ICONIC SIMULATIONS:

AN EVALUATION OF THEIR EFFECTIVENESS AS TECHNIQUES FOR SIMULATING ENVIRONMENTAL EXPERIENCE ALONG COGNITIVE, AFFECTIVE, AND BEHAVIORAL DIMENSIONS

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ABSTRACT

PURPOSE OF STUDY: This study has three purposes. First, it examines the validity of three basic tools of environmental designers and researchers, three dimensional physical models, perspective drawings and photography, as devices for simulating physical environments so that subject or user responses to a particular environment can be obtained in absentia from the real environment. Secondly, it examines the effects of variations in the stimulus properties of a simulation such as increasing or decreasing the level of abstraction, inclusion or exclusion of color or motion. Thirdly, it looks at the effects of the personal variables, profession, experience with simulations, sex, and environmental experience. The information gained provides some indications of the validity of using simulations of the types tested in certain situations and with certain audiences. In addition, it should prove of some use in assisting a designer or researcher in selecting an appropriate simulation or mix of simulations for a particular audience, environment and purpose.

METHOD OF STUDY: The study employed a two-phased research design. The first phase was an experimental comparison of the responses to six commonly-used iconic simulations with responses to direct experience. The second phase involved three separate experimental investigations of the effects of controlled variation of a single variable such as abstraction, color, and motion within a specific type of simulation upon response fidelity. Response fidelity was determined by comparing responses to the environment obtained by means of simulations

with those obtained by means of direct experience of the environment. The primary emphasis of the study was on measuring response fidelity on cognitive, affective and behavioral dimensions. This involved measuring: 1) the amounts, types and quality of information obtained about the environment; 2) the affective or like-dislike response to the environment, and 3) the attitudes toward carrying out a number of ordinary everyday behaviors in the context of the environment. The primary subjects were residents of the Westgate Married Student Housing Project at M.I.T. A secondary sample of students of the M.I.T. School of Architecture and Planning was employed to test for differences between environmental designers and the general sample. The subjects were selected to be as homogeneous as possible on all dimensions save those of interest and were randomly assigned to treatments.

FINDINGS: The phase one comparative study demonstrated conclusively that, for the samples tested, there are considerable differences between ones response to a simulated environment and his response to the real thing on all of the selected dimensions. It should be emphasized, however, that those differences are by no means all in the direction of a degradation of the experience. In a number of instances where comparison with some objective reality was possible, certain of the simulations proved superior to reality. The data from the second phase experiment support the hypothesis that cognitive, affective and behavioral response fidelity varies inversely with the degree of abstraction. Highly abstract drawings result in severe negative distortions of affective and behavioral response patterns. The hypotheses that inclusion of color and motion to a display would increase response fidelity were rejected. In the case of color, there was no difference. In the case of motion, however, the still display resulted in superior response fidelity on most dimensions. The comparative study revealed that there were differences between environmental designers and the general sample in their response to both reality and simualtions. Both sexes responded similarly to both reality and simulations.

ACKNOWLEDGEMENTS

I would like to express my appreciation for the assistance provided by the following persons: first, my wife Lee, who helped in collecting and coding the data, in the preparation of those simulations involving photography, and who provided continual encouragement and support; secondly, the members of my committee, Professors William Porter (Chairman), Kevin Lynch, Mary Potter, and Stephen Carr who provided invaluable guidance and criticism; and finally the residents of Westgate and the students of The School of Architecture and Planning who gave of their time to serve as subjects.

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INTRODUCTION

Physical models, perspective drawings, and photography in its various forms, are important and traditional tools of the environmental design and research disciplines. One particularly important use of these devices is for simulating physical environments so that subject or user responses to a particular environmental form or quality can be obtained in absentia from the "real environment." Often this is necessary because that environment or environmental quality does not yet exist or cannot be studied in situ. There is, however, little evidence as to the equivalence between experiencing real versus simulated environments.[1] Thus, although the techniques offer many technical and procedural advantages to the researcher and planner, there still remains a basic question as to their validity in many situations.[2] The purpose of this study will be to address some aspects of that general question. More specifically it will seek answers to the following questions:

1) How equivalent is the experience of a trip down a city street derived indirectly, by means of those simulations commonly used by environmental designers and researchers, to that of the experience gained directly by actually travelling down that street?

