In RCCCs survey one question asked what the expectation was for each company to stay or leave the district. These expcetations were compiled by sector and are used in computing the range between low and high capture rates. The equation is as follows:

$$\frac{\%\text{ of sector expecting to stay and grow}}{\text{Average \% with similar expectations for all companies}} \times .5 \pm \%\text{ of city emp. 1980}$$

When applied to the absolute growth projected for the city of Cambridge, the % shares for Cambridgeport translate into the following absolute growth in employment.

Cambridgeport Absolute Share of State Employment Growth, 1979-1990

Sector	Low	High
Durables	170	1025
Nondurables	10	75
Wholesale	5	40
Retail	50	210
Business Services	170	1040
Educational Services	0	425
Hotels	0	210

Technical Appendix #2: Calculation of Employment Impacts

The calculation of employment impacts begins with the estimates of the demand for space identified in Chater 1. Demand by two digit SIC is shown below.

SIC	Name	Estimated Demand for Floor Area (ft^2) Light Industry	Office/Commercial	
27	Printing and Publishing	20,000	0	
283	Drugs	18,000	3,000	
35	Nonelectrical Machinery	150,000	100,000	(KLH Building)
36	Electrical Machinery	25,000	0	
38	Scientific Instruments	260,000	50,000	
50/51	Wholesale Trade	58,000	5,000	
53	Department Stores	0	25,000	
54	Food Stores	10,000	20,000	
56	Clothing Stores	15,000	20,000	
58	Restaurants	15,000	20,000	
70	Hotels	0	175,000	
73	Business Services	30,000	92,000	
89	Professional Services	52,000	113,000	
8071	Medical Labs	10,000	45,000	
822	Colleges and Universities	25,000	107,000	
63-66	Insurance and Real Estate	20,000	35,000	
60-62	Banking and Finance	0	20,000	
81	Legal Services	10,000	15,000	

For each SIC there is also an occupational matrix as follows:

	Occupation						
SIC	%Managers	%Prfsnl.	%Service	%Skilled Manf.	%Unskld.Manf.	%Clrcl.	%Sales
27	8	6	0	39	8	16	23
283	11	8	1	33	22	17	8
35	5	18	2	30	34	10	1
36	7	25	2	15	35	15	1
38	8	25	2	30	19	15	1
50/51	11	6	3	6	34	18	22
53	7	6	5	2	13	16	50
54	12	4	18	4	17	7	38
56	13	7	7	5	12	17	39
58	11	4	77	0	1	3	4
70	6	2	70	2	4	15	1
73	8	19	30	3	8	29	11
89	11	58	2	6	1	21	0
8071	6	64	8	5	3	14	0
822	20	41	15	15	6	19	0
63-66	15	15	6	5	3	47	17
60-62	18	7	3	0	0	71	1
81	5	35	0	0	0	60	0

Source: D.E.S. Occupational Profiles.

Using data reporting the number of square feet required per employee by industry, the sqare feet projections in the first table can be converted into projection of employment by SIC. The employee density figures used were as follows:

SIC	Name	Ft^2/Employee
27	Printing and Publishing	496
283	Drugs	750
35	Nonelectrical Machinery	342
36	Electrical Machinery	564
38	Scientific Instruments	330
50/51	Wholesale Trade	1397
53	Department Stores	275
54	Food Stores	625
56	Clothing (& Misc.) Stores	554
58	Restaurants	373
60-62	Banking and Finance	459
63-66	Insurance and Real Estate	190
70	Hotels	365
73	Business Services	250
8071	Medical Labs	250
81	Legal Services	225
822	Colleges and Universities	330 (For labs same as SIC 38)
89	Professional Services	210

Source: RCCC survy of 200 establishments in Cambridge, and Herr, P. Evaluating Development Impact, p.116.

Employment by occupation for each scenario is calculated by dividing the potential demand for floor area in the first table by the floor area per employee in the third table, and multiplying the result by the percentage the percentage each occupation forms of total employment in table two. For incstance, in the light industrial scenario, 20,000ft^2 of demand divided by 496 ft^2 per employee yields 40 jobs. Of these 8% are managers, or 3 employees, 6% are professional workers, or 2 employees, and so on.

