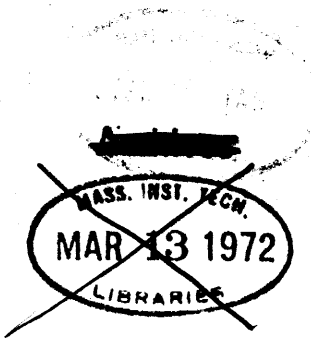
MIXED USE INDUSTRY IN URBAN POVERTY AREAS

A discussion and design proposal in partial fulfillment of requirements for the Graduate Bachelor of Architecture program at Massachusetts Institute of Technology

Alan B. Dolmatch

12 January 1968 (June)



R3126O

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

Part I - Introduction and Statement of Investigation

A. Introduction

We live and operate today in a society being constantly reshaped by expanding technology and social fermentation. In attempting to rationalize the complexities and aggressions, the forces within our system have resorted to a restructuring of patterns through specialization of activity and physical separation of differences. For example:

- Technology has created rationalized labor.
- Racism has produced the black ghetto.
- Mobility has allowed work and home to be separated by an amorphous transportation experience.
- Land use conflicts have caused exclusion by zoning, and an outmigration of industry from the city.
- Efficiency has prompted agglomeration of similar uses to the exclusion of others (e.g. industrial parks, business districts, shopping centers).
- Land development and the design professions have treated land parcels as entities divorced from all but an economic context.

There are other parallel responses as well; however, it is the result of these kinds of attitudes which have yielded the fractioned environments in which we must now function.

It is little wonder that out of this societal condition, voices are being raised in concern over the seemingly inevitable emasculation of diversity and quality in life. The search is for

combinations, rather than separations, which will have meaning, comprehensibility, and a possible validity in the face of great social, economic and technological forces.

In a real way, the city is the barometer of the larger society. The city can be a market-place of ideas and confrontations. It can be the place of communication and exchange. And it must be the place where the reconciliation of different interests can occur with equality. Our present legacy does not fit this picture. For the ideas and confrontations tend to be within closed circles of activity. The communication and exchange is clearly econocentric. And the deep hostility toward the white man within the black ghetto is the most eloquent commentary on urban equality.

The city is breaking down in its most meaningful functions. It can, no doubt, continue for many years as a viable commercial institution; however, unless new patterns can be established to develop the city as a place of beneficial human interaction, we may find our ability to have these interactions atrophied, both from within for lack of experience in such contact, and from without for lack of the physical environment to sustain them.

B. Statement of Investigation

This thesis, in its analytical and design phases, is an attempt to propose an urban physical context for relationships of people and of activities. Fundamental to it is a belief in the

role of the city as a place of interchange of ideas, values, and information as well as goods, services and capital. But before such an interchange can fruitfully take place, there must be a framework of equality of participation, influence, and results. In this sense, as long as the black man in America is excluded from this framework, it will contain such a basic weakness that its functions of interchange will be subverted to functions of exclusion and isolation as it has so many times before.

The problem of finding new physical patterns in which to encourage exchange, begins with a physical pattern in which the most isolated and disenfranchised group can bring themselves to equal exchange potential; that is, a condition of economic, political and social equality and respect. Clearly, this latter is not the consequence of the physical pattern. However, the environmental contribution (or obstruction) is part of the means of achieving it. This investigation will, therefore, range beyond the physical environment as a means of making the design proposal a part of a larger context. It will attempt to test the possibilities of interaction and exchange in the black ghetto to understand whether such a physical context can both serve as a model for future environments and serve as a place which helps the black community to achieve equality of condition and realization of potential. It will consider in special detail, the position of industry and industrial activity in effecting this development,

and the particular requirements of industry, workers, and community as criteria and constraints within a physical design.

The physical design will be given location and development based on the criteria put forth in the analytical phase of the thesis. It will deal with one site location, and some mix of activity (including industry) which advances the ideas of an environment conducive to interchange and communication.

C. Recognition of Constraints

When an action is proposed which requires change from existing practice and/or values, it is necessary to at least take account of what the principle inertias are in the societal system that is to be changed. The resistance which change encounters is dependent both on the strength of these inertial forces, and the acceptability or risk associated with the changes. It will, therefore, be part of my purpose to propose acceptable alternatives, or cite precedents which establish a basis for change in kind if not degree. Some of the more established constraints are:

1. Fundamental Economic Basis of Capitalism

    a. Optimization of costs and situation
    b. Oriented to market response
    c. Profit related to risk
    d. Evaluation of actions on economic criteria (both short and long term)

2. Existing White Racism and Negro Pathology

    a. Cycle of pvoerty, undereducation, underemployment, poverty, etc.

b. Negro militancy and the black man's self image.
c. White economic, political and psychological exploitation of the black community.

3. Governmental Inertia

a. Reluctance to innovate, thus a need for precedent.
b. Objectives develop from larger societal and lobbyist goals. Not always tied to an ethical/ moral basis or the neediest.
c. A legacy of liberty rather than equality; individual rather than community needs.

The designer may influence and participate in a process which changes these constraints, but clearly cannot effect such changes through design alone. This thesis will, therefore, examine the existing framework of the principle conditions to be changed so that proposals might enlist rather than collide with these forces.

Part II - The Existing Framework

The discussion of present conditions and trends in this section is by no means exhaustive. My objectives are to describe a point of departure from which my analysis and design can proceed. Therefore, the forces, groups, activities and relationships will be the ones central to my thesis but not total to the problem.

A. Public Policy

The policies promulgated by various levels of government for the regulation of land use and users cover a wide spectrum of activity and control. Indirect controls such as highway location decisions, tax legislation, the location of utilities and services, minimum wages, etc., all imply benefits and penalties to users of different sites, regions and states. On the other extreme, such actions as progressively inclusive zoning, physical restrictions on building dimensions, direct subsidy, urban renewal policy, traffic restrictions and so forth, clearly prevent the possibility of certain activities occuring in specific areas. Since policy is presently the outgrowth of the political process, it may be worthwhile to look at the equities and biases built into the system of policy determination in order to conceive an approach to implementing policies for mixed useage of land and compensatory programs for the urban ghetto.

Public policy is generally the result of compromise amongst interests and power groups that have a stake in the policy consequences. These interests represent concentrations of money, political control or population, and as such, all have the potential to alter the power structure. In general, however, as the interest is broader based but less concentrated, it is not as easily mobilized, and generally has far less at stake for each individual in terms of rationalizable goals. It is often because the political control rests with individuals of this group (rather than true representatives) that group interests are furthered. It is apparent then, that an unorganized, un-monied and unrepresented group, regardless of its size, will not have its interests furthered through the political process. This is a fundamental bias in our policy system.

The counterbalance to this bias generally has been in the person (or persons) of advocates. Often in the past, these advocates have remained out of touch with the group being advocated for, and have fostered policies which, though based on rationalized needs, were generally enacted in terms of majority values. Thus we have the debilitating systems of welfare and social services, and the unfathomable bureaucratic processes by which help might be obtained. The Protestant Ethic which underlies many of these programs and policies may have motivated these well intentioned social planners, or they may have had to yield

up their pound of flesh in terms of this ethic, to the political forces in exchange for enactment. The biasing policies can be brought into equilibrium by supplanting them with what I call equity based policies, or by complementing them with policies of reverse bias. These events occur after the elements that have been discriminated against have organized and exerted pressure. For example, the black communities are exerting pressure for local control of renewal, welfare, education, social services, job training, open housing, etc. Industry is provoking subsidies and tax concessions to locate in areas of unemployment. Mass transit programs are being stressed and highway programs challenged. Zoning practices are being questioned in the light of industrial outmigration. In short, the biases in public policy are being challenged, and the concessions yielded up are the consequences of new alternatives open to the previously discriminated group. In the case of industry, it is outmigration and loss of employment, taxes, etc. In the case of the black man, it is a growing militancy to try to bring down the system if the rewards of the system and the control of the system is not adequately shared.

The situation is such that the organizations, interests and power groups whose resources are committed in the city (and who evaluate situations in totally economic terms) are becomming progressively more in favor of larger scale funding to produce solutions of problems of the ghetto. The risks to their interests

are now higher and therefore the expenditure to protect it can be higher. In addition, the economic soundness of full employment, reduction in long term welfare costs, reduction in the costs of criminal acts, and the increased value of urban property, are edging these interests to the forefront of white support for programs to help the black community. This kind of leadership can implement public policy that has reverse bias. And I would expect that the next decade will see a tremendous allocation of private and governmental capital into the ghetto to not only fund the struggle for equality, but to buy off the threat to liquidation of white urban wealth posed by the militant, exploited disenfranchised black community.

The present framework, therefore, can accept the need for greatly increased expenditure. The raising of, allocation and level of funding are the specifics which require articulation and implementation.

B. The Determinants of Urban Industry

The locational decision of industry today is made at two scales. The larger scale or regional decision is determined by prerequisites to the industrial operation (e.g. material supply, labor, gross market, basic transport).[1] Certain industries are closely tied to supply (e.g. the extractive industries), however

---

[1]T. E. McMillan Jr., "Why Manufacturers Choose Plant Locations vs. Determinants of Plant Locations," Land Economics, August, 1965.

many will be virtually free to locate over wide areas without incurring significant cost penalties. Within these larger areas, it is possible to describe certain locational and/or site qualities that influence the site selection decision, and might prompt an industry to locate within an urban context. These, then, become the locational characteristics that attend urban industry.

It should be emphasized here that urban location is more than just containment within the physical and jurisdictional boundaries of a city. An island in Boston harbor might satisfy that criterion and have no more contribution than an isolated industrial site in Billerica. The urban context that is being considered is one in which the varied activities and land uses of the city are mingled and juxtaposed with industry. In this sense, urban implies interaction with differences. Part of this review of present attitudes is to illustrate the internal and external forces which inhibit or encourage that interaction potential.

1. Location

a. The market for the industry can be one or a combination of the following:

1. The urban area and its populations.
2. Specific industries within the urban area.
3. Surrounding the urban area (even to great distances) so that transportation cost is optimized.
4. Remote, but such that the difficulty of contact with and transportation cost to the market do not penalize the product profitability.

b. Similarly, suppliers can bias location to the city if:

1. The proximity reduces delivered cost.
2. The centrality reduces total delivered costs.
3. The proximity allows for lower storage costs of supplied materials.

c. Public policy influences plant location in a multitude of ways, some executed at national level, others strictly local.

1. Subsidy - either through gift, tax benefits, favorable capital rates and access, underwriting risk, lease, resale services, etc.
2. Zoning - principally progressively inclusive, however performance zoning is appearing and is a more equitable way of judging use compatibility.
3. Transportation network location biases land utility for industry.
4. Public utility regulation, development and encouragement establishes power and service differentials.
5. Income and property taxes.
6. Minimum wages and labor legislation.
7. Protective tariffs.

d. Transportation and traffic flow is most important to industries with multiple truckload supply and delivery per day. Otherwise, delay and inconvenience may be financially acceptable or may be less costly than direct delivery to a remote location. Unless an industry's market and supply are totally local, the present tendency is to cluster along urban arteries for ready access to long haul highways.

Rail delivery is often necessary for large bulk material users, however, unless the plant is very large, or requires large amounts of supplies from appreciable distances, (approximately 400 miles and up), or has products too large for trucking, the rail spur is not essential.

e. The principle deterrant to urban location for industry is the scarcity of suitable land at acceptable prices. The economics are clear and are well described by Shenkel.[2] Briefly, urban land is a fixed durable resource with utility. Interests competing for this land (residential, developers, commercial, industrial, etc.) can pay according to the income potential of the land. Industry's income potential is generally lower than commercial; therefore it is at a competitive disadvantage in acquiring land. The problems of industrial land use have engendered restrictions on where industry may locate (progressively inclusive zoning). Since much of industry's land is used as reserve (for growth, storage, parking, etc.), the utility of the land is further reduced (as much as 50-75%).

Industry in the city can exist if:

1. It is a high land-utility industry (either multi-storey or high worker/area ratio) or
2. The urban land market for industrial use is broadened or
3. The cost of land can be shared by a number of firms and/or uses (i.e. multi-storey utilization),

and the requirements of growth capacity and parking can be met.

f. Labor supply is an inducement for location around if not in the core city of an urban area. So long as the skills required can be readily taught and upgraded, the labor supply

---

[2] W. M. Shenkel, "The Economic Consequences of Industrial Zoning," Land Economics, August, 1964.

market will be related to the unemployment rates and wage rate differentials between the industry in question and prevailing jobs requiring comparable skills.

Since mass transportation systems are structured radially inward, and the poor and unemployed tend to rely on mass transportation, the clearest way to match job availability to labor supply is to locate centrally or in proximity to a poverty area.

The industries which are therefore amenable to urban location from a labor standpoint, are those which utilize easily trained semi-skilled labor and are not heavily automated.

2. Scale of Urban Industry

The foregoing discussion of locational determinants have some direct counterparts in the questions of industrial scale. Since these considerations are put forth from industry's viewpoint, we need not, for the moment, consider the impact of a large factory on a neighborhood. The two most important aspects of location that impinge on scale are transportation congestion and land availability. In the former, a large-scale operation would not only overtax a network of city streets due to peak-hour traffic, but it could cause considerable inefficiency in the supply to and distribution from the factory of material and products. The land aquisition problem is even more difficult. The grain of the city is such

that while certain sites may be of marginal utility to commercial activity, large tracts are rarely so unless there is some other basic flaw (e.g. marshes, absence of streets and/or city services, etc.). Therefore, premium land costs may be required for part of a sufficiently large site.

a. Stetzer's studies of industrial density in Chicago[3] and Logie's comprehensive work[4] have shown the broad range of density within and between various industries. (Density being defined in several ways: employees per land area, floor space/employee). Logie similarly shows differences in intensity and worker utilization (intensity being defined as the gross tonnage of material supplied and removed from the industry per production worker).

Both density and intensity limit the efficient use of large urban indistrial sites. High density and intensity create problems of traffic and material transportation. Low density sites cannot afford high utility land. Low intensity plants are quite suited to urban sites, and therefore would be the more amenable to large scale urban operation; however, they are tempered by density considerations.

b. The scale of land acquisition and plant construction is tied to industrial growth possibility. In an urban situation

---

[3]D. F. Stetzer, "Industrial Density in Chicago," Thesis for M.A. in Geography at University of Chicago, Dec. 22, 1965.

[4]G. Logie, Industry in Towns, London, 1952.

land held in reserve for growth purposes drains both initial outlay and annual tax payments. History shows that piecemeal acquisition of land and construction as growth occurs, results in basic inefficiencies and unacceptable inflexibilities. (e.g. See Whitman and Schmidt Study[5].) Since plants count on as much as 200% growth capability, the opportunities for large plant expansion in the city is severely restricted. The conditions under which this might occur are:

1. If addition vertically is satisfactory for plant operation.
2. If no severe penalty is levied for holding land in reserve.
3. If adjacent land acquisition is facilitated and premium costs do not result.
4. If options on adjacent land and structures are available to the industry and if such structures are suitable industrial space for their needs.

While many of these conditions might occur for smaller plants (or for a fraction of smaller plants), the likelihood that a larger plant could find these possibilities in the city are slim.

c. The scale of a plant is tied to the economics of the process and the flow of material. Plant sizes are some compromise between processes that tend to be linear, and the movement of goods and people which tends to require compactness for

---

[5]E. S. Whitman and W. J. Schmidt, Plant Relocation, New York City, 1966.

efficiency. Large plants, whose layouts are highly particularized by the production processes, would require layouts that may be hard to site or incompatible with the urban street system and neighborhood pattern.

3. The modern industrial plant has characteristically been a single-level production block, with ancillary functions housed in either separate buildings or separate wings of the main block on the plant site. The form of these buildings is a response to the rapid changes in production technology which necessitate flexible deployment of machinery, production groups and material control. This single level form poses a strong bias against urban sites, both because of the land demand of this form and the deadening effect of it on street activity.

   a. The processes and technology of current industry are reliant upon fairly heavy equipment arranged sequentially in some linear (though not straight-line) process. When the products being handled are large or awkward, there is a clear advantage in keeping this sequence on one level. However, it is not clear that vertical (or inclined) movement of smaller products or subassemblies cannot be made as efficiently if the building system has vertical movement designed into it. Likewise, linear production sequences are often run in parallel on one level, whereas a stacking of lines might be

comparably efficient. In short, the single-level plant is the result of design criteria that have been defined in terms of rationalized production. While it may be the most efficient system, many situations could be competitively efficient and flexible and be able to satisfy other interests. Any cost differentials are evaluable, and it seems reasonable to suppose that the increased overall utility of a different production organization in an urban site might warrant compensation to the industry by the beneficiaries of this organization (e.g. the city or state).

b. Non-production space, whether it be office, cafeteria, lockers, etc., has been treated as adjuncts to production areas to leave production areas as free and flexible as possible. While this attitude may not yield the greatest benefit (as opposed to efficiency), it is certainly not incompatible with urban location. The acceptance by industry of this kind of separation permits a more intensive utilization of land and may allow inter-industry combinations that are less expensive for the same degree of service and amenity.

c. Significant dimensions of industrial space cannot be categorized. The smallest bays for large industrial plants are approximately 25-30 ft. clear; 35-40 feet is common, but

exceptions of clear-spanning greater than 100 feet are sufficiently numerous to be considered commonplace. Small workshop industries should not go below about a 20-foot plan dimension. The height of industrial space is almost as varied. Large plants are likely to have 18-20 ft. clear ceiling heights, based on light, ventillation, machine heights, service and material distribution and the option of locating mezzanines in the production area. Workshop space is often only domestic or office height (8-10 ft.).
Only the very longspan factories pose problems for integration into the city fabric. The others are compatible with parking and commercial scales, and can be reasonably transitioned to, from domestic dimensions.

d. The issues of warehousing, shipping and receiving are potential problems in an urban situation. Warehousing is low utility use of land, and therefore is very expensive in proportion to its contribution to the production process. Shipping and receiving, coupled with temporary storage of materials and finished goods, present the problems of congestion and traffic conflict previously mentioned. Any diffusion of the shipping/receiving functions could reduce production efficiency. A concentration could cause street congestion and handling inefficiency. These elements suggest low-intensity industry for urban sites. However, with a

satisfactory design solution, the intensity can be extended upward without creating street congestion or gross material-handling inefficiency.

4. The environment which industrial activity imposes on the site and region is as varied as the processes which are involved. The wholesale condemnation of industrial proximity is far more a reaction to the 19th century blighting by heavy industry than to today's industrial activity. Nonetheless, industry today is quite capable of acts and effluents which can undermine property value and spoil environments. The primary difference now is that these are not necessary by-products of industrial activity and some can be curtailed without economic penalty, albeit some, over a long run. For example, pollution control by industry will reduce taxation for future governmental control of the pollution problem and thereby eventually increase regional property values. Reduction of excessive noise has a beneficial effect on worker productivity. Logie's table of possible industrial nuisance[6] deals with the heaviest industries, yet acknowledges that these nuisances are not inevitable. One can therefore argue that there is a wide range of industrial activity which need not adversely affect environment (of its own nature), and which may contribute positively to environment through visual, informational, diversifying contributions.

---

[6] G. Logie, Industry in Towns, pp. 77-79.

Regulating the interior environment of modern plants is as much a part of productive efficiency as is the flexibility for layout of process sequence. Some of these interior requirements will affect the suitability of the industrial plant for an urban site.

a. The lighting needs of modern plants above minimum industrial visibility levels (5 ft. candles at the floor surface) is dependent upon the type and size of work being performed. Most plants combine natural lighting through clerestories and roof glazing with artificial lighting in ceiling or suspended banks and special lights at work stations. The necessity to admit large amounts of natural light usually prevents any activity or major construction from occurring on or above the roof. Many large plants have been built with total artificial lighting and not all because of the necessity for totally controlled environments.

The economic arguments for and against natural lighting are not conclusive. If sufficient glazing is provided to give some contact with the outside, an augmentation of artificial lighting and a daylight "color reference," many of the objections to the totally enclosed plant will be overcome.

b. In many instances, industrial nuisance, as mentioned earlier, can be controlled to an acceptable level. In an urban site, however, the acceptable level in terms of

contamination may be unacceptable in terms of environmental amenity. Perhaps the least acceptable conditions are those which introduce an additional dimension of nuisance into the site. For example, a noise source at a busy urban street will not be nearly as objectionable as a mild odor in a neighborhood normally free from air contamination. Appropriately written performance codes can exclude unacceptable levels of noise, vibration, odor, dust, fumes, waste and effluents and so forth, without eliminating the possibility of many types of industry to be sited.

Nuisance is not only the process byproduct of some industrial activity, but can also be visual or "attractive" in nature. Industry which requires large amounts of uncovered storage of material or products exerts a blighting influence on adjacent land. Similarly, the safety hazards to neighborhood adults and children which may be the results of standard practice on non-urban sites, will require special design attention, probably a greater capital investment in plant facilities, or perhaps be so fundamental to the industry as to exclude it from an urban site.

c. One of Friedmann's[7] major arguments toward humanization within the industrial society is that the most significant influence on productivity is employee attitude toward work

---

[7]G. Friedmann, Industrial Society, Glencoe, 1964.

and management. While this is manifested in a variety of ways, the physical and social environment within the plant are good measures of the employers' regard for employees. An urban site enjoys an advantage in this regard. Aside from the general economics of heating and air-conditioning which can be effected by sharing of the environmental control system amongst various users, there is built into an urban site the ability to leave the work environment for a variety of different kinds of breaks. There is a different dimension of freedom in that more choices exist for out-of-plant services, ways to spend lunch and break times, and range of social contacts possible.

d. The non-production areas which were touched on before merit a little more comment. The combination of employee facilities amongst several industries could result in savings for the sharers. Lockers, showers, toilets, canteens, lounges, cafeterias, maintenance and janitorial equipment storage and equipment, entrances and training facilities, and so on, could be shared with minimal conflicts and resultant savings. In addition, the expanded contacts which might occur are desirable from social, business, and informational points of view.

5. In general, the non-transportational service requirements of industry are better met in an urban site. The city distribution systems of water, power, gas and steam save development costs normally encountered in rural plant sites. Waste treatment is often handled as part of the city sewage system which represents an additional economy. City utility supplied power is generally cheaper (except in developments such as TVA) because of the greater power usage per distribution system investment and the ability to use power generation equipment in its most efficient size.

The foregoing discussion has been general in order to point out that from industry's standpoint there are a number of good reasons for urban location. If it were possible to ease the impact of high land cost, and if a reasonable means of growth could be developed, urban location might be extremely attractive. Since the plant requirements and cost structures vary widely within and between industries, it is difficult to specify precisely which industries would prefer urban location. However, a summary description might be offered as a kind of image.

The urban industry is likely to be a small to medium sized plant (between 2000 and 100,000 sq. ft.) which is manufacturing rather than process oriented. It would produce goods that were high in labor quantity, but low in material quantity. The plant production could exist on several levels (for large plants) and would not require

major at-plant warehousing for production inventories. Labor density would be high and a principle market would probably be the metropolitan area. Typical industries might be:

- Costume jewelry
- Electronic component and assemblies
- Toy and game manufacturing
- Printing and bookbinding plants
- Ready-to-Wear clothing
- Dental supply
- Precision machine shops
- Office equipment manufacturers
- Recording and tapé manufacturers
- Sporting goods
- Laundry and cleaning plants
- Theatrical equipment suppliers
- Vending machine manufacturers
- Bakeries and dairy plants

and so on.

In parts III and IV a further specification of the industrial space to be designed will be made. At this point, some discussion of the practices and effects of mixed-use and cross-use would be in order.

C. The ability of different activities to exist in conjunction with each other occurs because of favorable economic, physical, and environmental relationships. Rather than look at specific activities and their compatibilities, at this point it may be more profitable to discuss the basic forces that relate activities and some of their consequences.

1. Urban Flux

a. In a broad sense, flux is movement of people, of materials, and of vehicles. The city can be represented as a pattern of flux on a micro or macro scale. Activity tends to align itself with

and reinforce these patterns, probably because doing so minimizes risk to the objectives of the activity. There are, however, activities which are virtually independent of flux pattern, and only require accessibility to be sustained. These activities generate fluxes if their attraction is great enough and often provide the input to transform the character of adjacent activities. Thus the primary activity within a high school, hospital, sport stadium, opera house, office building, factory, museum, church, railway terminal, etc., while having some locational determinants, is self-generating in terms of flux. Other activities may not rely continuously upon a flux, but nonetheless require it initially to enforce establishment. Still others are so totally dependent upon it, that a small change in location away from the flux would make its operation marginal or ineffectual. Flux is, of course, more than just so many people moving past or through a particular location. There is a wide range of motivation and disposition which attends people in transit. The tendency toward centralization of activities attempts to capitalize on a flux prepared to participate in the activity in a manner determined by the controllers of the activity. Even when favorable conditions of flux exist, there is the necessity to communicate the location and character of the activity in terms of its relation to the flux.

b. When the potential flux of a system (or city) is examined, several influences stand out. Firstly, a residential concentration is a flux potential, generally in proportion to its density over some reasonable pedestrian range (perhaps ½ mile in the city). Secondly, employment concentration is a flux potential, generally in proportion to employee density over some smaller pedestrian range (perhaps ¼ mile in the city). Thirdly, a unique activity is a flux potential which is biased by the distribution of intensity of activity within. Lastly, a transportation connection is a flux potential which is biased by the intensities of the activities it connects. Flux-dependent activities respond to these forces in terms of patterns and concentrations related to the flux.