Calculation of Net Employment

In 1972 the average expenditure in retail stores in Massachusetts was $2,300. Adjusted by the CPIU for Boston to 1981 dollars this figure rises to $3,455. It is estimated that each commuter (75% of the total new jobs created) spends one quarter of theri retail expenditure in Cambridge, while resident workers spend 75% of their total in the city. Of the total retail spending generated by new development, the two groups above total to 38% of retail dollars being spent in Cambridge. For scenario one, there are 2023 employees X $3,455 X .38 = $2656000 in retail spending in Cambridge as a result of new development. For the second scenario the retail dollars generated are $3,662,000.

Annual sales average between $100 and $120 per square foot of retail gross floor area. Using a mid figure of $110 this means that the spending genrated in the first scenario would support approximatly 25,000 square feet of retail development. In the second scenario the floor area of retail space supported would be about 35,000 square feet.

In the first scenario it is assumed that new retail development would draw in approximatly one third of its sales in the form of new business that was not going to other stores in Cambridge. This means that the 40,000ft^2 built would support about 13,000ft^2 through new sales. Added to the 25,000 supported by the purchases of new employees, and allowing for some purchases by the new companies themselves, the 40,000ft^2 of new retail development should be self supporting. A similar approach shows that of the 80,000ft^2 of retail space built in the office/commercial scenario, only 40,000 ft^2 would be supported and 40,000ft^2 drawn from other Cambridge establishments, leading to a loss of 80 jobs (at 500 ft^2/employee for retail).

Figure #4

Applying the employment impacts of new development on existing business, to the employment created directly in new companies in the CID, a total net job creation figure is obtained. In order to distribute this net effect by occupations it is assumed that the jobs lost will follow the occupational distribution in retail trade for those retail jobs lost, and will follow the average occupational breakdown for all industries, for those jobs lost due to competition for labor and rental increases.

Figure #5

The proportion of employment that will be held by residents of Cambridge is estimated on the basis of proportions of resident employees currently in Cambridge businesses. This data is gathered from the Cambridge Community Development Department, Directory of Cambridge Establishments, and from RCCC's business survey. The following proportions are estimated for each industry's resident workforce.

SIC	% of workforce Living in Cambridge
20	.25
27	.28
28	.19
35	.24
36	.44
38	.18
50/51	.15
54	.34
53	.34
56	.34
58	.34
63-66	.29
60-62	.29
73	.35
80	.20
81	.25
822	.30
89	.30

Multiplying these coeficiants by the net employment created in each industry yeilds the number of Cambridge residents who will be employed in the new development. By using the occupational matrices presented at the beginning of this appendix, employment can also be broken down by occupation.

Figure #6

The proportion of the net new employment that will be held by residents of Riverside and Cambridgeport is estimated at 1.5 times the proportion of the city's workforce that lives in the neighborhoods (19%) for an expected value of 30%. This expected value for all industries is then adjusted by occupation according to data collected by the Cambridge Office of Manpower Affairs on the workplaces of Cambridgeport residents. The formula used to adjust the expected value of 30% is as follows:

For each occupational group of current Cambridgeport residents:

$$\frac{\%\text{ now working in Cambridgeport}}{\%\text{ for all occupations}} \times .30 = \text{Adusted proportion of each occupational group that will live in Cambridgeport.}$$

Thus for managers, of the residents now in Cambridgeport 15% work in Cambridgeport, which is right at the average for all employment of 16%. Since the share of those managers living in Cambridgeport and working in Cambridgeport is so close to the average for the whole Cambridgeport workforce, managers are assumed to have the expected share of new jobs that will be held by Cambridge residents, or 30% of 38 = 11.