A somewhat analogous situation holds for vehicular flux except that a compound cost-time parameter, rather than distance becomes the best indicator of the area from which flux may be drawn.

c. Flux has not only a pattern in space but in time as well. The time pattern is often regulated by the time pattern of necessary daily activities. Therefore flux-dependent activity often reflects the time pattern of the flux even when the activity could reasonably sustain constant intensity through the day.

d. Flux-dependent activity includes retail stores and services, cafes, bars, restaurants, hotels, parking garages, and to some extent, places of entertainment, social and government services. When independent flux generators become locally intense, the rise in land values alters the character of activity along the flux paths. This local intensity can occur when there is some unifying function which requires (or required) similar activities to by physically close (e.g. law firms near courts and records, research firms near technical universities or government research installations); or when some public presence or image is desired for future benefit (e.g. corporate offices, bank and insurance companies). In general, the local intensity will develop and reinforce the transportation network, since employee accessibility is a requirement. Furthermore, since local services (such as drugstores, places to eat and drink, bank offices, shops, etc) enhance the convenience of the working environment, local intensity will provide the impetus for such ancillary activities to develop. Finally, if the demand for intensity can be sustained, the land value will increase and the high investment in land will be protected.

These factors work to concentrate high utility, highly flux-dependent activities within the zone of intensity. This

concentration can actually lead to a monopoly of certain activities by a zone, if the presence of several similar competing activities centralize the availability of that kind of function (e.g. women's shops, department stores, art galleries, etc.) and the intensity difference between that zone and others is great enough to pose a risk in locating elsewhere. Thus there are two forces of activity segregation at work when high flux intensity is present. First, low utility activities are driven out by high-priced rents (or land). Second, centralization of certain activities takes place suggesting higher risk for outside locations and inhibiting their occurrence in less intense areas.

e. The consequences of the flux potential-land utility relationship points up some built-in biases in this somewhat free system of location determination.

1. Areas with insufficient flux potential develop only minimal facilities for the people there, generally providing only necessities. Since these activities may not have the flux to sustain them economically at prevailing price levels, they must raise prices to compensate for marginal volume. Thus there is a premium paid for convenience. When the users have insufficient mobility to use other facilities (as in the ghetto) and few local flux generators (as in the ghetto), their selection is limited and their costs are raised. In

addition, when these users go into regions of higher flux potential to buy, there is an outflow of disposable income which cannot have a multiplying effect in their neighborhood. Conversely, if the few local establishments are controlled by outside ownership (as in the ghetto) the locally spent money is removed from that area to the areas of the owners. Therefore, to the degree that flux generators are excluded from an area, local convenience and choice are reduced and cost is increased.

2. Flux generators, requiring only accessibility to be sustained, act reciprocally with transportation systems insofar as the location of one encourages the location of the other. A radial transportation system encourages intensity only at the focus area. Focus development withdraws intensity potential from other areas and therefore inhibits changes to the transportation system. Thus, not only are high utility activities and jobs centralized, but direction of mobility is limited as well.

3. High utility land is a concentration of money and therefore influence. Since policy and governmental action are responsive to power interests, the priorities for public services and considerations would be biased against the low

intensity zones (unless they had a compensating power voice). This bias is reflected in the inequity of public services (such as snow and trash removal, police protection, street lighting, street cleaning and repair, traffic control, etc.) which exist between wealth and poverty areas of the city.

2. In examining how activities group together in the city, one can look at the characteristics of the flux on which they depend. The demands for goods, services, recreation, amenity and income exists within virtually every dwelling group. Participation in activities offering any of these basics is dependent upon need, desire, convenience and cost. The risk to the success of an activity is minimized if the activity is located where participation potential is high. The prior discussion described this potential in terms of flux. This section will deal with the individuals in that flux.

   a. Nearly all activity participation can be engrossed by adjectives such as purposive, casual and impulsive. Generally speaking, flux generators tend to be purposive activities as do activities fulfilling basic needs. However, in the latter case, convenience is a far greater determinant in the selection of the specific facility. Casual and impulsive activity must rely on a greater irregularity in the frequency of motivation and therefore must either have given an image of its

character and location to potential users or be close at hand when they might decide to participate.

b. Disposable income is a fairly valid indicator of how a dwelling group's income might be spent. Poverty areas naturally have lower disposable resident incomes, and therefore a much narrower possibility of sustaining activity other than provision of necessities or provision of very low cost (to the user) facilities. Poverty areas with non-resident higher income fluxes need not be deprived of these other activities and in fact the poor may use them within their income potential. (For example, art supply stores, coffee houses, toy stores, movie houses, etc.) It has been a questionable but prevailing practice to develop low cost facilities in the areas of flux or power and not in the areas of need and poverty (e.g. skating rinks, swimming pools, museums, new schools, libraries, etc.).

c. Passenger vehicular flux is generally purposive. Hemmens[8] notes that only a small percentage of vehicular trips are made in the city without some particular destination in mind. Furthermore, about 80% of all vehicular journeys in the city are for a single purpose (i.e. to one or more places

---

[8]G. C. Hemmens, The Structure of Urban Activity Linkages, Chapel Hill, September 1966.

of the same "land use" types). Less than 10% go to two or more different land uses (when residential use is not included). This pattern indicates only that the vehicle is not used to link activities, but does not preclude the linkage of activities by foot or mass transit once the vehicle has been left. It is implied in Hemmens' study that there is not a pattern of association amongst activities sustained by vehicular flux. If a pattern of association and benefit is to exist, it must be sustained by pedestrian flux; that is, in fairly close mix and concentration.

The urban poor are excluded from a range of choice and convenience in many activities because of their own marginal condition and the avoidance of their neighborhoods by people, money and flux. Little is done to compensate by way of providing low cost desired facilities for other activities. If more remunerative work is found outside the poverty area, the local activities do not receive full benefit from the increase in disposable income. Nor can outside vehicular influx be counted on, unless the location is one of greatest convenience. In a radial city, vehicular movement is primarily to or from the focus and thus only one direction of flux may occur.

3. Thus far the development and support of activity has been refered to economic terms. Clearly, there are environmental

considerations which apply not only to individual activities but to the possible association of activities.

a. Any activity is a possible information source although its communication may need only be minimal for its survival. (It can describe how things are made, what goods are available, how people live and relate to one another, etc.) The city, therefore, is not only a pattern of flux but a matrix of information to be perceived at a range of scales and over time. Without quantifying what makes environmental information comprehensible, it seems safe to say that the information must be presented so as to make an individual desire to understand his perceptions. This suggests that the information be clear, that there is variety rather than monotony, and that an individual be able to relate the information to his own living pattern, experiences or aspirations. Thus, the more any environment becomes a perceived microcosm of people and activity, the wider the range of possible understanding and communication that can result.

b. The great majority of data we receive is visual. An environment, then, can be simplified as a system in which information flow is limited by controlling what can be seen. The educational process, as well as the relation which is established with one's environment, is strongly influenced not only by the openness of activity, but also by the range of activity that can be seen and the human

involvement in that activity. In the absence of understanding how an office, factory, store or hospital works, a symbolic representation of these activities by their facilities is meaningless. Environment should, therefore, give information on which to base future experience and present understanding.

c. Environmental quality, as a psychological reaction to physical surroundings, imprints itself in one's disposition to participate in activity. Conflicts between activities can occur because the quality imparted by one activity affects the motivation to participate in a proximate activity. (As a caricature of this case, consider the effects of a funeral home or hospital on entertainment establishments.) Several current practices are used to prevent or alleviate possible conflicts. Zoning is used on a large scale to prevent incursion by a possibly conflicting activity. Self-containment also occurs, in which an activity encloses its land or its space to exclude the influence of outside activity. Buffer zones also are established in which a transition to the setback activity can occur and by which a feeling of removal may be suggested. All of these means sacrifice communication as the price for insulation.

The problems of incompatible scale are often unresolved, for the current system, aside from zoning, is unrestrictive in terms of establishing physical relationship between flux (or user) and activity. (Historical districts are one exception to this control of scale.)

d. Actual physical conflicts which prevent the operation of an activity from being conducted as desired are more easily indentified (if not resolved) than conflicts of environmental quality. These conflicts can in part be prevented by design if performance requirements for subsequent users are known. This area will be treated in detail in Part III.

Most activities exert direct control over environmental quality just within their property limits. Even that cannot be assured, however, when the dominant uses of surrounding areas alter the environment (e.g. a boutique near Chicago's stockyards may smell like the stockyards). Similarly the control of surrounding scale or physical conflict (such as traffic, theater lines in front of shops, etc.) are beyond the control of an individual activity. The recourses presently practices to remedy these incursions on environment are a) zoning codes, b) relocation and c) introversion of functions (e.g. solid infill to block the view, acoustic isolation to shut out noise, hermetic sealing to shut out dirt, odors, etc.). Each of these acts mitigates the conflict but tends to result in a restriction of information potential of the activity.

D. Three kinds of use combinations are discussed in this thesis, and a clarification at this point may be helpful to the reader.

1. MIXED USE, as a term, means the presence in a location of a variety of activity (or land use types). Thus mixed use may be industry, plus residential plus shops plus theaters etc. It does not imply that one activity uses another's facilities.

2. SHARED USE, as a term, means that facilities are available to a number of users, none of which owns the shared use facility. Thus, a toilet or a car-park or a canteen, or a lounge, etc. might be a shared facility.

3. CROSS USE, as a term, means the use, by a second activity, of facilities occupied by a primary activity, generally at the discretion of the individuals who control the primary activity. (The meeting hall of a church for an art exhibition is an example of cross use.)

Cross use of facilities is presently an ad hoc situation in which a correspondence of space available and space required is realized to an acceptable degree. This situation is typically encountered when an institutional or publicly-owned activity makes certain of its facilities available for community group functions or programs. Privately owned facilities are infrequently cross-used, and then only when the owner's interests are furthered by the sharing group (of which the owner may be a part). Activities which could take place at night (such as adult education programs, political organization activity, discussion groups, consumer mobilization groups, etc.) could use space occupied normally during the day (schools, day-care centers, offices, churches, etc.). Since many of these programs are beneficial to the municipal government as well as the community, some financial support might be reasonable, both to compensate the owner of a premise for its use, and to encourage a base of support for these programs beyond those partici-

pants. For example, if the businessmen stand to defray expenses through part-time lease of space, and if honoraria are available for local speakers (or fees for local instructors) an activity has a wider good-will and communication base from which to pursue its aims.

Shared use, however, suggests that certain peripheral functions of a variety of proximate activities need not be duplicated for each activity. For example, parking, bathrooms, lockers, lounges, cafeterias, etc., are services common to many activities and may best be shared rather than duplicated.

Part III - Thesis Problem

From the framework sketched out in parts I and II, four areas of concern for this thesis have developed which broadly give the scope of my objectives:

1. To describe a possible policy using industry as a means of furthering community goals without compromising industry's ability to function.

2. To design for industry's needs so as to also meet the needs of workers and community.

3. To investigate design problems in mixed-use environments.

4. To investigate the design consequences of space and facilities programmed for cross-use.

A. The policy proposals are clearly directed toward the need for equality in the American system as a pre-condition to establishing urban environment of communication and interchange. However, there is a basic paradox in the policy process, as I propose it here. It is most important for the black community to participate in and control the policies and actions relating to its community and people . The black community has been the focus of exhaustive study without beneficial results, and as such, it is skeptical and hostile to non-productive communication with the academic community. Therefore, any study (which is only a study) must rely on translating written statements rather than ongoing verbal interchange as the voice of the community. This clearly bypasses the involvement of the community in the process of formulation and control

and is antithetical to the whole concept of self-determination and equality. This paradox cannot be resolved unless the solution is a real solution.

This thesis process, then, can at best be a process of benefit to me. The community objectives and conditions are my perceptions of what the realities are, and are not the realities themselves. My thinking has been strongly influenced by the writings of Malcolm X[9] and Charles Silberman[10] whose works give perspective and insight into the life of a black person in America. With this caveat put forth, the policy and policy instruments can be proposed.

1. Most broadly stated, the policy I propose is one of compensation. It is the white responsibility to provide the funding and access to information necessary to enable black communities to develop economic, political and human resources to the point where results and alternatives are at least equal to those of the white majority. Equality is achieved when equals feel themselves and their conditions equal, and therefore no simple economic or political formula for achievement of equality can be offered. This equality can be fostered through preferential economic and social

---

[9] Malcolm X, The Autobiography of Malcolm X, New York, 1965. Malcolm X Speaks, New York, 1966.

[10] Charles E. Silberman, Crisis In Black and White, New York, 1964.

policies, severe curbs on white exploitation of the black community and attacks on the instruments of racism through legislative, political, and moral forces. The policies proposed here will deal with the contributions which industry can make to the larger goals and which can have design implications.

a. Development of human resources engenders:

   1. Elimination of unemployment and underemployment.

   2. Development of marketable skills.

   3. Development of entrepreneurial and supervisory capacities and aspirations.

   4. Development of black ownership and control of community economy.

   5. Development of black ownership and control of meaningful portions of the American economic system.

A policy to implement resource development means programs and funding at all levels of skill and education and in all phases of economic life. It means blue collar training, supervisory experience, access to capital, marketing and production training, and ownership of business and industry.

b. Stabilization of the community as a safe, vital place to live means:

   1. Stabilization of the family by secure profitable employment for men and opportunity for supplementary employment and income for women and youth.

2. Development of avenues of leadership based on achievement by individuals in the community.

3. Development of community organization through which influence, power, and governmental response can be exercised and elicited.

4. Development of effective communication into and out of the black community through possibilities of personal contact in employment, commerce, recreation, education, residence, and government.

5. Development of vested interest in the community through business and home ownership

Policy to support the stabilization process means the long-term support technically and financially of industry and business owned or controlled by the black community. It means providing facilities in which industry can begin, as well as places of commercial, business, and industrial employment. It also means facilities which will attract outside flux, spending and contact.

c. In order that the community be a convenient place to live and have an adequate share of amenities, a policy should promote:

1. Development of facilities to support community desired programs.

2. A wider range of goods and services offered within the community's business establishments.

3. A replacement/rehabilitation/removal program for the physical environment under local initiative, control, and operation.

Such a policy must not only intensify flux within the community, but involve external flux as sources of commercial vitality.

It therefore must introduce employment opportunities to make the community a workers job market, and must provide ease of access to outside people for employment and other activity. The development of flux generating concentrations must be regulated so as to prohibit land values from ranging beyond the possibility of home ownership for local residents. This can be done through low utility flux generators (such as industry) or public amenity activities, or actual regulatory policy.

2. The means of carrying out these policies is primarily related to location rather than race. It seeks to establish ways of pumping funds, programs and control mechanisms into poverty areas with support raised from areas of wealth.

a. The two to be considered in this policy instrument are:

1. Economic Zone

2. Social Zone.

In the economic zone definition, a parameter reflecting median or per capita income, delineated in terms of zones of equal population (perhaps about 1000-2000 people) and reflecting a narrow income band about the median, would be defined. A factor reflecting the difference between the urban median and the zone median could then be determined (economic zone factor or EZF), which would be the basis for compensatory and preferential economic programs and biases. In a similar manner (but based on significant social indices such as

desertions, illegitimate births, school dropout rates, etc.) a social factor could be determined which would be the basis for compensatory and preferential social services. Revenue would be raised on some reverse basis reflected in property tax and perhaps a non-resident income tax.

The economic programs which might be promulgated could fall under several general categories:

1. Subsidy
    a. Lower lending and credit rates with city or state backing.
    b. Lower property tax rates and/or assessments.
    c. Easier depreciation terms.
    d. Lower public utility rates.
    e. Defrayment of plant or office construction costs or lease at subsidized rates, both for larger plants and beginning industry.
    f. Rent control and/or rent subsidy.
    g. Property improvement incentives.
    h. Mass transit rates keyed to EZF of station.
2. New Construction
    a. Government and public facilities locations - government offices.
    b. New school construction.
    c. Contract awards for new construction.
    d. New Housing.
3. Land Control
    a. Limitation of land speculation by high real estate profit taxes.

b. Performance zoning with local appeal and control.

4. Training Programs

a. Subsidized training industry should be developed which is profit limited and designed to teach new skills to the unemployed and underemployed.

1. The unemployed continue to collect unemployment at a decreasing rate during training. The industry pays an amount in excess of unemployment and adds to this during training, so that at the program's completion, the trainee has attained average industry pay. These programs might last 4 to 6 months for training and a similar period for employment in the training industry. Training would amount to a full work week plus evening or Saturday classes. After about one year in such a program, the trainee would have to leave the training program and either assume supervisory duties, compete in the regular job market, or begin his own operation.

2. The underemployed person upon entering this program would retain his job and attend some evening classes, while working a full Saturday. This effort would be subsidized by State or local unemployment funds such that take-home pay exceeded that for the unemployed trainee at the beginning of his training. After several months of "moonlighting" training, he would leave his underemployment and work full time in the training industry. His skill upgrading will take longer, but no economic penalty should result.

3. The training industry might be a community owned corporation subsidized by municipal funds and producing marketable goods. The supervision and managerial people would be undergoing training as well as the operatives, and their tenure might be limited so as to open up opportunities for others while they went on to form their own companies.

b. General industrial training programs could be maintained at all industries in poverty zones. These programs, financed by the companies, would only partially erode the subsidies they are otherwise

receiving, and would be effective labor pool resource developers. This training should be useful in terms of being productive for the company, and it should yield a pay level related to prevailing labor rates for the trainees.

5. Advisory Services

   a. For small business problems.

   b. For technological problems.

   c. For training programs and techniques.

   d. For job location, interviewing, testing and general information.

   e. For communication with urban business, industry, government and institutional leadership.

6. Exploitation

   The prevention of exploitation by outside ownership is extremely difficult in that incorporated ownership may obscure the outflow of money, bypassing any preferential policy extended toward low EZF residents. So long as there is no price control any economic penalties levied on outsiders will be passed on to customers which in turn, will deter the inflow of outside buyers. Therefore, any control of exploitation will either develop by boycott or by indirection. If non-resident income tax is biased by the EZF of the place of employment and strongly graduated, non-residents will be returning some of their profit to the city which in turn will spend it in the low EZF areas. If prices are raised to support this higher tax, the local businessman or shop owner will be at a competitive advantage.

There are several clear advantages to a compensatory system. First, it need not be promulgated as a racial system, but one of helping the poor to establish enterprises and control. Second, because it is tied to a median condition, as a zone

begins to make relative economic progress in closing the income gap, the zone gets less preferential yet equal treatment. This is very much a healing process in which the growing self-reliance of the community demands greater exercise of local initiative. Since the institutions and social patterns developed will be unique to the community, the less reliance upon outside support during their growth and maturation, the more indigenous will be the culture.

The precedents for this range of action are in existence in form and intent, if not in total substance, by private and public agencies and government from municipal to state and federal.[11]

Subsidy is found in all forms of assistance and incentives[12] and generally is regarded as a means of:

1. Circumventing man-made impediments (e.g. taxes, high interest rates, unfavorable transportation situation).
2. Buying jobs for surplus labor.
3. Overcoming inertia in the economy to move it toward competitive equilibrium.

Laird and Rinehart[13] suggest it can also be:

1. A priming of the economic pump.

---

[11]R. A. Well, "Federal Influences on Industrial Location - How Extensive", Land Economics, February 1964.

[12]J. E. Moes, Local Subsidies for Industry, Chapel Hill, 1962.

[13]Laird and Rinehart, "Neglected Aspects of Industrial Subsidy," Land Economics, February 1967.

2. A catalysis for economic activity.

3. An accelerator to adjust to market conditions through increased liquidity.

Estall[14] cites a wide range of services made available by private and public organizations for the "distressed areas" of America. Amongst these are:

1. Venture capital and low interest loans.

2. Lease of space and service facility.

3. Managerial, technical, and clerical services and advice.

4. Subsidies and tax incentives.

5. Information collection.

6. Sale and conversion of facilities.

Likewise, Great Britain has active programs of locational control, incentive and subsidy, along with extensive housing development through public agencies.

When such controls as FCC and FPC regulation of utilities; public housing, rent subsidy and rent control administration (e.g. in New York); federal depreciation allowances for special interests; commuter mass transit rate subsidies, and so forth are included, the precedents for extensive subsidies are apparent. The unique factor is that they have not been concerted in an effort to develop equal participation and control for a disenfranchised sector of the population.

---

[14] R. C. Estall, "Planning for Industry in the Distressed Areas of the U.S.A.," Journal of the Town Planning Institute, Nov. 1964.

Land value controls have been utilized in Great Britain to inhibit land speculation in new town developments. Indirect influences on land prices are exerted by federal, state, and municipal actions. Differential rates of taxation are employed by federal and state governments for different types of income; and performance zoning, while rarely employed, has precedent in appeals decisions which attempt to do what performance zoning would codify.

Finally, large scale training programs and work projects have been used since the New Deal to develop manpower pools and useful work in the times of loose labor markets and mismatched skill/job relationships. Programs such as the OEO has established, do not really tap industrial capability. Long-term reduction of unemployment costs could balance the costs of instituting and continuing these programs until relief of hard-core unemployment was achieved.

B. Designing For Industry's Needs in the City

This section and sections C, D, and E are much more a design intent checklist than specific program information. I will attempt to cite the factors which must be accounted for in urban industrial design, keeping in mind the objective of achieving an environment of communication and interaction through mixed use.

1. Site Considerations

a. Accessability

1. Roads scaled to accept and distribute commuter vehicles, material and service transport. Truck movement rate is almost constant between 9 am and 6 pm, and virtually 0 between 7 pm and 6 am.[15]

2. Provision for car parking during working hours. For urban industrial workers in general, approximately 60% drive their cars to work. For the poor (under $4000/yr. in 1960)[16], approximately 40-60% use mass transit to get to work.

3. Provision for truck docking, loading and unloading. These rates[17] are approximately:

	Range*	Average*
Light trucks	.65-1.72	.9
Med. & Heavy trucks	1.1 -4.8	2.6
All trucks	1.8 -5.8	3.5

*figures in truck-trips per day per 100 workers.

4. Parking location within 3-min. walk (approximately 900 ft. or three short city blocks) of a plant entrance. Plant location to be within 5-min. walk (approx. ¼-mile or five short city blocks) of surface mass transit and/or 7½-min. walk from rapid transit.

5. Parking accessibility such as to permit arrival or departure of all employee vehicles with a 10-min. period.

b. Site Density and Intensity

1. Unless factory space is specifically designed for an industry, the control of density and therefore the

---

[15] L. E. Keefer, Urban Travel Patterns for Airports, Shopping Centers and Industrial Plants, Washington, 1962.

[16] D. K. Newman, "The Decentralization of Jobs," Monthly Labor Review, March, 1967.

[17] L. E. Keefer, Urban Travel Patterns. . . , 1962.

amount of employment available is undetermined. For planning purposes, an average density of about 200 sq. ft. per worker will encompass most small to medium factories of low product intensity (approximately 50 tons and under). This means approximately 210 factory jobs per built acre. (See Logie[18])

2. By developing for an average intensity of approximately 30 tons (in and out) per worker per year, with the capacity for doubling this figure locally, the majority of potentially urban industry could be sited. Higher intensity capacities would be more closely tied to main feeder streets. Lower intensity, to either secondary streets or mass transit proximity (since density and intensity have roughly an inverse relationship).

c. Growth

1. A long range physical expansion capability of 100% of area and facilities for all non-nursery industry is reasonably consistent with present practice. This need not be accomplished by contiguous new construction but may be accomplished by annexing adjacent industrial space, with the displaced industries relocated in equivalent space. This suggests that juxtaposition of large plants is not desirable, since large plant relocation necessitates major production stoppages.

2. Open space may be held in reserve for expansion and used for public amenity (e.g. parks, athletic courts, public parking, etc.). When this space is desired for industrial expansion, equivalent facilities should be provided with appropriate access (perhaps on rooftops).

3. Expansion or addition in both horizontal or vertical directions should be possible. This implies that larger plants occupy part or the whole of the upper level of industrial facility groupings.

---

[18] G. Logie, Industry in Towns, Chapters 10 and 13, 1952.

d. Geological

Considerations of soil bearing and foundation requirements, water table and water ph, differential settlement, seasonal ground water and flooding, drainage and so forth all are necessary, since even single story facilities often have high dead loading and vibratory amplification where large equipment is present. While complete basements are generally not necessary, the possibility of some basement use cannot be excluded in urban situations.

e. Circulation and Open Land

1. In addition to the accessibility requirements, the movement of people and materials outside the plant must be accounted for. In a multiplant (or industry) facility, this would include ramps, elevators, stairs, and circulation ways common to two or more industries, as well as the open space which was part of the site.

2. Open space held in reserve can be part of the access sequence and a community amenity shared by the industry. Since community acceptance and employee attitude are relevant to productive operation, any contribution to environment or use favors all interests. The difficulty of course, is when it is necessary to withdraw land from public use.

2. Space Requirements

a. Production Process

1. General industrial space must take account of a wide range of processes which might occur within it; and be biased toward larger clear span dimensions (35' to 40') in order to provide some flexibility in production layout.

2. Small factories and nursery industry range in size from approximately 1000 to 10,000 square feet with flatted factories in England and the Netherlands in the 1000 to 5000 square feet range. Flexibility in layout would require a variety of possible proportions in which a factory might locate and grow. Smaller plants which are predominantly job shops would not be as dependent on straight-line production as would be

the mass production operatives. If a structural bay is one measure of system modularity, the bay need not maintain full clear span in both directions. Different additive proportions of space might be better suited for the variety of possible small industry needs.

Product size strongly influences layout and space, since small products readily handled by conveyor systems can be moved in virtually any direction within the capability of the conveyor system. Manual or fork-lift type handling of material in process can incur inefficiencies both for the time required in movement or the space required for in-process storage at work stations. The manufacturing space should expedite this handling problem.

Plants which rely on gravity flow in certain processes or have large vertical machinery, or have parallel production lines with small material handling problems desire a multi-level plant. If given a choice, however, (with other considerations equal) the remaining factory users would choose a single-level plant because of familiarity and flexibility potential. New small plants (approximately 10,000 sq. ft. and below) are invariably single-level production areas. In meeting urban industry's needs, therefore, the principle type of production space will be horizontal, with the possibility of vertical connection scaled as follows:

a. Extensive for large area plants
b. Local for smaller area plants
c. Shared areas for smallest plants.

It might be reasonable to initially design certain major ramp connections as minimal continuities between production levels, both to facilitate shipping and receiving, and to build in certain expansion potential.

Larger plants will require clear space equal to at least two residential floors, for lighting, plant systems and conveyors, circulation and so forth. Smaller plants will need a mix of low and high clearance, for both minimum cost space, and space with some flexibility of office location, expansion, complex systems, etc. Horizontal expansion should

be able to occur by extending the building envelope outward, as well as moving infill between areas. Some modularization of vertical dimension should occur to permit expansion and contraction of different height spaces without production floor discontinuity.

b. Personnel

The manning of each work station requires that an allocation of space be made for material, machinery, equipment and personnel. While the physical presence of the machinery (etc.) requires space, the range of movements and the work positions of the personnel are important determinants in production layout, and work station orientation. Part C is more comprehensive about requirements and relationships pertaining to the worker in an industrial plant.

c. Interior Circulation

Circulation on production floors is generally restricted to employees, vendors, or buyers. Circulation is channeled both to provide access and to minimize conflicts between material handling, movement of people and work operations. Circulation above or around a production floor is sometimes used to connect two non-production areas separated by manufacturing. The ability to make this connection across a production area suggests that a

similar connection between non-industrial uses could be made for public convenience and information without impeding production-area operations.

d. Material Handling

Space for shipping, receiving, preliminary and final storage and mobile material handling equipment is required but could reasonably be shared by a number of small or medium-sized firms with appropriate savings in space and payroll. In-process work is best stored close to its last or next operation and therefore common storage is not convenient.

The sharing of storage and inventory space works to cushion the peak storage requirements of a firm. Since the likelihood of simultaneous peaks is lowered by greater numbers of participants, the space requirement can be made closer to the sum of the averages.

e. Visitor Facilities

Industries receive buyers, vendors, applicants, public functionaries and at times the general public, into their facilities for all forms of business, technical and public relations needs. Although most of the interchange between industrial personnel and their associates usually takes place outside of the production area, I believe it

is the production functions that are the most vital, interesting and communicative actions of an industry. Current practice buffers the visitor from the plant operations and stultifies the contact areas. Exhibitions, shows, salesrooms, and reception areas could readily have visual connection to production areas. A number of firms might reasonably share these public facilities with benefits in cost and contact.

f. Non-Production Facilities

Offices and meeting rooms, design and drafting areas, and space for special functions such as key-punching, data processing, print-making, and document storage, may be necessary adjuncts of an industrial operation. Personnel services such as canteens, lavatories, lockers and lounges certainly are. A variety of large industries use between 5 and 10% of their enclosed facilities for administration. In an urban situation, particularly with smaller, higher density industries, the provision of about 10% of factory floor area for offices is probably reasonable. If this proves excessive for a particular group of industries, the surplus is available for general office rental. If it is inadequate, the industrial space could undergo partial conversion for office needs. Smaller operations do not normally have the need or

desire for separate office concentrations, and therefore, the provision of office space need not be made piecemeal.

Office space is not tied to the horizontality of production areas, therefore office functions on several levels are reasonable. The choice as to whether the connections between offices grouped on different levels should be internal or external to the office depends on both the nature of the external connection and internal communication between office groups. The opportunity for people at work to have contact with residents, shoppers and non-office people suggests external connections where contact but not conflict will be high. The larger circulation dimensions in such areas would produce economies in office space use.

3. Industrial Environment

The environmental needs of industry (as distinguished from those of the industrial workers covered in section C) are minimal. In essence, industry requires an environment in which it will have to make minimal expenditures to satisfy environmental needs of its personnel. Since conflicting requirements exist (e.g. minimum surface for thermal loads vs. maximum surface for natural lighting) it would be better to cite desires rather than requirements, and accept the fact

that in most situations, some compromise will be necessary.

a. Light - Maximum indirect natural light

b. Color - High reflectivity, low glare

c. Noise - Ambient noise levels at the levels deemed satisfactory for operation within factory and/or office areas (i.e. requiring minimum acoustic treatment for noise transmission in either direction.)

d. Vibration - Introduction of no external vibration, damping effect of soil and foundation and no structural connection to vibration sensitive uses.

e. Thermal - Minimal surface exposed to natural environment. No direct summer sun. Still air on exposed surfaces.

4. Services and Structure

Industrial service requirements are highly dependent upon the manufacturing process. Major process industries may require large quantities of process or cooling water. Others may prefer to purchase steam for either process or motive power. Process industries generate the greatest amount of sewage, and solid wastes are generated in great quantities by extractive and reduction industries. Urban industry which is low intensity (and probably manufacturing) is comparatively low in its service demands except for electric power. Existing city service and utility mains should be sufficient to handle the requirements of the small and medium scale industries being considered. A separate substation may be

required if the concentration of power required exceeds local distribution capacity.

The heating, ventilating and air conditioning requirements of an industrial operation vary with the amount of heat dissipated in normal operations, the exposure and construction of the plant, the comfort level based on activity, and the fresh air requirements due to the nature of the activity. The demands for flexibility in space allocation and combination suggest a minimum of ductwork and piping and initial investment, plus a localized control capability. If a preferential utility rate is available, electric heating with unit fans and ventillators and several centralized refrigerant chillers may be the best solution for multi-industry complexes. Some alternates might be using city steam or oil or gas fired hot water heaters or boilers serving groups of factories and other users.

Live loads for factory floors not resting on grade will be biased by the storage requirements of the users, and the scale of equipment and machinery being used. Munce notes that "Provision for floor loading of 500 lb. per square foot is thus barely adequate for many present machine tools. A figure of 1000 lbs is not unduly excessive to meet future needs."[19]

---

[19]J. F. Munce, Industrial Architecture, N. Y. 1960, p. 103.

The British and Dutch examples noted earlier used flatted factory live loadings of 224 psf and 154 psf respectively.[20] The smaller scale of industry and products for the city probably makes the lower figures more realistic, however a range in capacity might be reasonable for smaller factories (perhaps 200-400 psf) while 500 psf might be adequate for the larger factory areas in the city.

5. Cross Use and Shared Use

If industry is provided with the site, space, environmental and service systems to meet its needs, there will be some possibilities of cross use for the community included.

a. Certain job shop manufacturing areas can be training shops (e.g. machine shops, woodworking and furniture shops, sheet metal shops, tool and die making and so on).

b. Office areas can be training areas or program base offices (shorthand and typing, key-punching and data processing, book-keeping and office practices).

c. Reception areas and public circulation can be exhibition areas for local program achievements.

d. Lounges, waiting areas and canteens can be public rest and sitting areas, providing phone booths, refreshments, and a chance to talk to husband, boyfriend, etc. who is on a break from work.

e. Meeting rooms can be classrooms or discussion rooms for community groups.

---

[20] U.N. Dept. of Economic & Social Affairs, The Physical Planning of Industrial Estates, UN, N.Y. 1962.

f. Roof areas can become play areas.

g. Circulation areas can be short-cuts or protection against bad weather.

h. Open spaces can be pocket parks, plazas, tot playgrounds, etc.

i. Parking can be guest, restaurant or movie parking.

j. Dispensaries can be local first-aid centers or health clinics.

k. Workers and supervisors can be teachers and program personnel.

In short, the presence of urban industry, even when its design is only minimally compromised toward communication, offers a very useable resource for the community, and a possible way in which it can earn its subsidy.

C. Designing to Meet the Needs of the Worker

The industrial worker has often been reduced to the status of a machine extension and has as frequently responded accordingly. Many employers have come to recognize that such attitudes not only are resented and breed animosity, but that they are not economical in the long run. It is my view that the industrial plant is more than just the place where a worker is rented by an employer for specific functions. The place of work can be an on-going experience of the worker's contribution to society, so long as he can understand his role in the production effort and is treated as a contributor. This means establishing conditions under which he can work effectively, developing communication which will give him understanding of the operation and identity in it and providing facilities that respond to his needs while at work.

1. Access and Circulation

a. Micro-Trip to Work: The path, sequence, and activity along the way to his work place should give a worker an awareness of the kinds of activities and operations taking place in the neighborhood and other industries. There should be choice in the way to get to work when the distances are greater than about three blocks, and the choices should be different in kind as well as path. It should also be possible to get from car to work place with reasonable weather protection.

b. There should be adequate parking; and access and egress by car should not involve long delays (10 min. maximum; 2 min. average). About 50% employee parking should be provided with capacity to grow to 100% if necessary.

c. Circulation within the plant should give an understanding of the whole operation, yet be free from hazardous contact. Distances to non-work spaces (canteens, bathrooms, etc.) should be less than about 300 feet and should afford some contact with fellow-workers en route.

d. In the process of moving through the plant, there should be the opportunity of seeing non-production functions of the plant (e.g. office, showrooms, etc.) and of checking the outside (for weather, traffic, activity, etc.).

2. Physical Environment

The diverse aspects of physical environment receive comprehensive treatment from differing viewpoints by Friedmann,[21] Linehan,[22] and the Building Studies Group at Garston, England.[23]

---

[21] G. Friedmann, Industrial Society, 1964.

[22] J. Linehan, Human Conditioning in the Factory, New York, 1954.

[23] Building Research Station at Garston, England, Factory Building Studies 2, 3, 6, and 8, London, 1959-62.

The practices and recommendations of these authors converge, however, insofar as the dangers inherent in environments that: a) induce fatigue or give no relief from a monotonous task; b) cause strain or confusion in the performance of the work tasks; c) create discomfort in performing at the working areas, and d) fail to indicate hazards, instructions or directions to workers. These translate into color, light, surface, sound, heat, vibrations, etc., depending upon the task, the size of the piece being handled, and the byproducts of the other operations sharing the work space.

a. Lighting: Natural and artificial, background level and work station, incandescent or flourescent. Provide adequate lighting for the task, avoid glare, extreme contrast, shadow on the work piece and harshness of light. In color sensitive work, special lamps may be required.

b. Color: Walls and ceilings should be light for reflectivity. Machinery, various colors, depending on key motions, color of work, and concentration required. In general, intense colors are used in areas in which long concentration is not required or for information. Bright intense colors cause fatigue but are excellent accents and definitions.

c. Surface: Non-glare enclosures and skidproof walking surfaces are desirable. Floors should be cushioned for work which requires long hours of standing. Some textural relief is desirable if it is not overwhelming.

d. Noise: Noise is tolerable up to the point where it becomes oppressive (and fatigueing) or disrupts communication or interrupts ability to concentrate on work operations. Therefore, constant masking levels might be acceptable, but periodic or cyclic noise is disruptive and may have to be surpressed either at the operation, in the plant generally or by separation of that function. Despite the tolerability of even somewhat high levels of background noise, Friedmann

points out examples of large efficiency increments due to reductions from what workers considered "tolerable noise levels."

It has been found to be productive to permit radios at work stations, particularly to relieve monotony of a repetitive task. Clearly, high noise levels (above approximately 75 db) that interfere with reception, intelligibility and conversation are costly both in terms of worker comfort and productivity.

e. Vibration: Excessive machine vibration and structure-borne noise can cause not only problems in manufacturing areas, but in all structurally connected areas. Isolation mounts on vibratory equipment is helpful; however structural isolation would be more favorable if possible.

f. Temperature and Humidity Control: Even when products and equipment do not require controlled environment, workers' comfort and performance dictate the desirability of temperature and humidity control. Natural ventillation, while acceptable for a good part of the spring and fall, is inadequate for the summer. Depending on the amount of activity and heat generated in the production process, the relative loads and temperatures to be maintained will adjust within the comfort band. However, it is an increasing practice in factories and an expectation of workers, that an air-conditioned (and heated of course) environment will and should be provided.

3. Work Place

The work station in a production operation, or the work area in a job shop is the worker's microcosm and domain. It should therefore be adaptable dimensionally, environmentally, visually, informationally and psychologically to his needs, work rhythms and freedom. This should be done within the limitations of safety, the sanctions of the peer group in the plant, and (hopefully) a minimal set of work rules.

The restraints imposed by the production layout do not necessarily preclude the ability to converse with workers and supervision; have tack-up space, a radio and place for storage of personal effects (like lunch, thermos, magazines, a sweater, towel, etc.).

The work station should not be isolated to the degree that there is no chance to observe other aspects of the process going on, to develop an understanding of the context of the individual operation in the production effort. In larger plants, this becomes a problem which must be offset by circulation paths and connections.

The physical relation of the work station to the supervisory or managerial function is a very sensitive one. There is a balance between management's ability to observe production functions, and constant supervisory scrutiny which can undermine worker morale and breed animosity. On the other hand, total absence of supervision from manufacturing areas breeds attitudes of suspicion. Studies related b y Friedmann[24] emphasize the importance in breaking down the employee image of supervision as bosses and enforcers. It therefore might be more productive if workers could observe the supervision in their offices, but not the reverse. The

---

[24]G. Friedmann, Industrial Society, Part III, Chapters 2 and 3, 1964.

suspicion that supervision exists to spy on the workers is prevalent, and the physical ability to do so can be interpreted as the act. If supervisors must leave their offices or desks to check over the production area, the openness of the act is viewed more positively.

4. Non-Work Space

The importance of the worker being able to get away from repetitive or fatiguing work necessitates places convenient to work stations but of different character and removed from the production operations. While neither spartan nor posh, lounges and canteens should give a different outlook and allow a restorative break; they should be the workers' and not the company's places. With a sufficient concentration of people, lunch lounges and a game room might be reasonable worker amenities. On the other hand, proximity to a concentration of shops, cafes and restaurants, offers an attractive alternative to in-plant amenity. Furthermore, if housing, offices, schools, and so forth are in conjunction with the industrial plant, the worker amenities might serve larger groups with reciprocal courtesies extended by other activity groups.

The provision of washrooms, lockers, showers, and toilets is essential, and some emergency dispensary close at hand should be available.

5. Relationships

In the final analysis, the activity of work is a series of relationships, some of which have or can have physical consequence, but all of which contribute to the attitudes of a worker.

a. Relationships should be developed:

1. With co-workers (aided by physical facilities which encourage social contact and group formation).

2. With supervision and management as peers in charge of work functions and co-operating with workers.

3. With non-plant people as a further range of social contact, communication and experience developing out of the workers' employment situation.

b. The spatial organization should help the worker:

1. To understand the operations of his and other activities in terms of the space they occupy.

2. To identify with his environment through preservation of human scale.

3. To understand the orientation and location of activities in terms of sequences of movement related to their space.

4. To understand the connection between different uses in terms of their space and activity connections.

c. Visual connections establish relationships:

1. To many aspects of company operations to understand a particular job in terms of the whole operation.

2. To other activities and places as a means of relaxing and finding out what's going on outside the factory.

3. To visual symbols, codings, etc. as a means of information for action, safety, decisions, etc.

When the worker perceives his well being and identity supported by his company, experience has shown he will return this respect in productivity, quality and loyalty. Design should allow this support to happen.

D. Designing To Meet Community Needs

Much has been put forth in prior sections about the flux input of employment concentrations, the response of government to power interests, and the use of industry as a community stabilizer and source of experiential information. This section briefly considers some of the design actions and attitudes which Industry might pursue for community benefit.

1. Blight and Nuisance Control

Industry can have low-cost common storage designed which might be underground or in sheds internal to the industrial area. Any extracted fill might be used for park development or lowland fill. Prevention of nuisance, while probably incorporated into codes can be positively prevented. Building exteriors, public ways, and construction materials should be maintainable (or weather well) and pick-up areas for industrial waste should be designed to prevent the street scene from becoming trash-strewn physically or visually.

2. Flux

The common circulation paths for workers should relate to the

street activity both visually and with access. The principal access and egress should not congest the streets but could concentrate flux in areas that can use it (shops, stores, retail services, cafeterias and restaurants, etc.). Vehicular movement should be diffuse in the community street pattern, but condensed within non-sensitive areas.

3. Information

Work operations should be visible from streets, public ways within industrial buildings and adjacent buildings. Visibility should allow some understanding of operations, but it should particularly offer an image of man at work, producing. Public ways through the industrial area should be clearly public and reinforced by activity nodes which clarify its public nature. Such places as roof-top skating rinks, intermediate level cafes or game areas, street or upper level playgrounds, upper level nursery or day-care center, interior exhibitions and public program offices might give these paths a public character, as well as general openness and visibility.

4. Generator and Supplier of Services

By accepting cross-use, industry can plan production and office layouts accordingly. It can offer multi-industry tours, employment training and information services, make

its public areas places of social contact and help involve its personnel in the variety of community programs. It can organize and lobby for business and industry advisory services and be an instrument for disseminating these services.

5. Scale

Large-scale urban forms such as highways, high-rise towers, sports stadia, large parking garages, power plants, gas storage tanks, etc. are generally not compatible in scale with the grain of neighborhood life. Industrial plants can effect scale transitions and act as buffers (or links) to soften the dominance of these strong forms. If penetrability and visibility are designed into industrial mixed-use areas, the edge need not be deadened; rather a different quality can be introduced which will give variety and an added sense of place which can be a positive feature in a complex environment.

E. Design Problems In Mixed-Use Environments

Having begun from the premise that a city is a place of interaction and communication, the design problem becomes one of maximizing that possibility while minimizing the negative consequences resulting from its achievement. It would be fruitless to attempt such an evaluation by looking in detail at the characteristics, space, functions and requirements of use types.

Such an effort would be encyclopedic. However, physical relationships between activities have a more identifyable range of implications which can be posed as conflicts, incompatibilities, compatibilities and complements. These can become evaluative criteria in looking at specific use mixes in any design.

The form in which these relationships are posed is abbreviated. It is roughly A vs. B vs. C etc.; which means that one party (or activity) can desire A while another can desire B, while another can desire C; or one party is A while another is B and so on. For example: Activity Scale - Intense vs. Low includes the full range inbetween and poses a possible conflict between uses requiring different scales of activity. (For example, a men's club relative to a department store). As was pointed out earlier, such conflicts are often resolved by internalization of the functions. However, the premise of a highly communicative environment creates a conflict which suggests that such a juxtaposition in scale of activity should not occur between these two uses.

In reality, conflicts (or compatibilities) are sets rather than separable criteria. The desire for one physical condition may be the cause of conflict in some other condition. For example, the desire of a factory to have natural ventillation in the summer may create an intolerable noise problem for adjacent shoppers. Yet the factory noise may be excellent masking when the factory is weathertight. The fact that a physical conflict develops between two activities is not separable from use

attitudes which are formed only partially by considerations of the physical environment. In addition, conflict is not always undesirable if the process of its resolution can bring about more beneficial results. Therefore, identifying conflict possibility in design does not (a priori) necessitate their elimination through design.

1. Scale

   a. Scale of Physical Extent - Urban vs. neighborhood vs. domestic

   b. Service Scale - Intense vs. Low
      Varied vs. Single

   c. Scale of Building - Urban Reference vs. Neighborhood landmark vs. Human

2. Circulation/Flux

   a. Type - Service vs. Passenger
      Vehicular vs. Pedestrian

   b. Volume - Intense vs. Low

   c. Destination - Through vs. Local

   d. Speed - High vs. Low vs. Stopped

   e. Intent - Purposive vs. Casual

   f. Age Group - Elderly vs. Adult vs. Youth vs. Active child vs. Tot

3. Edge

   a. Form - Active vs. Hard

   b. Penetrability - Open vs. Closed

   c. Activity - Busy vs. Dead

   d. Access - Free vs. Controlled.

4. Environmental

a. Sound - Noisy vs. Quiet
- Continuous vs. Intermittent
- Unpleasant vs. Masking vs. Pleasant

b. Fumes/Odors - Strong vs. Trace
- Unpleasant vs. Pleasant
- Blended vs. Single

c. Sun - Exposure vs. Protection
- Direct vs. Diffuse
- AM vs. Noon vs. PM - Summer vs. Winter

d. Wind - Windy vs. Still - Summer vs. Winter

e. Air - Conditioned vs. Fresh
- Warm vs. Cool
- Dry vs. Humid

f. Enclosure - Covered vs. Open
- Exposed vs. Protected

g. Visual - Communicative vs. Concealed
- Privacy vs. View vs. Scrutiny
- Clarity vs. Random
- Identity vs. Anonymity
- Color - Intense vs. Subdued
- Exciting vs. Relaxing
- Illuminated vs. Dark

5. Control

- Public vs. Private
- Group vs. Individual
- Exclusion vs. Intrusion vs. Penetration vs. Welcome
- Expansion vs. Limitation

6. Economical

a. Growth - Initial Utilization vs. Eventual Expansion
- Obsolescence vs. Permanence

b. Flux - Generation vs. Surpression
- Purposive vs. Casual vs. Uninvolved
- Convenience vs. Accessibility vs. Available Land

c. Service - Amenity vs. Minimal Requirements
- Choice vs. Optimum

d. Effect on Land - Value Raised vs. Lowered
- Cost Raised vs. Lowered

e. Costs - Raised vs. Lowered

f. Use Association - Complementary vs. Competitive vs. Unrelated vs. Antithetical

6. Time of Use

- Morning vs. Afternoon vs. Evening
- Long Duration vs. Rapid Turnover
- Periodic vs. Constant Intensity

7. Social Contact

- Perfunctory vs. Meaningful
- Similar People vs. Different People
- Similar Roles vs. Different roles
- Obligatory vs. Voluntary
- Concentrated vs. Diffuse
- Encouraged vs. Discouraged

8. Miscellaneous

a. Codes - Conformance vs. Variances

b. Hazards - Safety vs. Attractive Nuisance

It may be apparent after scanning this list that many of the possible conflicts are inherent in human values differences as well as in the rationalized conduct of any activity. Like wise, because perception differs, that which the designer views as compatible may be seen as conflicting by some people using or controlling an activity.

This mixed-use problem for the anonymous client is, therefore, more than just the design for a use pattern of information flow and activity. It is an open maleable system in which differing viewpoints of how the environment should be, can be resolved.

F. Cross Use and Shared Use

While cross use possibilities cannot be comprehensively categorized, it is possible to cite some general requirements for the existence of cross use potential and a wide range of programs or activity that might reasonably take advantage of these possibilities. (These requirements will be developed in reference to some primary use type which could then be made available for other programs or activities.) In actual practice it would be desirable to match up primary and cross uses so as to make the facilities readily adaptable to the needs of all users.