Technical Appendix #3: Housing Impacts

The dollar volume of direct demand was calculated as follows:

Industry

Variables: Average Earnings of the Unemployed: $6-8,000
Average Earnings of those Changing Jobs: $10-12,000
Income Elasticity of Demand for Housing: .5 to .8
% of Income Spent on Housing: 25 - 30%
% of Resident Workers Unemployed: 10 - 20%
% of Resident Workers Changing Jobs: 20 - 50%
% of Resident Workers In-migrating: 30 - 70%
Average Earnings in New Jobs: $16,500

High Range:
Change in income of Unemp.= 16,500-6,000 = 10,500 = +175%
Change in income of Chngrs, = 16,500-10,000 = 6,500 = + 65%
Change in income of inmgrnts. = 16,500

Change in housing expenditure of UE = 1.75 X E_i(.8) X .30 X 6,000
= +2,100 per person
Change in housing expenditure of CH = 0.65 X E_i(.8) X .30 X 10,000
= +1,300 per person
Change in housing expenditure of MG = 16,500 X .30 = +4,950 per person

175 new employees

Dollar demand by groups:
UE: 10% X 175 X 2,100 = +$36,750
CH: 20% X 175 X 1,300 = +$45,500
MG: 70% X 175 X 4,950 = +$606,375

Total: +$690,000

Industry (continued)

Low Range:
Change in income of Unemp.=16,500-8,000 = 8,500 = +110%
Change in income of Chngrs.=16,500-12,000 = 4,500 = +40%
Change in income of inmgrnst.=16,500

Change in housing expenditure of UE = 1.10 X E_i(.5) X .25 X 8,000
= +1,100 per person
Change in housing expenditure of CH = 0.40 X E_i(.5) X .25 X 12,000
= +600 per person
Change in housing expenditure of MG = 16,500 X .25 = 4,100 per person

150 new employees

Dollar demand by groups:
UE: 20% X 150 X 1,100 = +$33,000
CH: 50% X 150 X 600 = +$45,000
MG: 30% x 150 X 4100 = +185,000

Total: +$265,000

Office/Commercial

High Range:
Change in income of Unemp.=12,500-6,000 = 6,500 = +108%
Change in income of Chngrs.=12,500-10,000 = 2,500 = +25%
Change in income of in-migrnts. = +12,500

Change in housing expenditure of UE = 1.08 X E_i(.8) X .30 X 6,000
= +2,100 per person
Change in housing expenditure of CH = 0.25 X E_i(.8) X .30 X 10,000
= +1,300 per person
Change in housing expenditure of MG = 12,500 X .30 = 4,950 per person

Office/Commercial (continued)

190 new employees

Dollar demand by groups:
UE: 10% X 290 X 2,100 = +$60,900
CH: 20% X 290 X 1,300 = +$75,400
MG: 70% X 290 X 3,750 = +$761,250

Total: +$897,550

Low Range:
Change in income of Unemp.=12,500-8,000 = 4,500 = +56.25%
Change in income of Chngrs.=12,500-12,000 = 500 = +4.17%
Change in income of in-mgrnts.=12,500

Change in housing expenditure of UE = 0.56 X E_i(.5) X .25 X 8,000
= +1,100 per person
Change in housing expenditure of CH = 0.04 X E_i(.5) X .25 X 12,000
= +600 per person
Change in housing expenditure of MG = 12,500 X .25 = 2,875 per person

240 new employees

Dollar demand by groups:
UE: 20% X 240 X 1,100 = +$52,800
CH: 50% X 240 X 600 = +$72,000
MG: 30% X 240 X 2,875 = +$207,000

Total: +$331,000

Price Impact of Housing Demand

The dollar estimates of housing demand are translated into demand for housing units based on expenditures of between 25 and 30 percent of the projected income under each scenario, divided into the total dollar demand estimated. This demand for housing units is translated into a price impact based on the following formula:

$$\frac{\text{Current Housing Demand}}{\text{New Housing Demand}} = \frac{\text{Current Level of Real Price Increases}}{X}$$

Where X equals the price impact of new housing demand.

Technical Appendix #4: Traffic Impacts

The traffic generated by each scenario was calculated based on the following national data for trips per 1,000 ft^2 for different land uses.

Land Use	Trips per 1,000 ft^2 GFA
General Manufacturing	4.37
Research Oriented Manufacturing	5.09
Warehouses	5.52
General Office	10.32
Engineering Offices	22.99
Fast Food Restaurants	553.04
Sit Down Restaurants	233.19
Hotels	156.45 (per acre)
Department Stores	36.12
Supermarkets	135.30

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