1. Cross use potential exists when:

   a. Spatial groupings and/or machines and materials are free from primary use at "satisfactory" intervals. A satisfactory interval is determined by the needs of the cross use and might be as infrequent as an hour or two per month, or might require daily use for five or six hours.

   b. The facilities used are capable of being transformed to secondary use (and back to primary) with effort acceptable to either.

   c. The space available does not unreasonably restrict the possibility of the secondary user expanding its services and activities.

d. Quality of spatial groupings and the relationship of space and equipment, does not significantly impede the means or ends of the secondary activity.

e. The risk to the users is small and their interests are safeguarded during use.

f. Any costs associated with secondary use are acceptable.

2. Secondary users have facilities requirements met by one or a combination of the following:

a. Special use space (e.g. dramatics, athletics, machine work, etc.).

b. Space which is general for some basic use type (e.g. office, school, factory etc.).

c. Special equipment and/or available materials (e.g. business machines, computer equipment, lumber, scrap metal, machine tools etc.).

Therefore, the greater the conjunction of these facilities, the greater the chance of a secondary user finding its unique combination of requirements satisfied in one location (if not one building).

3. The programs that ghetto or poverty communities might develop range from those which attempt to develop attitudes of concern, to those giving direct benefit in economic, social, psychological or political condition. Facilities and equipment that have other primary use could accept many of these programs as secondary use. In addition, there are those facilities which are shared simultaneously by activities (such as lockers, canteens, toilets, etc.). The following

programs indicate a representative range of what might be developed by and for a poverty community.

a. Skill Development and Upgrading

1. On-the-job training programs and secondary production programs
2. Management and supervisory training programs
3. Trade and skill development programs - not employment dependent
4. Guidance, counseling and orientation programs.
5. Youth employment and co-operative programs
6. Classroom type programs on job related issues
   a. Examination study program - for union exams, civil service, college boards, etc.
   b. Information programs on employment issues (e.g. economics, pension and savings, automation impact, etc.).
   c. Union organizing/negotiating.

b. Environmental Programs

1. Design Workshop - technical and creative
2. Planning councils and planning aid
3. Service complaint coordination - environment
4. Information service on institutional/governmental actions
5. Materials procurement office - how and where to buy - what is available
6. Code and regulation advisory group

7. Home owners advisory group - financing, planning, home improvements and expansion, pressure-group formation.

8. Neighborhood environment program - clean-up, vacant land use, etc.

c. Social and Health Programs

1. Elderly care and training
2. Day care pre-school nursery
3. Infirmary dispensary/clinic
4. Family counseling services
5. Alcoholism/narcotics clinic
6. Psychiatric service.

d. Educational

1. Tutoring services
2. Library services
3. Remedial reading
4. Diverse supplementary education (e.g. music, writing, science, art, revolution,etc.)

e. Economic Programs

1. Credit Union - neighborhood or employee based
2. OEO co-ordination and program offices
3. Local small business councils
4. Consumer council and program
5. Setting up locally based services (e.g. canteens, drafting, model building, secretary pool, etc.)
6. Building and do-it-yourself centers
7. Co-op stores where services are not adequate
8. Tax assistance

f. Recreational Programs

1. Youth centers and game areas
2. Hobby centers
3. Visual aids center - film making and editing with public programs
4. Exhibitions
5. Playgrounds

6. Theater/drama/music - set design, lighting, acting, training
7. Arts and graphic arts, darkrooms, presses, process equipment, posters, etc.
8. Neighborhood equipment-making areas, e.g. playground stuff, street furniture

g. Political Program

1. Action group meetings
2. Neighborhood council meetings
3. Forums
4. Legal aid programs
5. Neighborhood/community newsletters and publications
6. Information service on political affairs
7. Ombudsman

People working in programs such as these may initially need wide mobility. In order to involve the community, it may be necessary to go house to house, rather than sit in a fixed location and await participants.

Part IV - Design Input

The discussions in the first three parts were made general in order to construct a contextual model of a community with industry. Part IV of the research will deal with the specifics of scheduling siting and programming a part of that model in order to proceed with the design investigation.

1. Procedure

The site for my design is within a roughly rectangular, 44-acre tract at the southwest corner of the South End in Boston. This tract has substantial amounts of unused open space, as well as extensive deterioration within its fabric. The tract is basically within the South End renewal area, being crossed by the proposed inner-belt highway at its southwest end. (A more complete discussion of the tract and site will be presented in Part V.) The study to be performed at the scale of the tract will not be planning as such. Its objectives are to determine a suitable site for the kind of use mix possibilities talked about earlier.

a. Site Selection

The site selection will take account of planned and existing:

1. Location, use and intensity of built-up areas and open land.
2. Street and highway character and intensity.
3. Public transportation.

4. Connections to important places and activities beyond the tract.

5. Physical condition of buildings and open land.

6. Economic activity.

7. Special features, references, landmarks, etc.

From these considerations, diagrams of possible vehicular and pedestrian movement and intensity, land use mix, rehabilitation and removal areas and larger scale connections will be made on tract maps. The site selection decision will be based on having possibilities of sustaining mixed use with industry while maximizing interaction (as expanded upon in prior discussion).

b. Time Reference

The design will be based on current conditions. It will be assumed that the inner belt will eventually be built in its recommended location (in this area) and be modified by the inclusion of rapid transit along its route. This need not significantly alter the highway design as the tracks might reasonably be underground in this area and made accessable from above at the edge or median areas. The design at the site will be based on certain assumptions about total redevelopment:

1. That redevelopment of the tract may not occur for five to ten years.

2. That it may not occur in the form of the present Boston Redevelopment Authority plan.

3. That changes to street patterns can occur if little or no removal is necessary.

4. That land acquisition for clearance or reuse is no obstacle.

5. That the construction of the new English High School will,proceed apace, and be occupied by the time a design such as I will propose might be built.

c. Use Mix

The specific use mix cannot be determined before the site selection investigation, however, the use types (in addition to industry) will be drawn from:

1. Residential - in primarily middle-rise density range.

2. Commercial - small to medium (approximately 500-5000 sq. ft.) retail goods and services.

3. Office - for use by firms in a wide variation of sizes (perhaps 300-10,000 sq. ft.) as well as office space for industrial firms.

4. Recreational - Public supported, such as swimming or wading pools, ice rinks, gymnasia, playgrounds, parks or gardens, athletic fields; with the possibility of a cinema or small theater, restaurant or night clubs, coffee houses, lounges and bars.

5. Educational - nursery schools and/or day-care centers, elementary school.

6. Governmental/Public Service - parking garages, police or fire stations, library, health clinic, computer center, etc.

The industry can be developed as three possible types:

a. Nursery and small industry, requiring plant sizes of up to 10,000 sq. ft.

b. General industrial space which can be planned up to 50,000 sq. ft.

c. Specific industrial space for a specific client.

Of these, (a) and (b) will be utilized on the site; however, space for a specific client might be treated spatially and locationally in a manner similar to general industrial space.

d. Site Development

The site to be developed at a large scale will be in the range of about four to eight acres. Within this area, investigations of use relationships, built density, pedestrian and vehicular circulation, domestic and industrial service systems, open space, expansion and growth, parking and transportation, will be undertaken.

It should be possible to identify and attempt to resolve basic conflicts in use, scale and environmental quality in the site design, working within the framework of conflicts and compatibilities put forth in Section E of Part III.

e. Detail Design

If time permits, a portion of the site will be developed in sufficient detail to show:

1. Industrial space and its relationships to circulation, other proximate uses, its servicing facilities, micro-climate and micro-environment.
2. Structural and mechanical systems for the industrial space and other space utilizing the same or dependent systems.
3. The possible use of industrial space in conjunction with office space and other non-production facilities.

2. Design Information

Writing a design program for unspecified industrial firms is, at best, a questionable enterprise. Every design variable must be a compromise between a condition that is acceptable to all activity, and a cost penalty which would be borne by only those industries which require that specific condition. The ideal system would be something close to a minimal system, to which increased capability might be added at costs comparable to rates achievable if these additions were part of initial construction. While it is possible to add additional banks of lights, it is considerably more difficult to change the clear-span dimension, double the floor load capacity or alter overhead clearance. One alternative is to provide a range of design criteria for each design parameter, and look at the consequences of these combinations.

a. Design Variables

If we look at three physical design parameters (1. clear span, 2. space height, and 3. load capacity) to see how they vary in terms of three basic conditions of production (product size, production method and plant size) for high density, low intensity industry, several relevant groupings will result (see Table IV-1).

1. Mass production techniques and large plants use heavier equipment and must be designed for higher loading.

TABLE IV-1

Product Size	Production Set-Up	Plant Size	Clear Span	Space Height	Load Capacity	Relation to Shipping level	Material Handling	Spatial Proportion
1. Large	Mass Produce	Large	Large	High	High	On shipping level near dock	Crane or truck. min. conveyors.	Varies with production line length
2. Large	Mass Produce	Small	Large	High	High	On shipping level	Crane or truck	Long rectangular for straight run. Rectangular for reverse run
3. Small	Mass Produce	Large	Large	Med.	Med.	Near dock but not nec. on same level	Conveyors in prod: truck or conveyors for shipment	Rectangular to square depending on line lngth and number
4. Small	Mass Produce	Small	Med.	Med.	Med.	Not too sensitive	Conveyors or manual	Not too sensitive
5. Large	Job Shop	Small	Med.	Med.	Med.	On or within 1 level of shipping level	Crane or truck	Not too sensitive

TABLE IV-1 (Cont.)

Product Size	Production Set-Up	Plant Size	Clear Span	Space Height	Load Capacity	Relation to Shipping Level	Material Handling	Spatial Proportion
6. Large	Job Shop	Small	Med.	Med.	Med.	On or within 1 level of shipping level	Crane or truck	Not too sensitive
7. Small	Job Shop	Large	Small	Med.	Med.	Not too sensitive	Conveyor, manual, or truck	Not too sensitive
8. Small	Job Shop	Small	Small	Small	Small	Not too sensitive	manual or truck	Not too sensitive

2. Mass production is the most sensitive to clear span since production lines, rather than flow between operators determines efficient organization of space for process.

3. Operations that are highly dependent upon cranes or conveyor systems; or which require large equipment (which probably has vertical dimension) require high manufacturing space.

4. Plant size becomes important when:

   a. Larger size justifies larger equipment or,
   b. Larger size changes the material handling equipment and requirements.

Since mass production of large products tends to produce intensity without density, that category of manufacturing will be minimal.

Nursery industry might reasonably be categories 4, 6, and 8.

Training industry (and training programs) would accomodate the widest range of skills in categories 1, 3, 5 and 7.

These eight categories can be reasonably combined into:

1. Space with long clear spans, two-story space and high-load capacity that can add to large production spaces.

2. Spaces with medium clear spans, and a mix of 1½ to 2-story high space with medium load capacity that can add to medium sized production spaces.

3. Spaces with smaller clear spans and a mix of:

   a. 1½ story high space with medium load capacity,
   b. 1 story high space with low load capacity,

   which can add; but do not necessarily become medium-sized production spaces.

b. Dependent Design Variables

A wide range of design variables exist which depend upon the

character and concentration of industry for their treatment or value. The table below (Table IV-2) cites prime reference sources which I will use for design input based on the development of the design at larger scale.

TABLE IV-2

Architectural Record - Buildings for Industry, N.Y. 1967
Garston, England, Building Research Station, Factory Building Studies #1-12., London, 1959-62.
Walter Henn, Buildings For Industry, Vol. I, N.Y. 1965.
Gordon Logie, Industry In Towns, London, 1952.
Edward Mills, The Modern Factory, Plymouth, 1951.
James Munce, Industrial Architecture, N.Y. 1960.

	Arch. Rec.	Garston	W. Henn	G. Logie	E. Mills	Munce
Environmental						
Light	pp. 43-49	Study 2	pp. 288-340		pp 67-77	pp.120-123
Color	18-23	Study 8				124-26
Noise		Study 6	222-25		pp.87-88	p.104
Nuisance			357-59	pp.71-79		
Air Cond.	39-42		364-67			116-24
Heat & Vent		Study 1 p.10-12	360-64		77-83	147-58
Materials Handling						
In-Plant Systems	pp. 10-13		pp.249-261		pp.91-96	pp.159-166

TABLE IV-2 (Cont.)

Materials Hand. Cont.	Arch. Rec.	Garston	W. Henn	G.Logie	E.Mills	Munce
Loading & Unloading system	pp. 82-84		pp.20-23	pp.87-97	pp.89-91	
Storage			393-96			p.223
Structure and Enclosure						
Loading		Study 1 p.4-6 Study 4	pp.44-45 178-81			pp.102-103
Clear Span	p. 16	Study 1 pp.7-8	pp.46-106			
Structural Systems			pp.46-106		50-62	
Enclosure		Study 11	pp.158-220			pp.86-113
Services						
Power	pp.34-38	Study 10	pp.342-356	pp26-33	pp33-37	pp.28-29
Effluent & Waste				pp.26-33	pp30-33	pp.128-131

TABLE IV-2 (Cont.)

	Arch. Rec.	Garston	W. Henn	G.Logie	E. Mills	Munce
Services Cont.						
Fire Protection & Safety		Study 9	pp.380-87			p.137-146
Non-Production Areas						
Offices			pp.402-410		pp.104-109	
Employee Services	pp.24-33				pp.124-137	
Parking & Transportation*				pp.26-33 84-113		
Roads & Intersections			pp.15-17			
Parking & Terminals			pp.18-19			
Pedestrian Circulation	p.30		pp.400-402			
Bicycles & Misc.			pp.28-31.			

*An excellent general reference in this area is N. Kennedy, J. Kell, and W. Homburger, Fundamentals of Traffic Engineering, Berkeley, 1966, dealing with roadway and intersections, capacity & characteristics, Chpts. VII, XVII, XVIII, XXII, XXIII; Parking & Terminal Characteristics, Chpts. VII, XXI, XXIV; Pedestrian characteristics, Chapter XIX.

Design input dealing specifically with the tract or site will be discussed in Part V. Pertinent Building Code requirements will be included in that part.

Part V - SITE

A. Description of Tract and Site

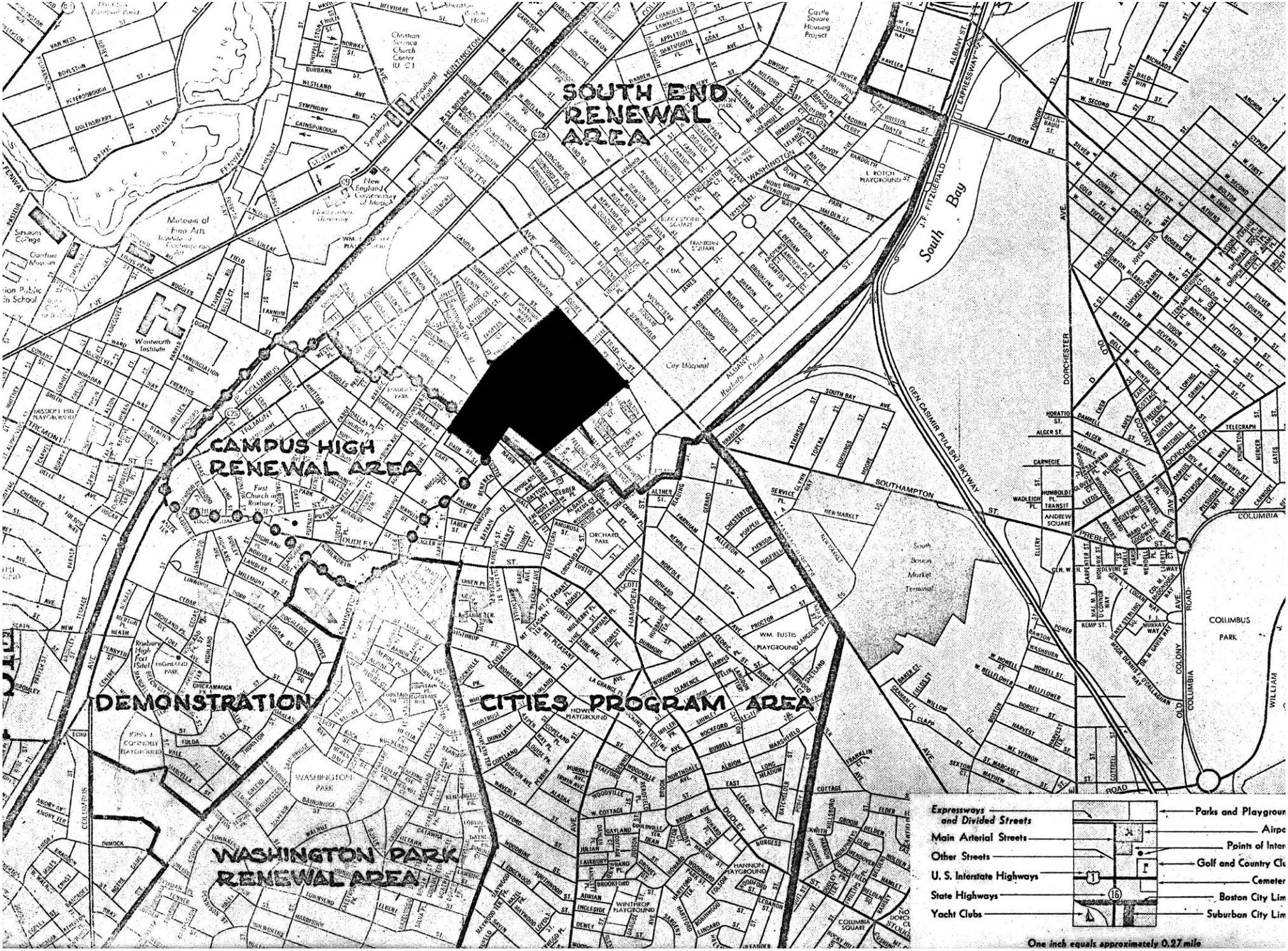
1. Location

The tract under consideration for this design investigation lies at the boundary between Boston's South End and Lower Roxbury districts (see Fig. 1). The tract is shown on Fig. 2 and is defined by:

- Shawmut Avenue on the NW.
- Williams Street between Shawmut Ave. and Washington St. on the far SW.
- Washington Street between Williams Street and Hunneman Street on the far SE.
- Hunneman Street between Washington Street and Harrison Avenue on the near SW.
- Harrison Avenue between Hunneman Street and Northampton Street on the near SE.
- Northampton Street on the NE.

The proposed inner belt highway intersects the tract below grade in a northwesterly direction adjacent to Hunneman St (see Fig. 3), and establishes surface collector roads along its right-of-way.

The tract is representative of South End orientation in that its principal streets are extensions or reinforcements of the radial road system generated from the downtown Boston focus. The one major exception is Massachusetts Avenue which lies parallel and one block away from Northampton St., the NE boundary. Massachusetts Ave. serves locally to link a wide


SOUTH END RENEWAL AREA
CAMPUS HIGH RENEWAL AREA
DEMONSTRATION CITIES PROGRAM AREA
WASHINGTON PARK RENEWAL AREA
South Bay
Expressways and Divided Streets
Main Arterial Streets
Other Streets
U. S. Interstate Highways
State Highways
Yacht Clubs
Parks and Playgroun
Airpo
Points of Inter
Golf and Country Clu
Cemeter
Boston City Lim
Suburban City Lim
One inch equals approximately 0.27 mile

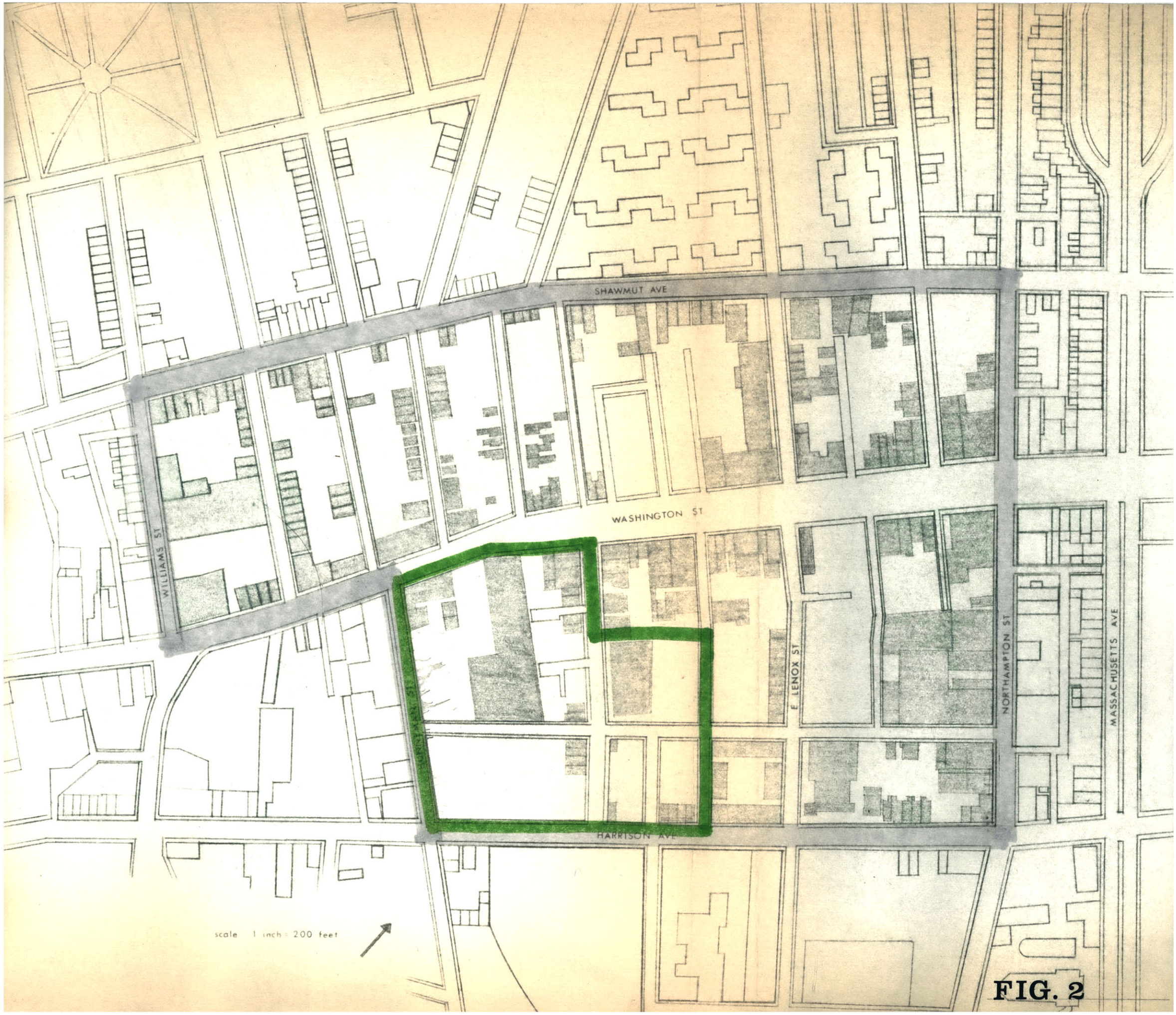

SHAWMUT AVE
WASHINGTON ST
WILLIAMS ST
HUNNEWELL ST
E LENOX ST
NORTHAMPTON ST
MASSACHUSETTS AVE
HARRISON AVE
scale 1 inch = 200 feet

FIG. 2

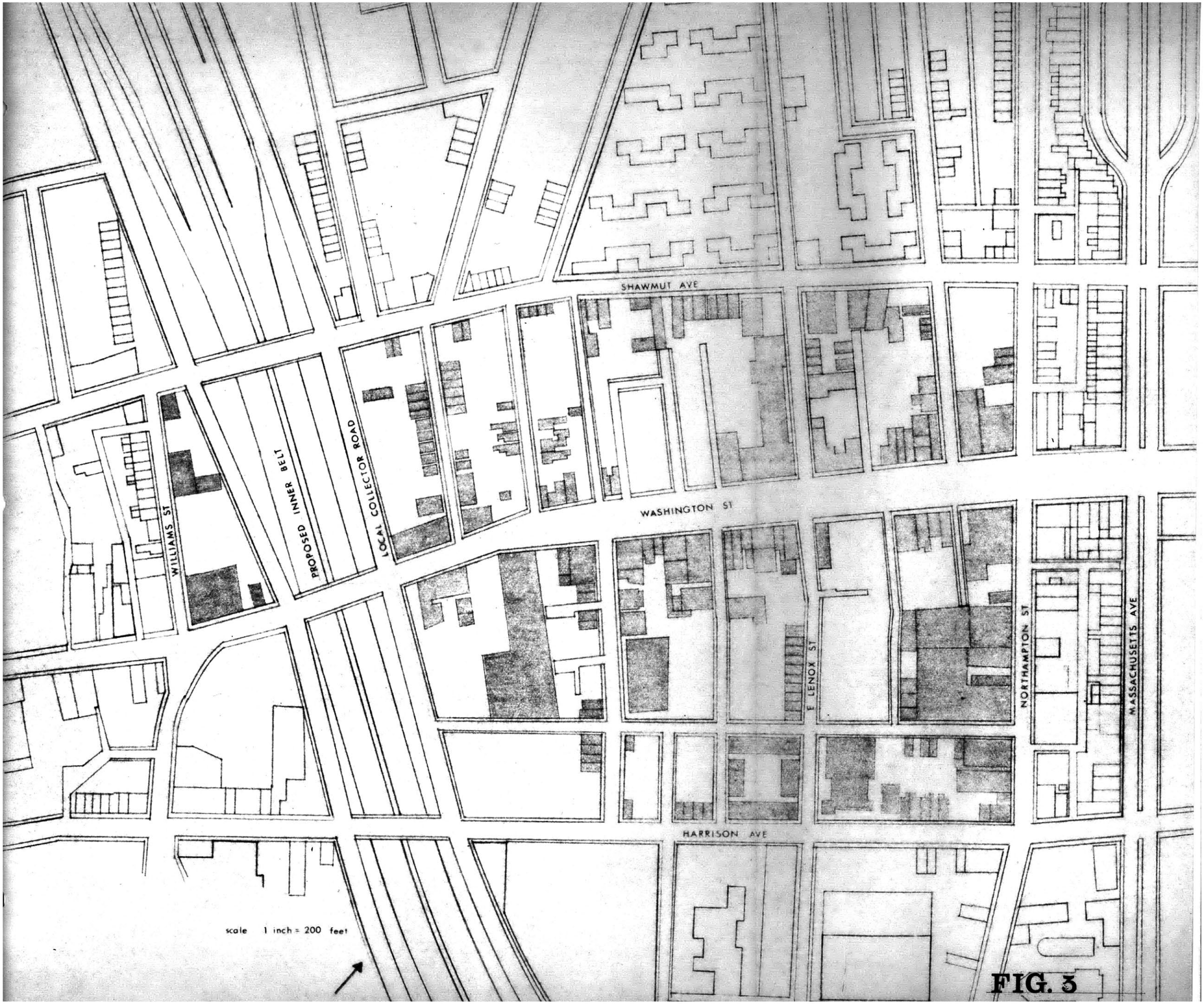

SHAWMUT AVE
WASHINGTON ST
HARRISON AVE
WILLIAMS ST
PROPOSED INNER BELT
LOCAL COLLECTOR ROAD
E LENOX ST
NORTHAMPTON ST
MASSACHUSETTS AVE
scale 1 inch = 200 feet

FIG. 3

range of vehicular activity:

a. Traffic leaving the Southeast Expressway for the Back Bay and areas to the W and SW of the Back Bay.

b. Traffic generated from the industrial and distributional activity to the E and SE to Cambridge and the northern suburbs of Boston.

c. Traffic coming from the southern residential areas of Boston bound for areas not more conveniently serviced by the expressway-turnpike system.

d. Local traffic moving in circumferential or non-radial patterns.

Washington Street, which essentially bisects the tract in a NE-SW direction, is a major connection between Roxbury and Downtown Boston. The rapid transit from Forest Hills (Jamaica Plain) to Downtown Boston is elevated above Washington Street throughout the South End. Transit stops at Northampton Street (Fig. 4) and Dudley Square (approximately 400 yards SW of Williams Street along Washington Street) are local transportation nodes. The Dudley Station-to-Harvard Square bus follows Washington Street from Dudley to Massachusetts Avenue (where it turns NW to Cambridge).

The campus high school and associated housing in the Madison Park Renewal Area will lie to the west of the tract across the proposed inner belt (and within the Model Cities demonstration area which is contiguous to the South End Renewal Area). At the east corner, the Boston City Hospital complex begins (Fig. 5), extending northeasterly along Harrison Avenue. Just

Figure 4. NORTHAMPTON ST. MBTA STATION ON WASHINGTON ST.

FIG. 4

FIG. 4

Figure 5. BOSTON CITY HOSPITAL ACROSS HARRISON AVE.

FIG. 5

FIG. 5

to the south of the hospital, along Massachusetts Avenue, access to and egress from the Southeast Expressway occurs.

2. Activity and Land Use

The land use and activity patterns within the tract become clear when seen in the context of the tract periphery. Washington Street is the commercial spine of the area. Retail stores and consumer services exist in high concentration along Washington Street northeastward from Dudley Square and southwestward from Massachusetts Avenue. Because of the more centralized location of Dudley to a residential population, and because of the transportation interchange which exists there, the commercial activity extending from Dudley is about twice as great (in terms of linear distance) as from Massachusetts Ave. (approximately 1/3 and 1/6 mile respectively). The area along Washington Street between these developments is a hodgepodge of decay, vacant or underused land, and fractioned, unrelated activity (see Figures 6 - 8).

Shawmut Avenue is essentially residential in nature; however large areas of cleared land exist behind the frontage to the NW (see Figure 9). Between Shawmut Avenue and Washington St., excepting E. Lenox and Williams Streets, vacant land, punctuated by enclaves of housing exist. Harrison Avenue and the area between it and Washington Street is primarily non-residential containing industry (and associated parking areas),

Figure 6. MASSACHUSETTS STORAGE WAREHOUSE CO. BUILDING AT WASHINGTON AND HUNNEMAN STREETS

FIG. 6

Figure 7. NORTHWEST SIDE OF WASHINGTON ST. SOUTHWEST OF THORNDIKE ST.

FIG. 7

Figure 8. NORTHWEST SIDE OF WASHINGTON ST. NORTHEAST OF THORNDIKE ST.

FIG. 8

FIG. 8

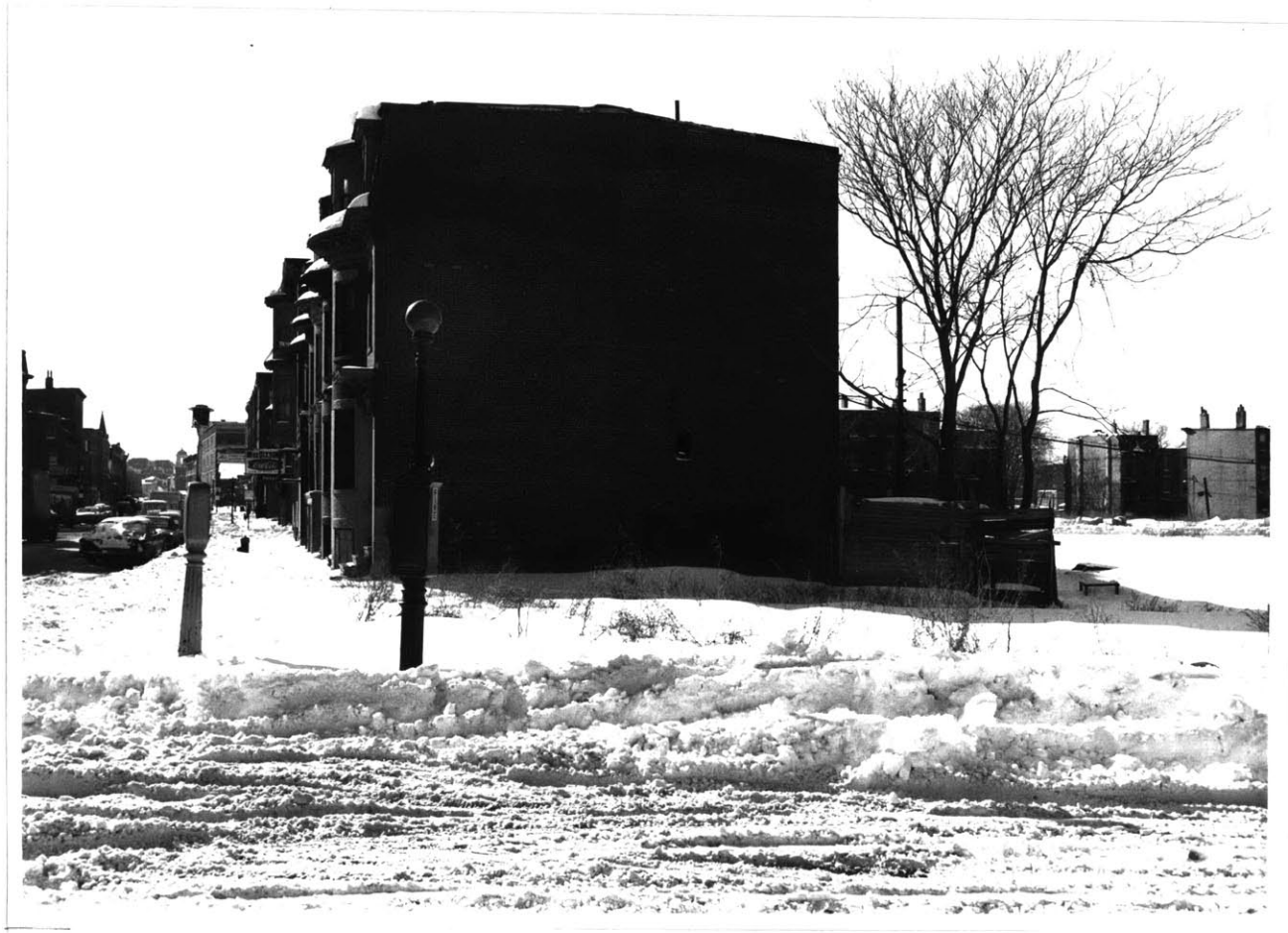


Figure 9. SHAWMUT AVE. AND VACANT LAND BEHIND THE NORTHWEST SIDE FRONTAGE

FIG. 9

FIG. 9

wholesale and supply firms, junk-yards, warehouses and garages. Green Shoe Company's manufacturing facilities and the Blanchard Liquor Warehouse abut the tract to the southeast, making an anachronistic scale and activity juxtaposition to a residential pocket at the E corner of the site (Figures 10, 11 and 12).

To the northwest beyond Massachusetts Avenue, the use is primarily commercial along Washington Street, and residential elsewhere. Little clearance or vacant land exists today, though decay is extensive in the physical condition. To the southwest beyond Eustice and Williams Streets, commercial and residential land use is more intense and strongly effected by the Dudley Square focus.

In summary, then, the tract represents a confluence of separate land-use patterns, blighted over time and only minimally relevant to the needs of the people in the area.

Figure 10. GREEN SHOE CO. ON HARRISON AVE.

Figure 11. BLANCHARD LIQUOR WHOLESALE WAREHOUSE ON HARRISON AVE.

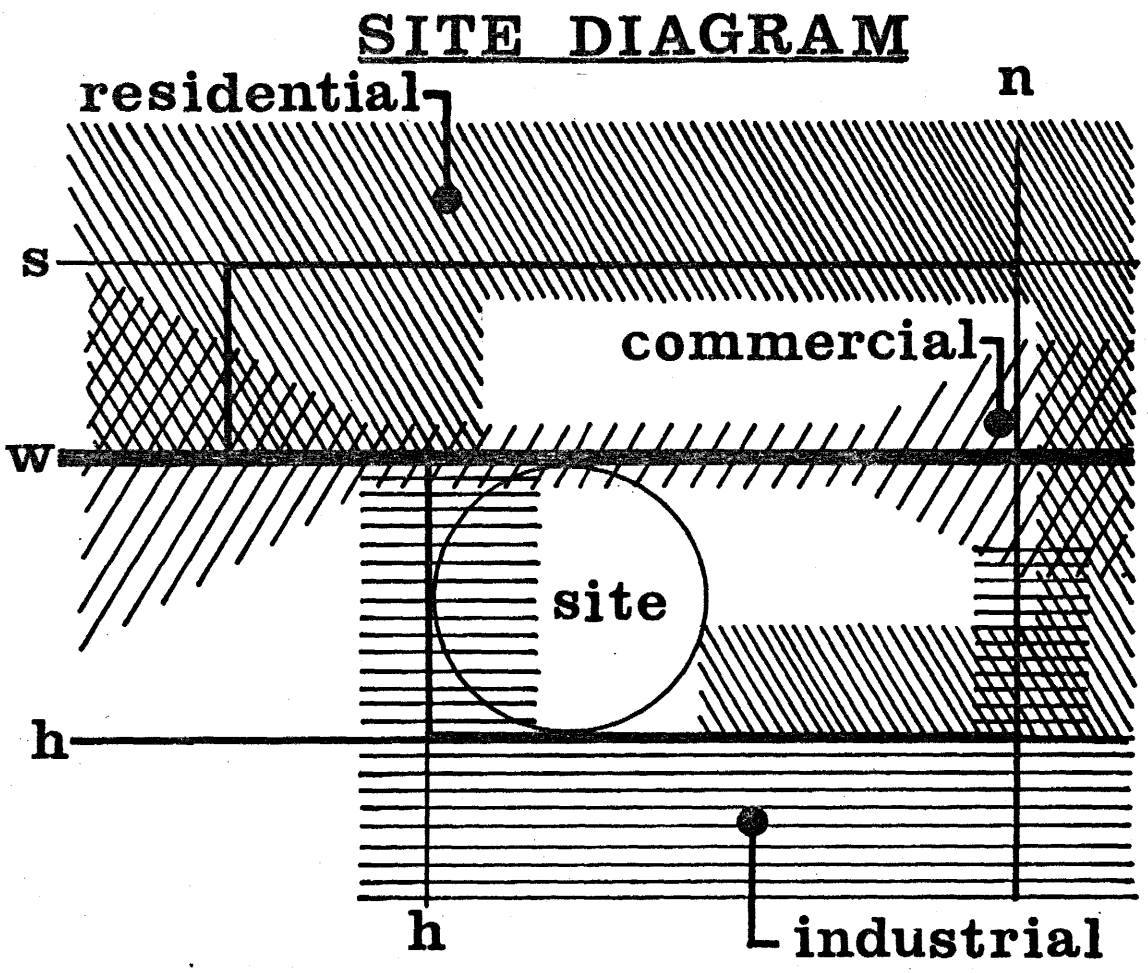
FIG. 11

FIG. 11

Figure 12. ROW HOUSES AND ST. STEPHEN'S R.C. CHURCH OPPOSITE BLANCHARDS ON HARRISON AVE. (RESIDENTIAL BLOCK BEHIND ST. STEPHEN'S IS OPPOSITE GREEN SHOE CO.

FIG. 12

FIG. 12



There has been no positive resolution of these patterns and forces with the result that the tract today (and particularly its central area) is almost dead, and the adjacent areas are in jeopardy of a similar fate.

3. Physical Pattern

The pattern of built density somewhat reinforces the activity patterns in the area. With the exception of the east corner of the site, the areas adjacent to the tract are more densely built up than the tract itself. With the exceptions of the

eastern and western corners of the site, virtually all buildings three or more stories in height require substantial or extensive rehabilitation to achieve the Boston Redevelopment Authority's satisfactory rating.

The single story structures, which house much of the tract's Washington Street commercial activity (Figures 13 and 14) are of more recent vintage (most since 1920) and generally in satisfactory condition. The presence of the elevated rapid transit, and its byproduct noise level no doubt made Washington Street frontage undesirable for residential and office use, and this is reflected in the buildings constructed in the era of the elevated.

By neglecting the "panhandle" of the tract (for the moment), the resulting square site can be described as a fringe of multistory structures, enclosing a bowl of single-story buildings and open land, with a pocket of older multistory blighted buildings in the center.

4. Circulation

Vehicular flow no longer corresponds to the radial predominance which the South End planners originally gave to the street pattern. As a result, the radial arteries are underused, and the Massachusetts Avenue circumferential connections overtaxed. The Massachusetts Avenue flow, as suggested earlier, is clearly not all locally generated; however, the lack of local circum-

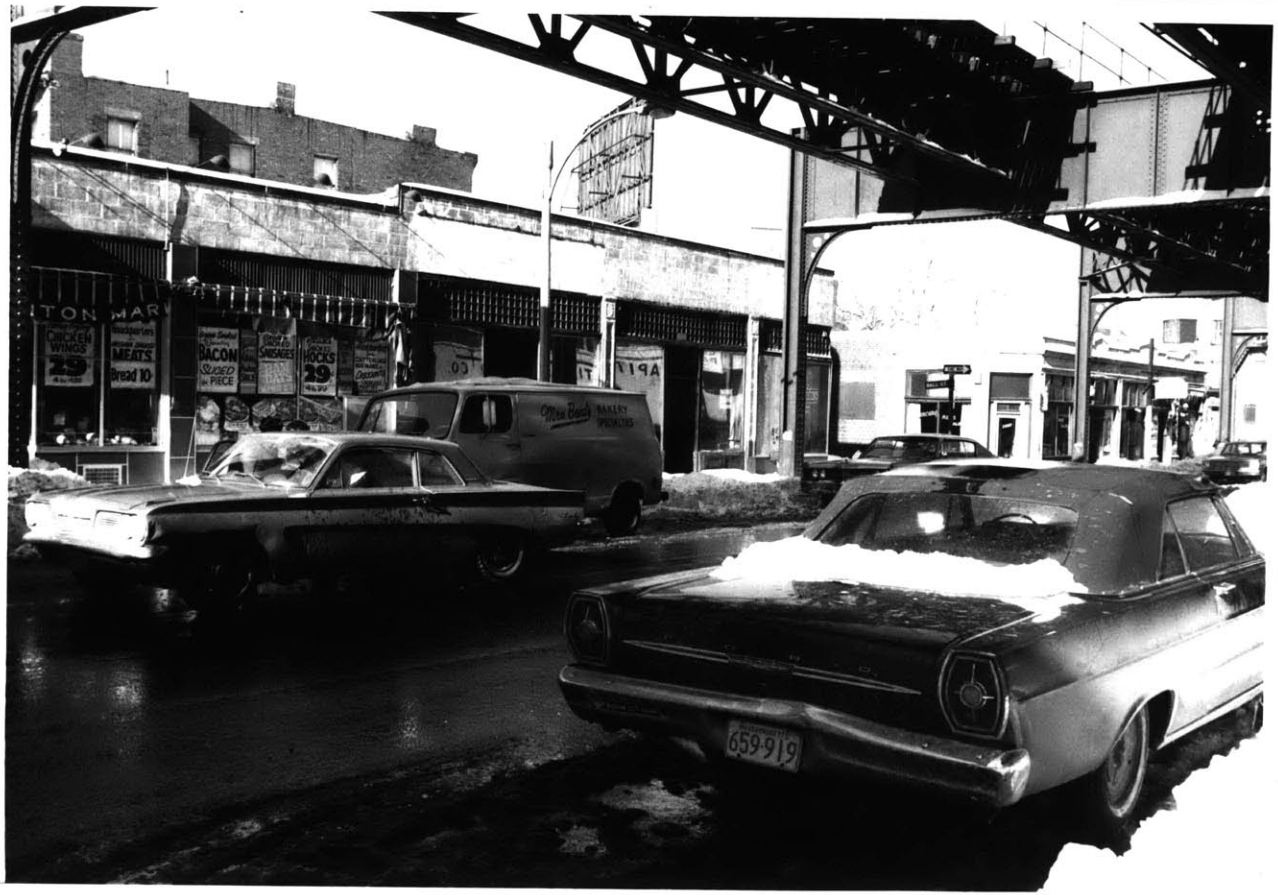


Figure 13. WASHINGTON ST. NEAR HUNNEMAN ST.

FIG. 13

FIG. 13

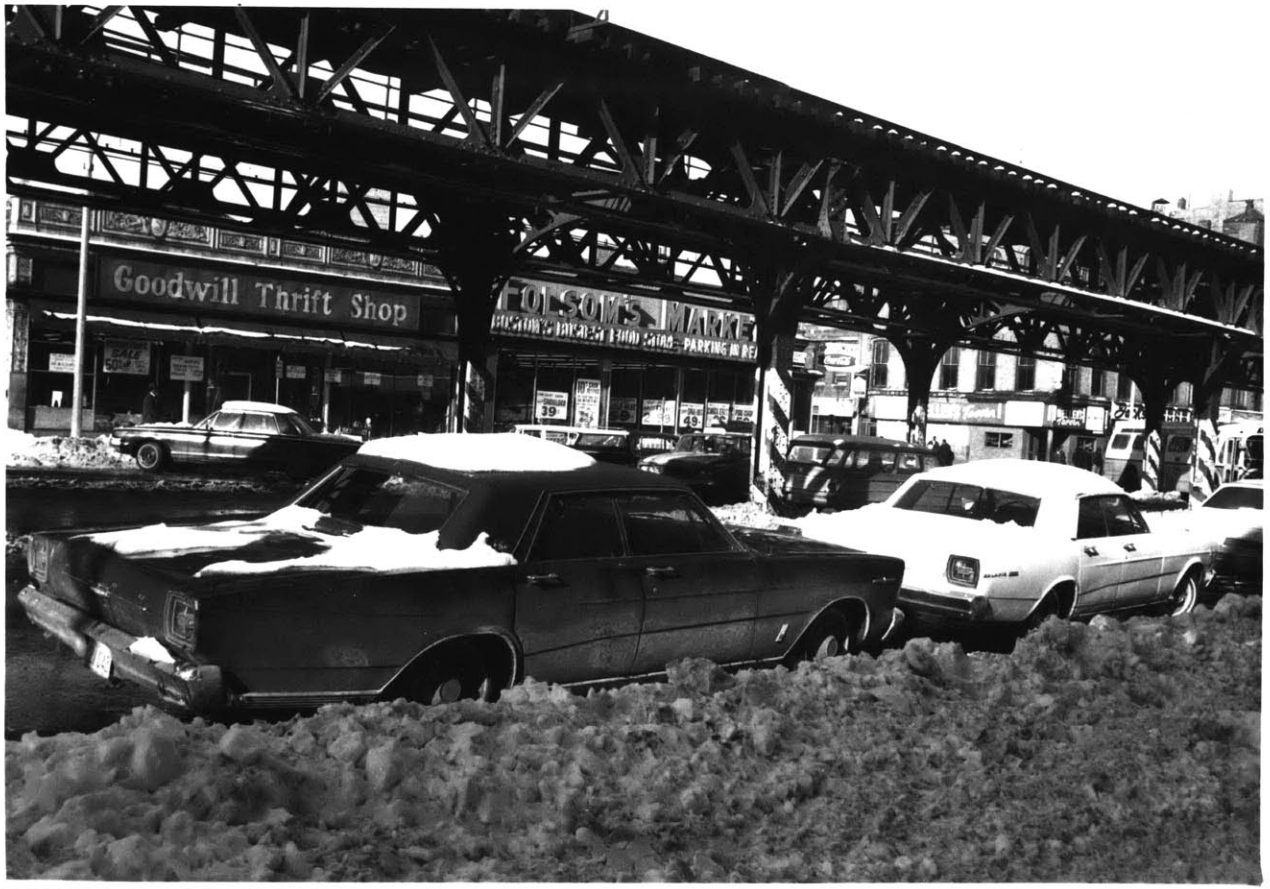


Figure 14. WASHINGTON ST. NEAR NORTHAMPTON ST.

FIG. 14

FIG. 14

ferential alternatives gives local drivers little choice. Washington Street presents a special problem, both because of the commercial servicing requirements along its edges and the elevated structure above it which is supported from the street. This restricts traffic to single moving lanes in each direction, which, coupled with the poor visibility beneath the tracks, slows the traffic flow. The other radial streets, both defining the tract and beyond, are not used to capacity. Shawmut Avenue is necked down in places which, in combination with residential parking demand, slows flow during peak demand periods. Harrison Avenue which is several feet wider and less used for curb parking, flows more freely despite comparable volumes to Shawmut.

The Boston Traffic Commission performed an 18-hour cordon count in 1961[25] the results of which are described in Table V-1. A pedestrian count during the same period reveals a virtual monopoly of pedestrian flow by Washington Street at the Northampton Street counting point.

Table V-2 indicates the connections that the principal streets within and close to the tract make with local and urban activity and residential areas.

---

[25] 1964 Cordon Count - Downtown Boston, Boston Traffic and Parking Commission, Boston, 1964.

TABLE V-1 1964 - 18-HOUR CORDON COUNT

Location of Count	Inbound to Boston or Back Bay						Outbound from Boston						Pedestrian Count
	Total Vehicles	% Cars	% Trucks	% Buses	AM Peak Hour Flow	PM Peak Hour Flow	Total Vehicles	% Cars	% Trucks	% Buses	AM Peak Hour Flow	PM Peak Hour Flow	
Columbus at Northampton	9,613	89.6	10.0	0.4	984	626	7,118	87.5	11.8	0.7	375	788	2,009
Tremont at Northampton	7,964	84.7	13.8	1.5	712	459	6,473	83.5	14.6	1.9	290	675	2,152
Shawmut at Northampton	ONE WAY OUTBOUND						4,524	87.7	12.2	0.1	194	652	1,449
Washington at Northampton	7,929	86.9	8.6	4.5	718	453	5,160	82.2	11.5	6.3	222	449	14,429
Harrison at Northampton	3,907	90.6	8.7	0.7	280	276	3,053	89.0	10.3	0.7	126	360	1,976
Albany Ave. between Mass. Ave. & Northampton	ONE WAY OUTBOUND						38,500	76.5	22.8	0.7	2,250	6,418	329
Mass. Ave. between SE Expressway & Albany St.	29,100	77.4	22.0	0.6	3,713	2,184	ONE WAY INBOUND						774
Mass. Ave. at Harvard Bridge	16,980				1,371	1,467	17,016				1,382	1,434	
SE Exprwy. & near Mass. Ave. exit	60,300	89.8	9.9	0.3			47,900	89.0	10.7	0.3			

TALBE V-2

Street	INBOUND Connect to	Approx. Distance	OUTBOUND Connect to	Approx. Distance
Tremont St	Downtown Boston theater district	1½ mi.	Harvard Med.	1¾ mi.
			Jamaica Pl.	2½ mi.
Shawmut Ave.	Downtown Boston theater district	1½ mi.	Dudley Square	½ mi.
Washington Street	Downtown Boston Govt. Center	2 mi.	Dudley Square	1/3 mi.
			Roxbury - Eggleston Sq.	1½ mi.
Harrison Ave.	Downtown Boston	1¾ mi.	No. Dorchester	1 3/4 mi.
	Tufts NE Med. Center			
Albany Ave.			No. Dorchester	1 3/4 mi.
Mass. Ave.	Cambridge (MIT)	1 3/4 mi.	So. Boston	2 mi.
	Back Bay (Pru)	1 mi.	SE Expwy.	½ mi.

5. Parking

The extensive local parking in the area is due to the Green Shoe Company's large facility on Harrison Avenue. Within the tract, large scale parking lots can handle as many as 750 cars (@ 350 sq. ft. per car), 530 of which are available to, if not owned by the Green Shoe Company. Many small residential or company lots also exist. The majority of the large lots are underused, and likely are held in reserve for physical expansion of future parking demand (see figures 15 and 16).

Figure 15. GREEN SHOE CO. PARKING LOT AT HARRISON AVE. AND HUNNEMAN ST. (ON SITE)

FIG. 15

FIG. 15

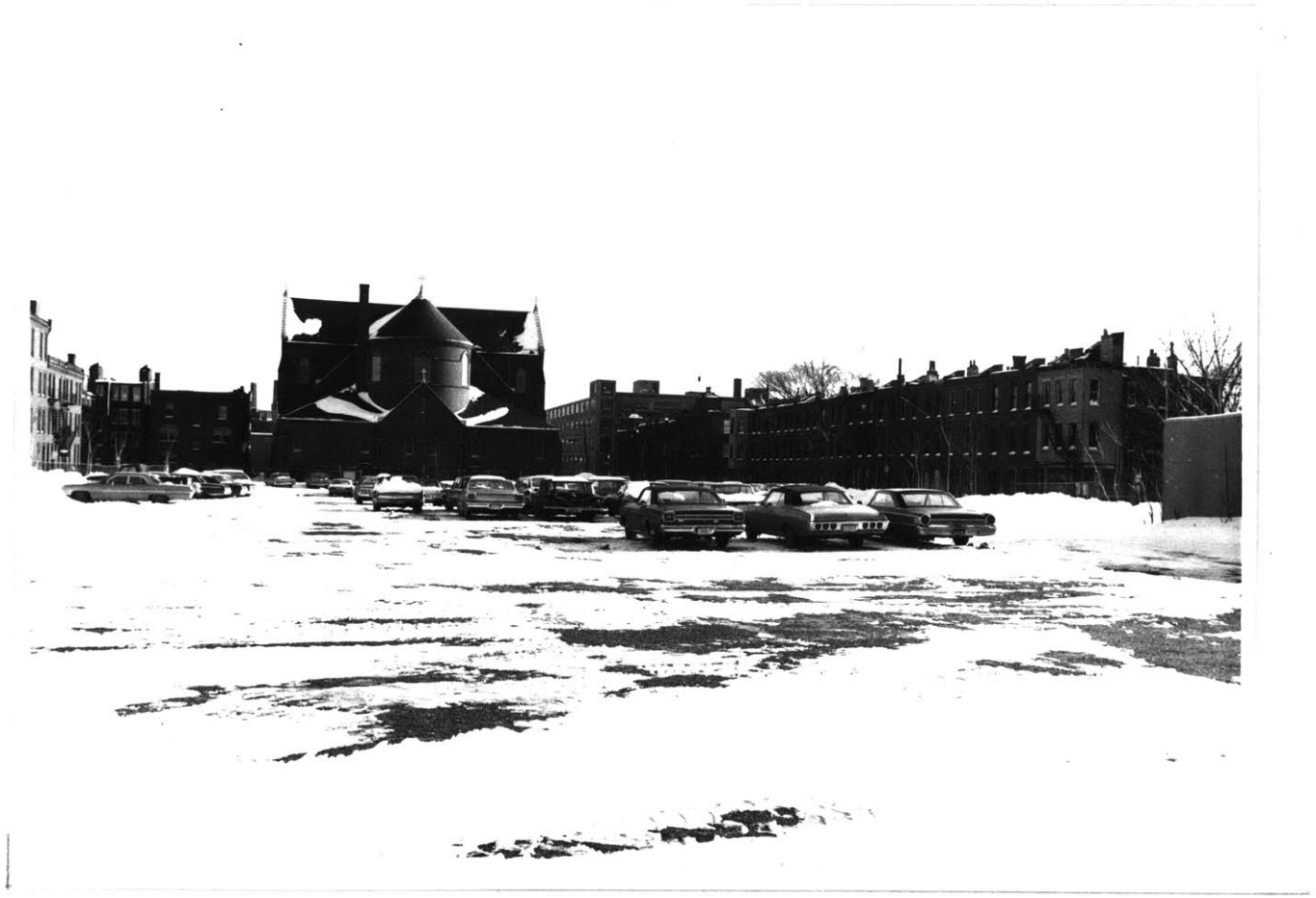


Figure 16. GREEN SHOE CO. PARKING LOT BEHIND ST. STEPHEN'S CHURCH NORTHEAST OF E. LENOX ST.

FIG. 16

FIG. 16

6. Housing Stock and Resident Population

The housing stock in the tract area can be estimated from a combination of building use and physical dimension and condition data. Although this is a rough means of obtaining such information, it does give an order of magnitude, both of the available housing and the impact of renewal in any area of the tract on family displacement.

Table V-3 summarizes the information within the tract and estimates population on the basis of 200 sq. ft. per person.

TABLE V-3

TRACT HOUSING STOCK

Condition of Buildings	Gross Floor Area* of Housing-Sq. Ft.	Est. Population
Satisfactory	48,000	240
Substantial Repairs Required	180,000	900
Extensive Repairs Required	170,000	850
Approximate Total.	400,000	2,000

*Includes circulation, structure, mechanical, etc.

The principal significance of these estimates is that almost 90% of the housing in the area is substandard.[26] Even though the gross residential density of the tract area (approximately 40 acres without encompassing streets) is about 50 persons per acre, it is concentrated in the east and west extremities such that the living condition is high density although the community services and facilities are dependent upon almost suburban densities.

The population characteristics, while not available as a unique census area, are reflected in the census parameters of encompassing and adjacent areas. The population at the east corner of the tract (near the City Hospital) is predominantly white with a high percentage of foreigh-born and first-generation native born (approximately 50%). This group has segments greater than 10% in Irish, Italian, Syrian, and Greek ethnic stock. Its age characteristics are skewed toward the elderly and away from the schoolage (relative to the greater Boston average).

---

[26] See Boston Redevelopment Authority, South End Report, Boston, 1962 (Unpublished), for a complete description of conditions warranting classification as satisfactory, minor repair, extensive repair, and major repair. I have changed these classifications to what I feel are more descriptive terms (in the absence of the complete B.R.A. explanation): Satisfactory - satisfactory or minor repair is needed; Substantial Repair - extensive repair needed; Extensive Repair: major repair needed.

At the west corner of the tract, the population is predominantly negro, and is a mixture of single adults, families with greater than average numbers of children, and elderly. All the symptoms of poverty and disenfranchisement are exhibited in the population'statistics, from the health and education parameters to the unemployment, income and residential stability indices.

Based on housing location, and assuming an existing 100% racial segregation, population of the tract is approximately 2/3-negro and 1/3-white. The open land and parking lots, which act as buffers between these two zones give this 100% segregation assumption credence, and observations at thc tract generally support this assumption.

7. Microclimate

Information on microclimate is included in Appendices A-1 through A-3.2.[27]

B. Pending Proposals

Three major renewal/rehabilitation programs affecting or altering the tract area are presently in existence:

A. South End Urban Renewal Plan (Figure 17).

B. Campus High School Urban Renewal Plan (Figure 18).

C. Demonstration Cities Program.

---

[27]Data from J. R. Myer. Class Notes for Architectural Design. Unpublished.

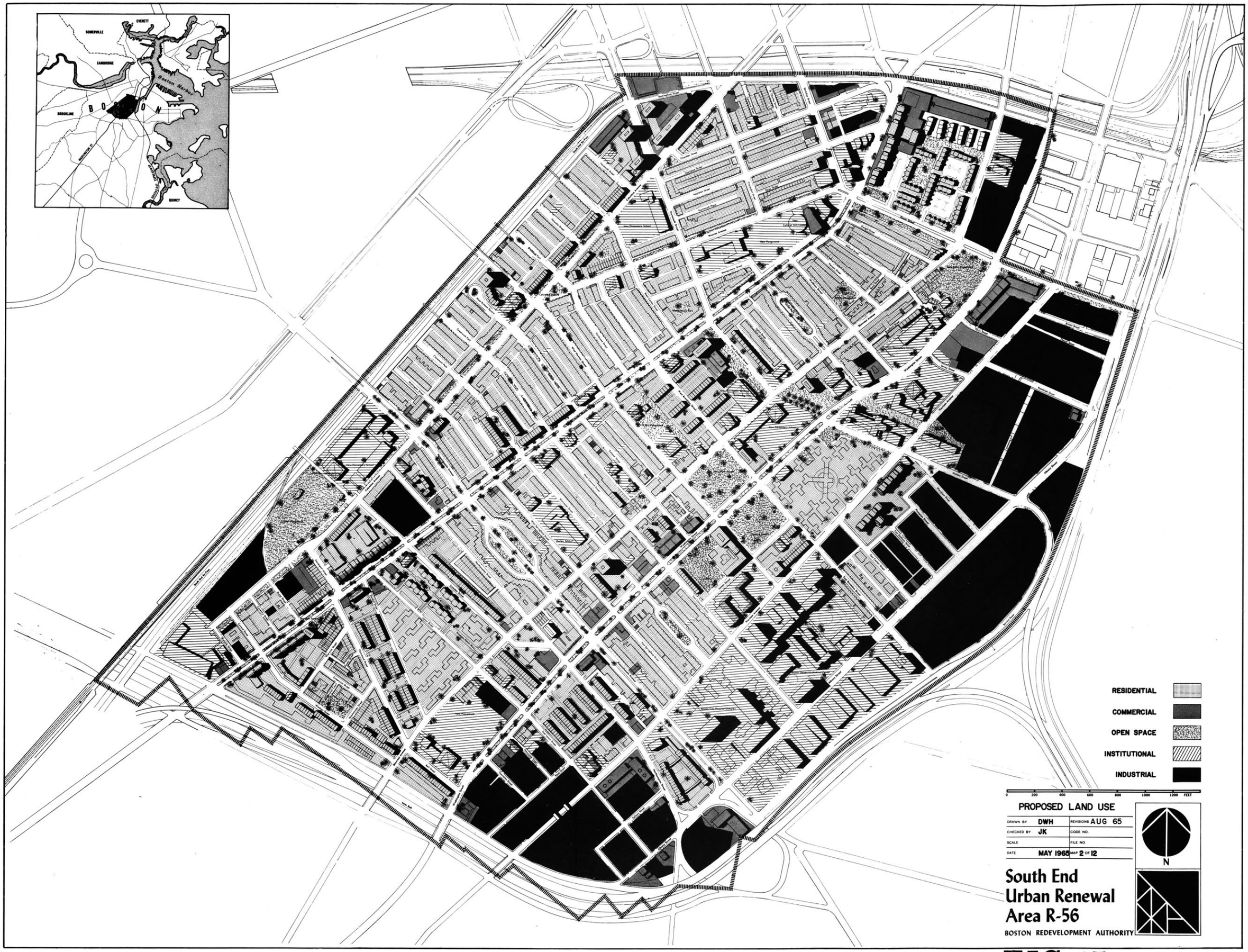

SOMERVILLE
EVERETT
CAMBRIDGE
Boston Harbor
BROOKLINE
B O S T O N
QUINCY
RESIDENTIAL
COMMERCIAL
OPEN SPACE
INSTITUTIONAL
INDUSTRIAL
0 200 400 600 800 1000 1200 FEET
PROPOSED LAND USE
DRAWN BY DWH
REVISIONS AUG 65
CHECKED BY JK
CODE NO.
SCALE
FILE NO.
DATE MAY 1965
MAP 2 OF 12
N
South End
Urban Renewal
Area R-56
BOSTON REDEVELOPMENT AUTHORITY

FIG. 17

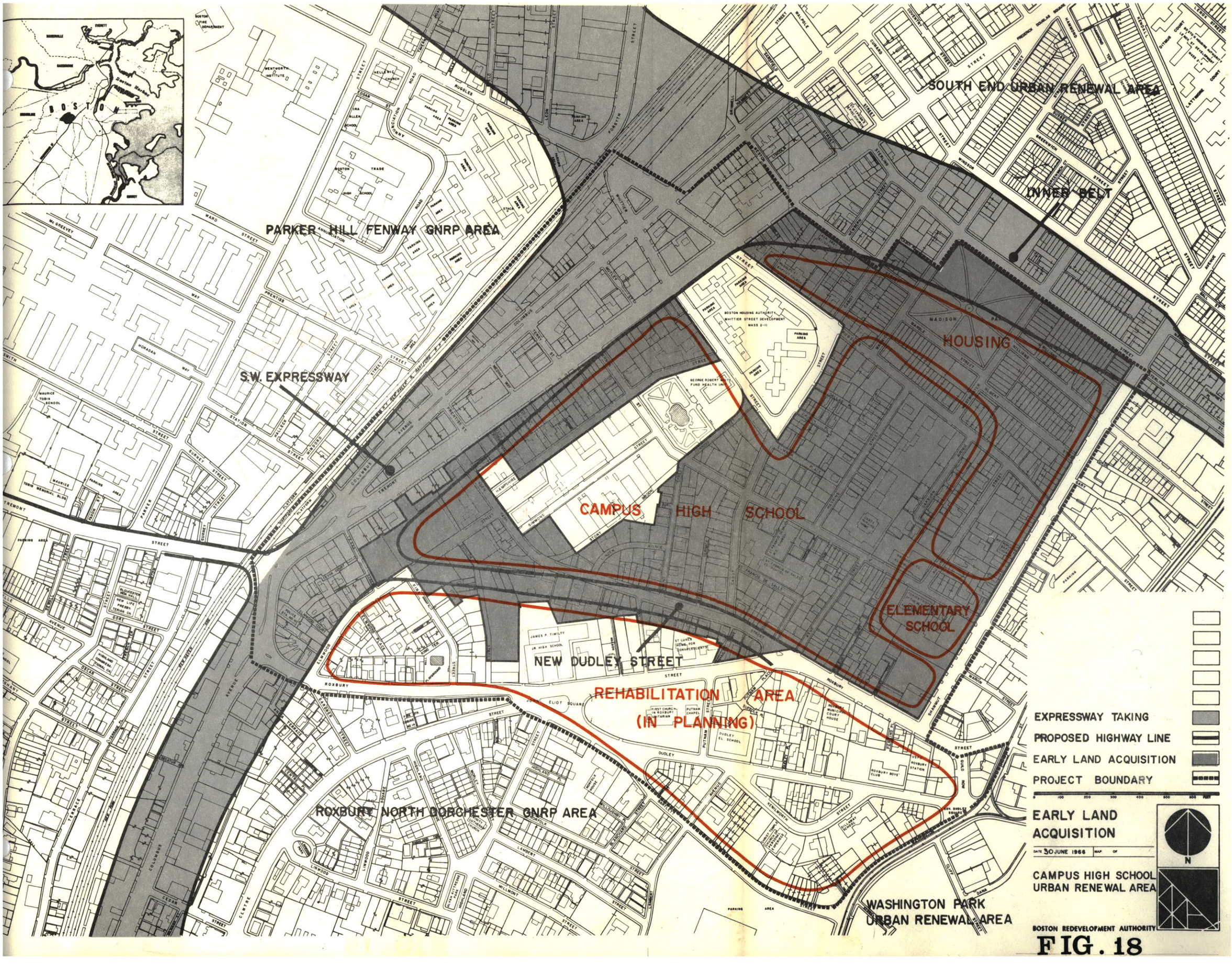

BOSTON
SOUTH END URBAN RENEWAL AREA
INNER BELT
PARKER HILL FENWAY GNRP AREA
S.W. EXPRESSWAY
HOUSING
CAMPUS HIGH SCHOOL
ELEMENTARY SCHOOL
NEW DUDLEY STREET
REHABILITATION AREA
(IN PLANNING)
ROXBURY NORTH DORCHESTER GNRP AREA
WASHINGTON PARK
URBAN RENEWAL AREA
EXPRESSWAY TAKING
PROPOSED HIGHWAY LINE
EARLY LAND ACQUISITION
PROJECT BOUNDARY
EARLY LAND ACQUISITION
DATE 30 JUNE 1966
CAMPUS HIGH SCHOOL
URBAN RENEWAL AREA
BOSTON REDEVELOPMENT AUTHORITY

FIG. 18

In both A and B, the Inner Belt is assumed in its proposed location and provisions for collector roads, overpasses and interchanges affect the land-taking and removal decisions.

Only the South End Urban Renewal Plan (SEURP) is sufficiently developed to warrant some comment in relation to this thesis and the tract.

1. The SEURP treats the Inner Belt as a barrier not to be connected across either in use, form, direction or surface. This attitude of barrier reinforcement may in time perpetuate the same conditions of blight and debilitation which presently plague the tract area.

2. The area SW of E. Lenox St. and SE of Shawmut Avenue has been virtually voided of any opportunity for resident convenience, use or contact. There are few opportunities or invitations in this 36-acre sector for casual penetration or social contact.

3. The commercial facilities have been withdrawn from population and flux concentrations and have been located on what seems to be criteria of ease of servicing and vehicular accessibility (for a population with very low vehicular ownership and high infirmity).

4. The elevated has been removed without equivalent service provided (or suggested by new commercially relevant patterns).

5. Certain of the clearance (and rehabilitation) decisions could reasonably be challenged in terms of eliminating buildings of unique quality (see Figures 19 and 20) and the preservation of buildings and uses exerting a blighting influence (Fig. 21).

6. The row housing forms prevalent in new housing areas, while perhaps diagrammatic for the site plan, suggest an attitude of retaining an unnecessarily restrictive housing type for conditions and life styles not clearly consonant with that housing form.

While other criticisms might legitimately be offered, the essence of the SEURP, in the tract area, is one of use separation and rationalization. Since this is clearly contrary to the objectives of this investigation, I feel free to reject the context developed in the B.R.A. plan and work within the existing context, acknowledging the (now postponed) Inner Belt route as a future force to be accommodated and exploited, if possible.

C. Site Selection

The site selected, which is shown outlined in green on Figure 2, is 6.8 acres in area and is contained between Washington Street and Harrison Avenue; and Newcomb and Hunneman Streets (with a sector along Washington Street between Newcomb and Thorndike Sts. excluded).

Figure 19. EXAMPLE OF BUILDINGS OF ARCHITECTURAL QUALITY SLATED FOR CLEARANCE UNDER THE SOUTH END URBAN RENEWAL PLAN - RESIDENTIAL BLOCK ON HARRISON AVE. OPPOSITE GREEN SHOE CO. SEEN ALONG E. LENOX ST.

FIG. 19

FIG. 19

Figure 20. EXAMPLE OF BUILDINGS OF ARCHITECTURAL QUALITY SLATED FOR CLEARANCE UNDER THE SOUTH END URBAN RENEWAL PLAN - RESIDENTIAL BLOCKS AT THE EAST CORNER OF WOODBURY ST. AND SHAWMUT AVE.

FIG. 20

FIG. 20

Figure 21. CAPITOL TIRE AND RUBBER CO. (ON THE SITE) AS SEEN FROM WASHINGTON ST. THIS BUILDING IS TO BE RETAINED UNDER THE SOUTH END URBAN RENEWAL PLAN.

FIG. 21

FIG. 21

1. Present Land Use

The site presently supports a variety of uses, providing housing, parking and employment in the area. Some estimates of that employment and housing as well as physical characteristics of the site will be described in this section. (See Table V-4.)

2. Site Selection Criteria

The choice of this site, as opposed to another within the tract, came about because of unique relationships both in the existing fabric and in the area in the future should the Inner Belt be put through.

a. Open Space, Clearance and Relocation: It was felt to be desirable to choose a site that would not require the wholesale displacement of essential resident activity or services (shopping, residence employment and entertainment). This site and the vacant land across from it, between Washington Street and Shawmut Avenue offered the greatest proportion of open land and unoccupied structures for a site over 5 acres. In addition, the largest building on this site was a single-story structure, with open storage requirements that were both extensive and blighting.

The parking requirements for Green Shoe Company could be met by acquiring the vacant land and junkyards adjacent to

TABLE V-4 PRESENT LAND USE

Buildings, Use and Location	Fig. Ref.	Associated Open Land		Bldg* Cond.	Building Area sq.ft.		Estimated Employment**	Estimated Occupancy
		Area sq.ft.	Use		Ground Coverage	Gross Floor Area•		
4-story warehouse at Hunneman and Washington containing:	6	4030	Service driveway & parking plus open storage of equipment	Fair				
Furn. store 1st. fl.					3410	3410	9	-
Bar 1st. fl.					1010	1010	10	-
Warehouse office & Storage					3140	25820	26	-
Supplementary Storage - bldg. behind warehouse 3- and 1-story sections	-	-	-	Fair	1830	3690	3	-
Capitol Tire Co. Washington St. between Hunneman & Thorndike Sts. Tire sales & supply plus service & retreading facilities. Single story.	21	14540	Service, driveway, & customer parking	Satis.	38230	38230	125	-
		21350	Open tire storage					
2-story Ace Baking Co. Corner Wash. and Thorndike Sts.	22	3790	Service & parking	Satis.	5770	9880	50	-

Buildings, Use and Location	Fig. Ref.	Associated Open Land		Bldg* Cond.	Building Area sq.ft.		Esti-mated Employ-ment**	Esti-mated Occu-pancy
		Area sq.ft.	Use		Ground Coverage	Gross Floor Area°		
16 three-story row houses in groups of 4, 2 & 1; located along Thorndike St. & Harrison Avenue	23	2630	Misc. Residential	Fair (11)	8160	23940	-	120
		560	Misc. Residential	Poor (5)	3490	10470	-	52
Variety store in 1st fl. of bldg. at Thorndike & Harrison Avenue		-	-	-	-	540	2	-
Vacant factory corner of Reed & Thorndike Sts. formerly an elementary school	24	9410	-	Fair	13500	13500	-	-
Parking lots on remainder of the site	15 25	117000±	Green Shoe Company	-	-	-	-	-
Streets & sidewalks within site but not adjacent to it.	-	45060	-	-	-	-	-	-
Totals		218370 5.0 acres	-	-	78540 1.8 acres	130490	225	172

*Satis.=satis. or needs minor repairs
Fair=needs substantial repairs
Poor=needs extensive repairs

°Basement areas not included.

**Single shift for all businesses except bar assumed.

±Equivalent to off-street parking of approx. 330 automobiles.

Figure 22. THE ACE BAKING CO. AT THE SOUTH CORNER OF THORNDIKE AND WASHINGTON STREETS.

FIG. 22

FIG. 22

Figure 23. LOOKING NORTHWEST TOWARD WASHINGTON ST. ALONG THORNDIKE ST.

FIG. 23

FIG. 23

Figure 24. LOOKING SOUTHEAST TOWARD HARRISON AVE. ALONG THORNDIKE ST.

FIG. 24

FIG. 24

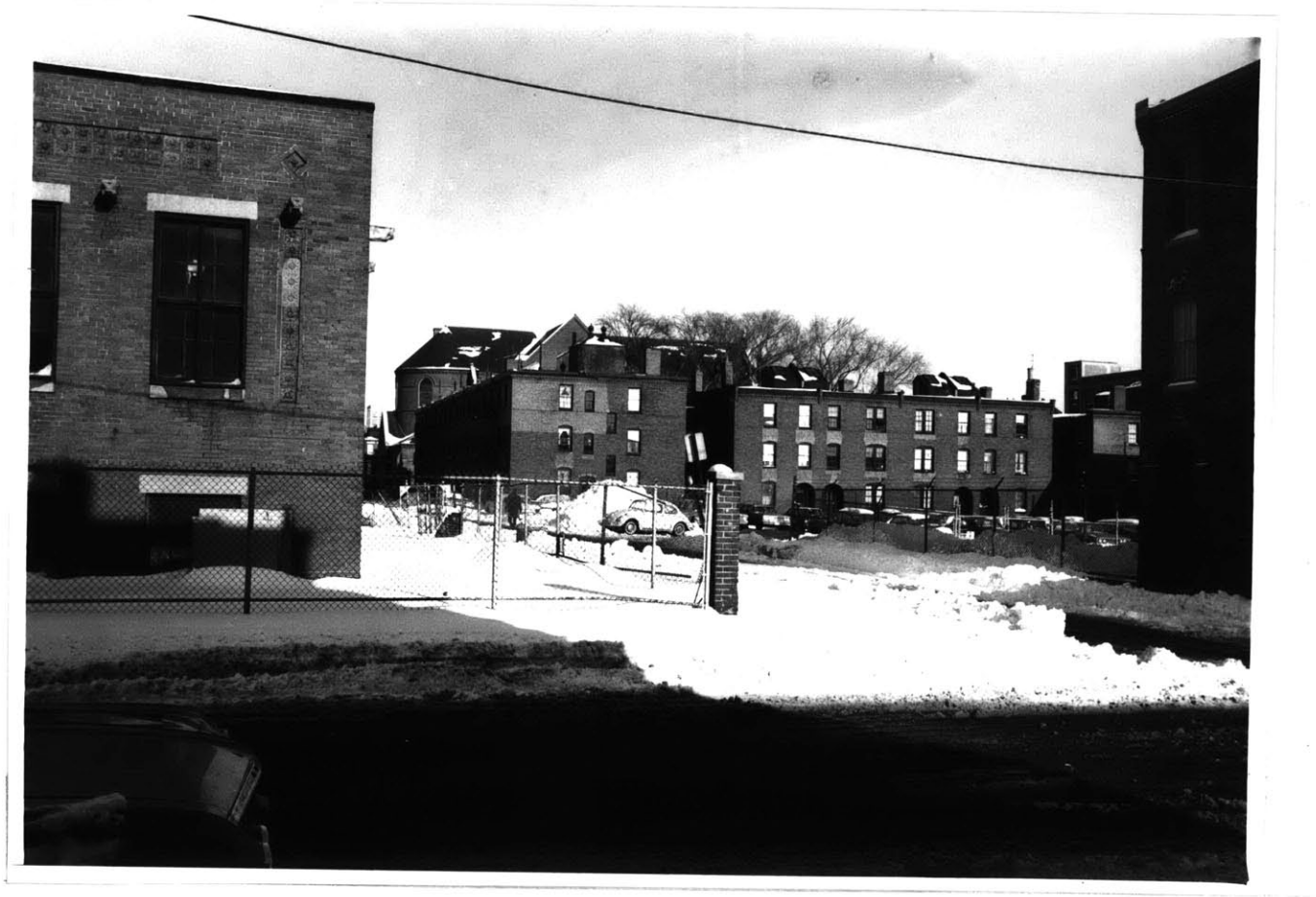


Figure 25. LOOKING ACROSS THE PARKING LOT AT THE SOUTHEAST END OF THE SITE TOWARD THE RESIDENTIAL BLOCK ALSO SHOWN IN FIGURE 19.

FIG. 25

FIG. 25

it on the SE, S, and SW.

b. Street System: Of the three radial streets within the tract, Harrison Avenue is the most capable of supporting increases in traffic flow. In addition, the primarily residential nature of Shawmut Avenue, and the presence of the Washington Street elevated argue against those streets for industrial truck and increased passenger traffic.

The Southeast Expressway is most easily connected to from the Harrison Avenue side of the tract and Hunneman Street (or the Inner Belt collector road system) in the future could readily channel truck traffic and peak hour vehicular flow from the more sensitive or overtaxed areas.

c. Expansion: The need for expansion of any possible component of a mixed-use development seemed a relevant basis for site evaluation. The area to the SW and S of the tract presently either vacant or occupied by junkyards and supply houses, would be prime directions of expansion, particularly because of the public housing now located to the SE of Harrison Avenue and SW of Eustice Street (Whittier St. Project). To the NE, additional open land is available. To the N and NW the vacant core of the Shawmut to Washington strip offers possibilities. Aside from these open areas, the large expanse of the Green Shoe

Company addition could possibly sustain air rights or public use on the roof.

Finally, the Inner Belt and its collectors replacing Hunneman Street would offer expansion possibilities for air rights and/or public open space as far as Eustice St.

d. Commercial Viability and Flux: Since Washington Street is the spine of nearly all public service and retail activity, it seemed imperative to connect a mixed-use development to the principal movement and activity generator in the area. Thus Washington Street becomes a necessary frontage or inclusion of any site. In addition, the rapid transit stops at Dudley and Northampton are presently about 2/3 of a mile apart. An additional stop on the line might be warranted on several accounts:

1. To service the residential and industrial communities in the present and planned numbers.
2. To connect with a possible inner belt circumferential rapid transit.
3. To reduce the speed and noise of the elevated trains passing through the area.
4. To input a commercial stimulus into an inconvenienced area.
5. To make accessible to the larger Roxbury and South End communities, any major public facilities or amenities (like the campus high school) which may be located in the area.

6. To ameliorate the barrier effect of the Inner Belt by giving the area accessibility and stimulating use.

As a final consideration, Washington Street narrows significantly along the site frontage, and it is important to control the introduction of additional vehicles into Washington Street to prevent an aggrevated traffic condition from worsening.

e. Connection: The population blocks at the east and west corners of the tract are spatially separated. The site chosen is a potential meeting ground for these groups without a forced confrontation. By trying to link the population fragments of the area instead of separating them with barriers or unrelated uses, a better coexistence might be established in terms of community cohesion and support for remedial social, economic and environmental programs.

The location between these groups offers cross-use of the facilities to more people without having to venture into alien neighborhoods. Similarly, the stores, industries and services, being on a "neutral ground," might expect wider patronage.

f. Communication: This site and the Washington Street frontage satisfies the desires for a communicative environment on

several scales. As both a boundary marker between the South End and Roxbury, it becomes a zone reference. The directional change in Washington Street can be communicated here. The high pedestrian intensity on Washington Street can be touched by the activity within the site. The transit location and interchange (should it come to pass) as well as the highway location, can be referenced, and the passing rapid transit will have a different kind of activity mix, visible at its scale of movement, which can invite the riders to see what is going on at slower pedestrian paces.

g. The final criterion, scale compatibility, is one which requires action to reconcile the extensive Green Shoe complex with the small residential quality of the Harrison Avenue housing. While little can be achieved across Harrison Avenue, much might be accomplished within the site selected in its relationship to that housing. Furthermore, proximity to the Inner Belt requires a different scale of building and activity. This site, then, offers the possibility of establishing scale transitions both to fine grain residential life and urban scale forms. Since this thesis is in part to find out whether use mix can meet such demands, this site could not be refused.

D. Design Approach

Many of the criteria discussed in the preceding section have direct consequences in the organization of the physical design of the site. Figures 26 and 27 diagrammatically describe some implications on circulation, connections, use mix, growth and scale which can act to guide an initial design investigation.

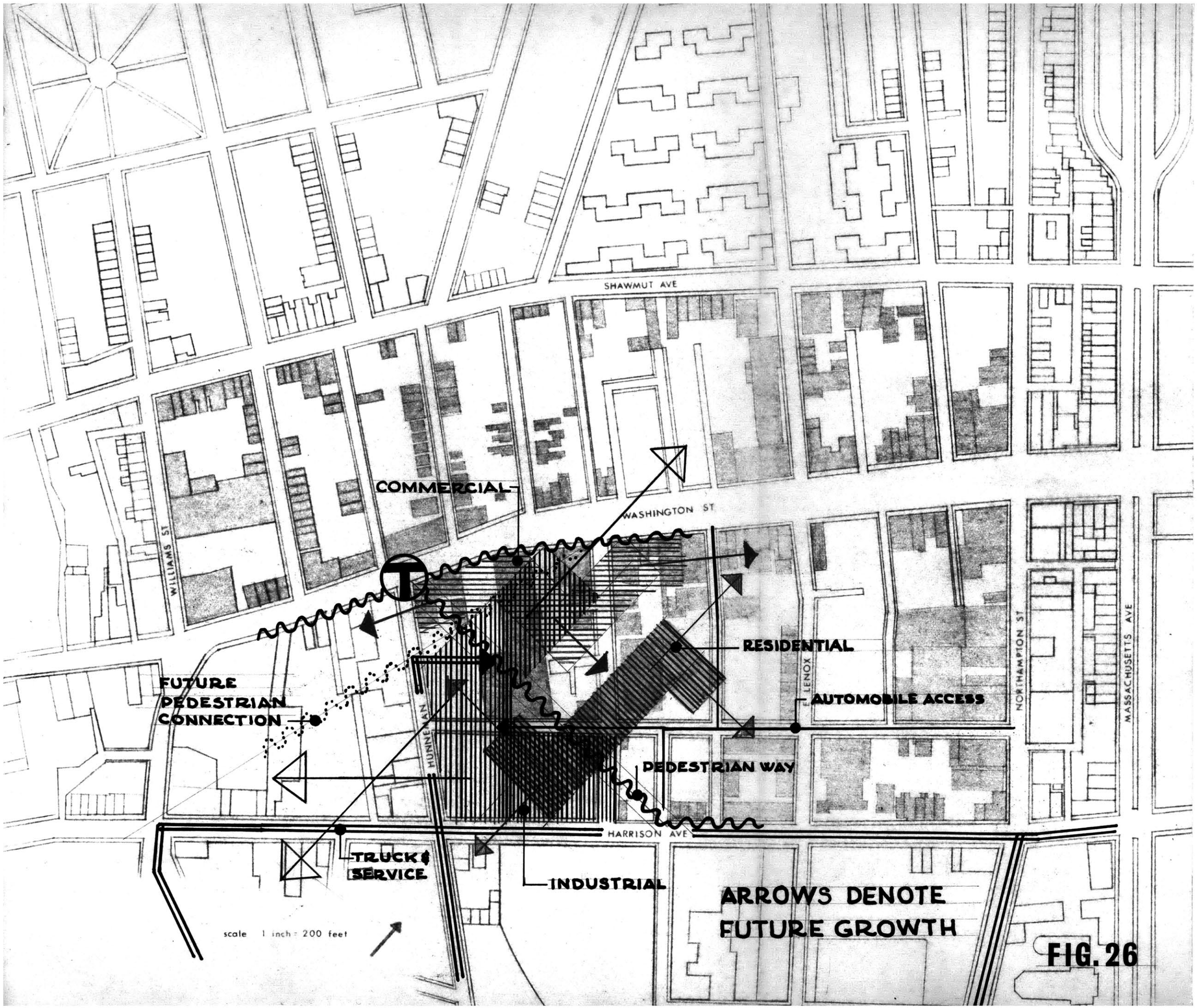
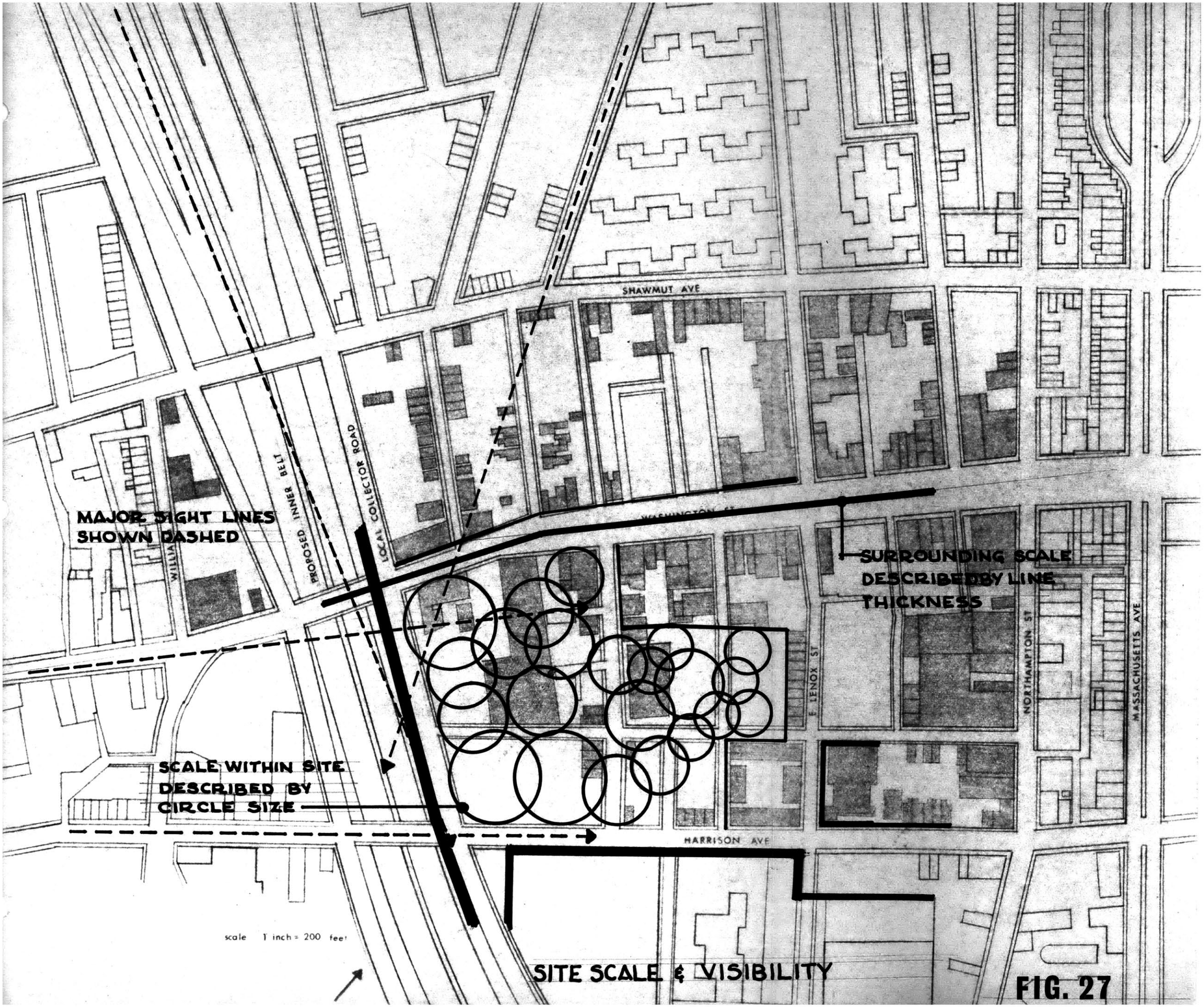

SHAWMUT AVE
COMMERCIAL
WASHINGTON ST
WILLIAMS ST
RESIDENTIAL
FUTURE
PEDESTRIAN
CONNECTION
HUNNEMAN
ELENOX
AUTOMOBILE ACCESS
NORTHAMPTON ST
MASSACHUSETTS AVE
PEDESTRIAN WAY
HARRISON AVE
TRUCK &
SERVICE
INDUSTRIAL
scale 1 inch = 200 feet
ARROWS DENOTE
FUTURE GROWTH

FIG. 26



SITE SCALE & VISIBILITY

FIG. 27

APPENDIX A-1

BOSTON MICROCLIMATE SUMMARY BY SEASONS

January through March (Winter)

Three types of days are normally found in these months. One type is the clear, dry, cold day (temp. 24° to 38°)with northwest winds between 10 to 15 m.p.h.; approximately 14 days are clear. The second type of day is partly cloudy with temperatures similar to clear days. There are approximately 17 days that have this condition. The third type is rainy or snowy depending on temperature. During snow storms winds are from northeast. Approximately 12 days are like this, and about 5 days are foggy.

April through June (Spring)

These months are generally warmer (temp. 50° to 70°F). Approximately 12 clear days; winds are west-northwest, southwesterly with speeds about 10 to 13 m.p.h. on this type of day. Ten to 14 days are partly cloudy to cloudy during this season of the year. Rainy days equal to about 6 to 12 days per month with about 3 inches of rainfall each month.

July to September (Summer)

These months are usually very warm, especially July and August (temp. 65° to 90°F). Humidity is very high; between 70%-85%. Winds are northerly and mainly southwesterly with wind speed of

10-12 miles per hour, depending on the condition. Few days are clear (7-8); most days are partly cloudy and cloudy (10-14 days each type); rainy days are few in number (3-5) but with high accumulation for one day periods (3-5 inches). Thunderstorms are frequent also. Hot summer afternoons are frequently relieved by the "sea breeze:" as air flows inland from the cool water surface to displace the warm westerly current.

October to December (Autumn)

These months are generally cool with temperatures 25° to 60°. Most days are clear (about 15 days) or they are usually cloudy (11-14). Winds are southeasterly to northerly with speeds about 10-20 m.p.h. Snow starts to appear around the first of December with several inches or more throughout the month. There are about 9-10 days of precipitation.

APPENDIX A-2

BOSTON MICROCLIMATE SUMMARY BY PARAMETER

I. Temperature: Highest recorded temperature is 102°; lowest -14°F. However, recommended summer design temperature is 88° based on conditions occurring on exceptionally hot afternoons from May through September. Winter design temperature might be taken as 8°F, a condition which is exceeded only 1%hours yearly.

TEMPERATURE DISTRIBUTION	ANNUAL HOURS	
over 85°F	3%	occurring sometimes in July & Aug.
65° to 85°.	.28%	major summer climate
45° to 65°.	.32%	spring & fall weather conditions
25° to 45°.	.31%	major winter climate
0° to 25°.	6%	occurs in Dec., Jan., and Feb.

II. Sun: The distribution of clear and cloudy days is fairly uniform throughout the year. Maximum amount of available sunshine occurs in September (68%), minimum in January (53%). Solar heat can be a valuable contribution during underheated times. Shading is necessary at the hot periods.

III. Wind: Wind velocities are generally stable throughout the year, with 10 m.p.h. summer and 13 m.p.h. winter average speeds. Prevailing winds during underheated periods (October - April) come from NW direction. During overheated season they are variable

from S to SW. During the hottest part of summer days the prevailing direction is south. High velocity winds (over 15 m.p.h.) are infrequent. However, in January and February, NW, W, and SW strong winds occur. Forty m.p.h. wind velocities are probable in any month; velocities over 60 m.p.h. are seldom measured. NE winds occur during snow storms.

IV. Precipitation: Monthly averages are fairly uniform throughout the year; varying from 3.0" in November to 4.3" in August. Greatest precipitation of 17.5" was recorded in August. Heavy cloudbursts in summer might bring 1" of rain in fifteen minutes, or 2" to 3" in a single day.

V. Snow: Amount of snowfall varies considerably. Snow cover lasts only a few days normally.

VI. Relative Humidity: Yearly average of relative humidity lies between 56-76%. It is lower in winter than in summer (when it will rise to 80% or more through four months).

APPENDIX A.3.1 DETAILED CLIMATE INFORMATION FOR BOSTON

	Temperature				Precipitation			Average Number Days/Sunup/Sundown						
	Average		Extreme				Wind	Rain	Snow	Thun	Fog	clr	pc	clo
Month	Max.	Min.	Max.	Min.	Total	Snow	Dir.	.01"	1.0"					
Jan.	37	22	62	-12	4	13	NW	13	3	-	2	9	6	16
Feb.	37	33	68	-4	3	10	WNW	12	3	-	1	8	7	13
March	45	30	70	10	3	8	NW	12	2	-	2	8	8	15
April	55	39	88	17	3	1	WNW	13	-	1	2	7	8	15
May	66	49	93	34	3	T	SW	13	0	3	3	6	11	14
June	76	58	100	47	3	0	SW	10	0	4	2	6	11	13
July	80	64	100	55	3	0	SW	10	0	5	2	6	13	12
Aug.	79	64	100	52	3	0	SW	10	0	4	2	9	11	11
Sept.	73	50	100	40	3	0	SW	9	0	2	2	11	8	11
Oct.	63	47	90	31	3	T	SW	10	0	1	2	11	8	12
Nov.	51	37	74	17	3	2	NW	11	-	-	2	8	8	14
Dec.	40	26	64	-2	3	7	WNW	10	2	-	1	9	8	14
Year	59	43	100	-12	39	40	SW	133	10	20	23	98	107	160

Average wind velocity ranges from 10 to 15 m.p.h.
Average relative humidity ranges from 54% to 60%.

APPENDIX A-3.2 DETAILED CLIMATE INFORMATION FOR BOSTON

Average Temperature

TIME	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
7 a.m.	22	32	36	39	50	74	74	70	56	48	38	31
10 a.m.	26	36	36	44	57	84	75	81	67	51	46	30
12 noon	30	36	40	42	61	89	83	88	67	56	48	32
4 p.m.	35	35	38	40	62	88	87	88	66	59	50	34
7 p.m.	28	35	42	42	64	79	83	80	65	52	45	30
9 p.m.	26	34	44	39	63	73	76	75	57	50	43	28
12 m.	28	39	42	38	57	68	70	72	50	47	40	26
Max. Average	32.7	35.5	42.1	51.9	69.6	77.2	79.7	79.4	70.0	61.0	51.4	38.9
Min. Average	18.0	20.4	29.5	36.4	49.4	57.6	62.3	61.5	54.0	44.0	36.7	25.9
Average	25.4	28.0	35.8	44.2	59.5	67.4	71.0	70.5	62.0	52.5	44.0	32.0
Hours of Sun (15th of month)	9.4	10.6	12.2	13.4	14.6	15.3	14.8	13.9	12.5	11.1	9.8	9.1
Typical Sun Angle	22-30	30-40	40-52	52-62	62-69	69-71	64-70	57-64	45-57	34-45	27-34	22-27

BIBLIOGRAPHY

BOOKS

Architectural Forum. Industrial Buildings by Albert Kahn, New York, 1938.

Architectural Record. Buildings for Industry, New York, 1957.

Friedmann, G. Industrial Society, Glencoe, 1964.

Goss, A. British Industry and Town Planning, London, 1962.

Goss, A. and Tetlow, J. Homes, Towns, and Traffic, London, 1965.

Henn, W. Buildings for Industry, Vols. I and II, London, 1965.

Hoover, E. M. The Location of Economic Activity, New York, 1948.

Kennedy, N., Kell, J., and Homburger, W. S. Fundamentals of Traffic Engineering, Berkeley, 1966.

Logie, G. Industries in Towns, 1962.

Makielski, S. J. Jr. The Politics of Zoning, New York, 1966.

Malcolm X. The Autiobiography of Malcolm X, New York, 1966.

_____. Malcolm X Speaks, New York, 1966.

Martin, B. V. et. al. Principles and Techniques for Predicting Future Demand for Urban Area Transportation, Cambridge, 1965.

Mills, E. D. The Modern Factory, London, 1951.

Moes, J. E. Local Subsidies for Industry, Chapel Hill, 1962.

Munce, J. Industrial Architecture: An Analysis of International Building Practice, 1960.

Self, P. The Planning of Industrial Location, London.

Silberman, C. E. Crisis In Black and White, New York, 1964.

United States Bureau of the Budget, Office of Statistical Standards. Standard Industrial Classification Manual, Rev. Ed., 1967.

Whitman, E. S. and Schmidt, W. J. Plant Relocation, New York, 1966.

Wilson, R. F. Colour and Light at Work, New York, 1953.

REPORTS

Building Research Station at Garston, England, Factory Building Studies, #s1-12, London, 1959-62.

Edwards and Kelcey. A Study of Trucking Problems in the Garment District, N.Y.C., New York, 1961.

Hemmens, G. C. The Structure of Urban Activity Linkages, Chapel Hill, Sept. 1966.

Keefer, L. E. Urban Travel Patterns for Airports, Shopping Centers, and Plants, Washington, D.C., 1966.

Linehan, J. Human Conditioning in the Factory, 1954.

N. Y. State Bureau of Urban Affairs. Industrial Renewal, New York, 1963.

Rennhackkamp, W. H. Lighting In Industry, Pretoria, 1961.

U.N. Department of Economic and Social Affairs. The Physical Planning of Industrial Estates, N.Y., 1962.

U.N. Seminar on Industrial Estates in the ESCAFE Region, Industrial Estates in Asia and the Far East, N.Y., 1962.

U.S. Department of Labor. The Negro Family: The Case for National Action, Washington, D.C., 1965.

University of Connecticut. Personal Factors Influencing Small Manufacturing Plant Location, 1962.

ARTICLES

Austin, R. W. "Who Has the Responsibility for Social Change?" Harvard Business Review, July/August 1965, pp. 45-52.

Bernstein, "A Comparison of Industrial and Race Conflict," Monthly Labor Review, 90:39-41, July, 1967.

Building Type Studies #69. "The Lighting of Industrial Plants," 1942.

Chimitz, B. and Vernon, R. "Changing Forces in Industrial Location," Harvard Business Review, Jan.-Feb. 1960.

Clark, C. "Transport: Maker and Breaker of Cities," Town Planning Review, XXIX, 1958.

_____. "Location of Industries and Population," Town Planning Review, XXXV, Oct. 1964, pp. 195-218.

Czamanski, S. "Industrial Location and Urban Growth," Town Planning Review, Oct. 1965, pp. 165-80.

Diamond, D. E. "Occupational Shifts in Negro Employment," Business Topics (Mich.), 13:32-44, Summer 1965.

Estall, R. C. "Planning for Industry in the Distressed Areas of the U.S.," Journal of the Town Planning Inst., Nov. 1964, pp. 390-96.

Ford, Bacon, and Davis. "New Plant Costs" N.Y.C.

Haar, C. "Transportation and Economic Equality," Traffic Quarterly, XXI, Oct. 1967, pp. 521-26.

Lai , D. C. Y and Dyer, D. J. "Kwun Tong, Hong Kong," Town Planning Review, Jan. 1965, pp. 299-310.

Laird, W. E. and Rinehart, J. R. "Neglected Aspects of Industrial Subsidy," Land Economics, 43:25-31, February 1967.

Leger, R. R. "Cheaper Financing," Wall St. Journal, 167:1+, 1 April 1966.

"Loosening Pinch," Wall St. Journal, 168:1+, 23 September 1966.

McMillan, T. E. Jr. "Why Manufacturers Choose Plant Locations vs. . " Land Economics, 41:239-46, August, 1965.

Miller, H. V. "Characteristics of Modern Industrial Plants and Their Relationship to Industrial Zoning," Columbus, Ohio, 1953.

Mooney, J. D. "Urban Poverty and Labor Force Participation," American Economic Review, March 1967, pp. 104-19.

"Multi-Story Factory, Brighton," Architectural Review, 133, Feb, 1963, p. 188.

Newman, D. K. "The Decentralization of Jobs: (Job Opportunities. . . out of reach of the city-centered poor)," Monthly Labor Review, 90:7-13, May, 1967.

Schindler, R. and Ferreri, M. G. "Auto Ownership as Affected by Transportation System Alternatives," Traffic Engineering, 38, Oct. 1967, pp. 24-28.

Shenkel, W. M. "The Economic Consequences of Industrial Zoning," Land Economics, 40:255-65, August 1964.

Silberman, C. E. "The Businessman and the Negro," Fortune, Sept. 1963, pp. 96-99+.

_____. "Business Can Live With the 'Labor Shortage'," Fortune, May, 1966, pp. 112-15+.

Terhorst, J. "The Business Role in the Great Society," Reporter, 33:26-30, October 21, 1965.

Wetzel, J. R. and Holland, S. S. "Poverty Areas of Our Major Cities," Monthly Labor Review, 89:1105-10, October 1966.

"Where Jobs are Going Begging," U.S. News, 59:85-87, 29 November 1965.

"Why Factories Are Taking to the Country," U.S. News, 54:72-74, June 17, 1963.

Will, R. A. "Federal Influences on Industrial Location: How Extensive," Land Economics, 40:49-57, Fall 1964.

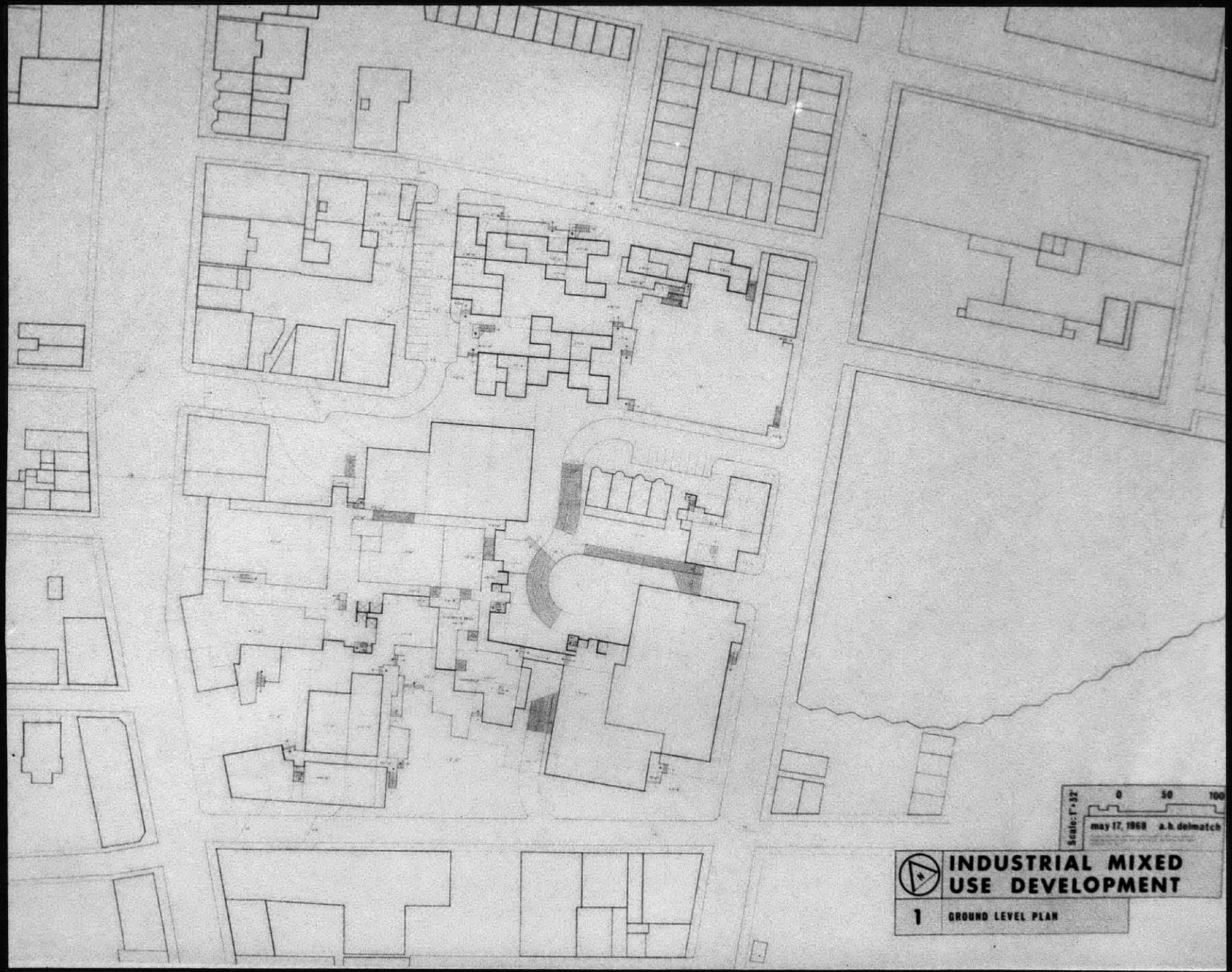
MISCELLANEOUS

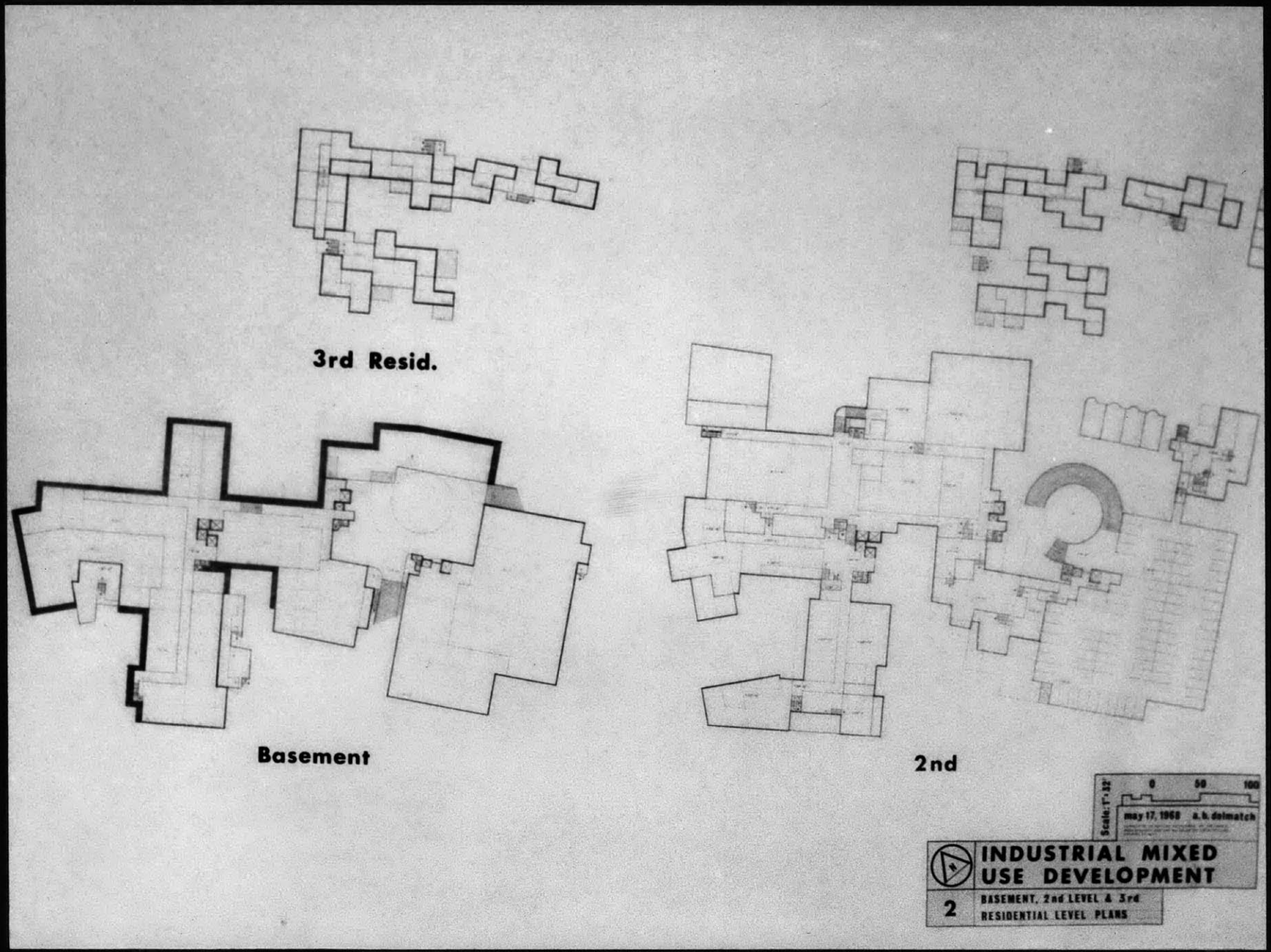
Beshers, J. M. Notes for Seminar "Negro In the Urban North," May 2, 1967. Unpublished.

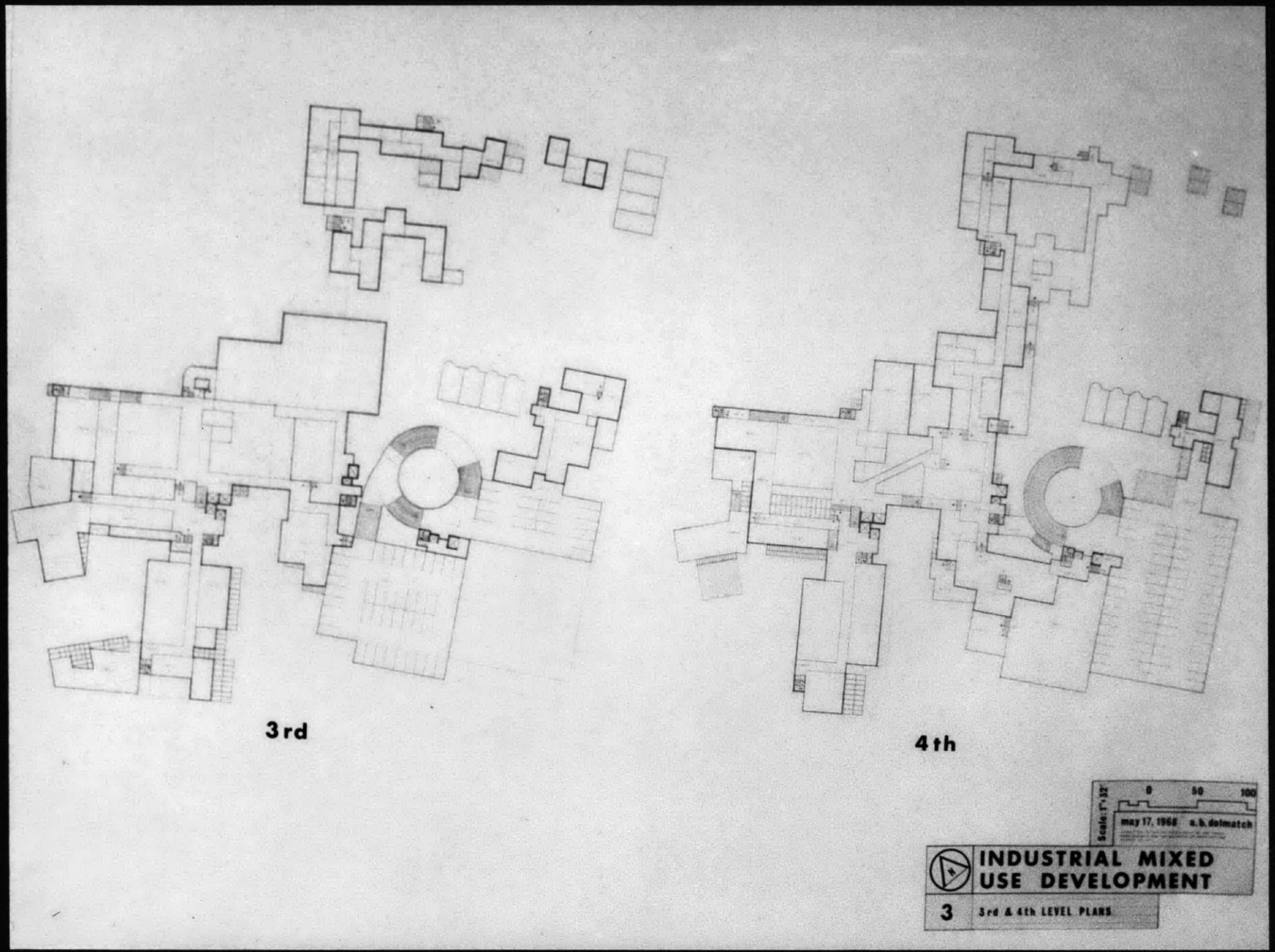
_____. Notes from class on Urban Social Structure, Fall 1966.

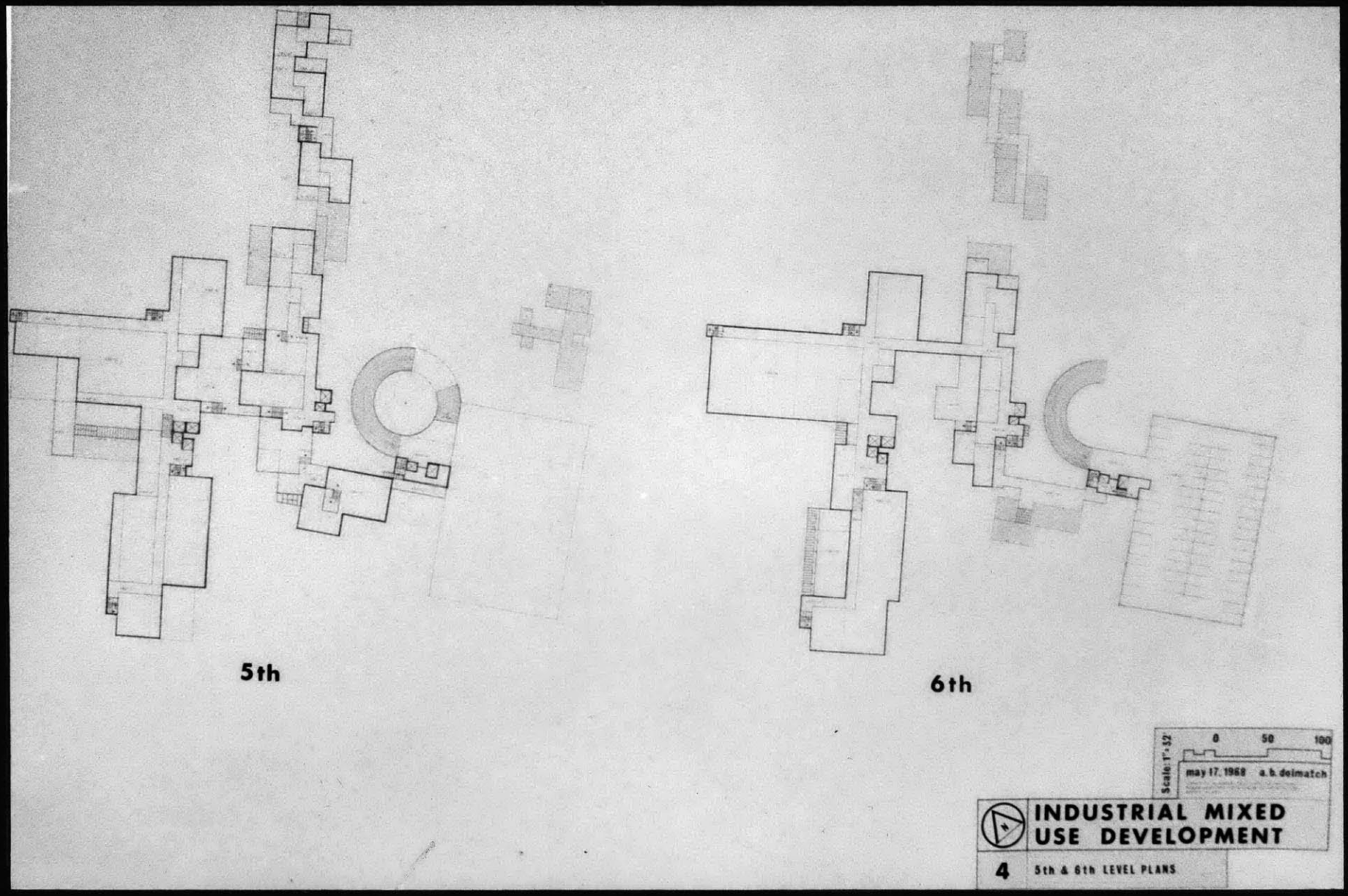
London County Council, Unit Workshops at Long Street, Shoreditch, 1958. Unpublished.

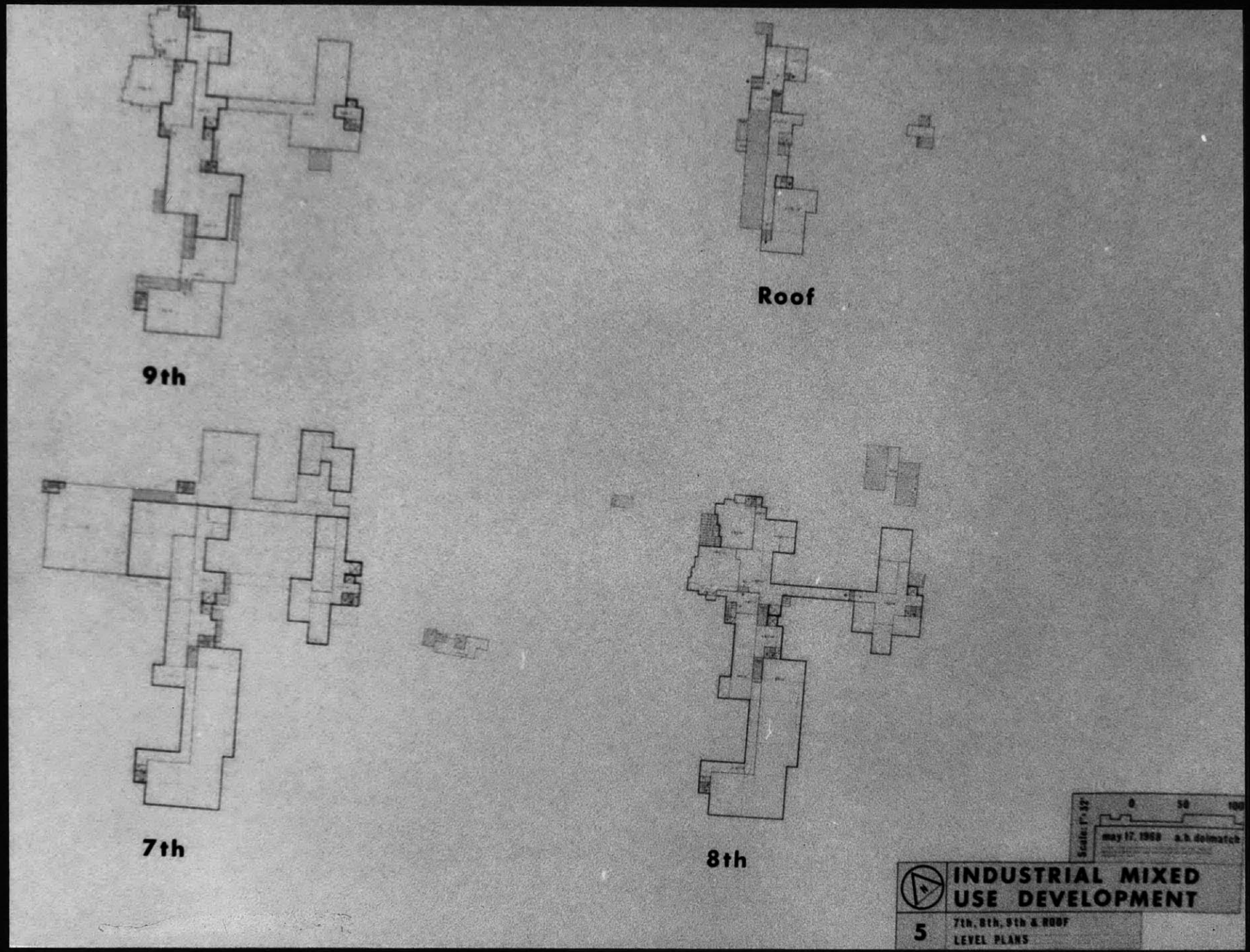
Stetzer, D. F. Industrial Density in Chicago, 1966, Chicago, Thesis for M.A. from University of Chicago.


Scale: 1" = 32'
0
50
100
may 17, 1968 a.h. deimatch
INDUSTRIAL MIXED USE DEVELOPMENT
1
GROUND LEVEL PLAN


3rd Resid.
Basement
2nd
Scale: 1" = 32'
0
50
100
may 17, 1968 a. h. dalmatch
INDUSTRIAL MIXED USE DEVELOPMENT
2
BASEMENT, 2nd LEVEL & 3rd RESIDENTIAL LEVEL PLANS


3rd
4th
Scale: 1"-32'
0
50
100
may 17, 1968 a.h. dolmatch
INDUSTRIAL MIXED USE DEVELOPMENT
3
3rd & 4th LEVEL PLANS


5th
6th
Scale: 1"=32'
0
50
100
may 17, 1968 a. b. deimatch
INDUSTRIAL MIXED USE DEVELOPMENT
4
5th & 6th LEVEL PLANS


9th
Roof
7th
8th
Scale: 1"=32'
0
50
100
may 17, 1969 a.h. dolmatch
INDUSTRIAL MIXED USE DEVELOPMENT
5
7th, 8th, 9th & ROOF LEVEL PLANS


GROUND LEVEL
COLOR LEGEND FOR USE TYPE OR CONDITION
residential
commercial
industrial
office (general)
office (related to industry)
community use
parking
shared use
flat roofs, decks and walkways
sloped roofs
open to area below