2) What are the effects of variations in stimulus properties of a simulation, such as increasing or decreasing

the level of abstraction, or inclusion or exclusion of color and motion, etc., upon that experience?

3) What are the effects of personal variables such as profession, experience with simulations, environmental experience, value orientations, etc.?

The answers to these questions are important to environmental designers and researchers who must commonly use such simulated environments in their work but who have little evidence as to their validity. The findings from this study should prove useful to designers in their task of selecting a simulation to best convey proposed environmental interventions to clients or users, and as a means of improving the quality of the various simulation techniques, and finally to researchers as indications of the validity of their research findings gained by using simulated environments in laboratory settings. This report on the study will be developed in six chapters.

Chapter I develops the research approach used in the study, one involving four separate experiments in a two phased study. The first phase is an experimental comparison of the effectiveness of a specific example of six different types of simulation relative to direct experience. The second phase consists of three separate experimental investigations of the effects of controlled variation of a single variable (such as the level of abstraction) within a specific type of simulation upon response fidelity.

Chapter II describes the research design used in the phase one comparative study, a comparison of the effectiveness of six simulation techniques in obtaining responses which are equivalent to those of direct experience. This chapter discusses the sample selection process for the phase one study, how the treatments were prepared and administered and how the data were collected, processed and analyzed.

Chapter III describes the findings from the phase one study design and is composed of six sections. The first is an examination of the relative amounts, types, and quality of information obtained by subjects as a result of experiencing one of the seven treatments. Secondly, the affective response of subjects is compared. Thirdly, attitudes toward carrying out a number of ordinary everyday behaviors in the context of the selected environment are examined. The fourth examines responses to a number of projective questions. Fifth, a selected set of personal variables are examined to ascertain whether or not they result in different responses to simulations. The last section presents an analysis of the subjects reactions to the quality of the simulations and some of the ways they felt the simulations might be improved.

Chapter IV describes the research design used in the second phase experiments each consisting of an experimental investigation of the effects on response fidelity of controlled variation of a single variable within a specific type of simulation. It describes the procedures used in sample selection, preparation and administration of the treatments, and the strategy for collection and analysis of data.

Chapter V describes the findings of the second phase experiments designed to test the effects of color, motion, and abstraction on response veridicality. The chapter is in three parts. The first reports the findings of the experiment on abstraction, the second the results of the experiment on color, and the third the results of the motion experiment. Each describes the effects of the variable in question on cognitive, affective and behavioral response fidelity.

Chapter VI develops the major conclusions reached in the study from both the comparative study and the experiments on color, abstraction, and motion.

The theoretical background of the study is described in two appendices.

Appendix A examines the process of simulation, what it is, what its broader purposes are, and what the major factors to be considered in a study of simulation effectiveness might be. It also reviews the handful of related research on simulation effectiveness.

Appendix B examines simulation as a process of communication between a designer/researcher and a client/user/subject audience. It attempts to draw together a number of important insights from the theory of communication and the theory on perceiving and remembering which have relevance to the study. A model of the communication process is developed which serves as a means of identifying the important variables and relationships in the process.

NOTES

1) Several people have made this point, among them are:
A. E. Parr, "In Search of Theory VI," Arts and Architecture, September 1965, p. 15, and:

Kenneth H. Craik, "The Comprehension of the Everyday Physical Environment," Journal of the American Institute of Planners, January 1968, p. 34, and

Kevin Lynch, "Site Planning," Second Edition, MIT Press, 1971, p. 111.

2) It is recognized that simulation offers many other advantages which make it a useful tool in any event.

CHAPTER I

RESEARCH APPROACH

As I noted earlier the purpose of this study is to examine the question of the validity of using simulations as surrogates for the real environment in both research and design, to examine the "response" fidelity of some specific types of simulation which are commonly used in environmental design and research. It is obviously possible to envisage many questions or hypotheses of interest in such a study; however, I have chosen to focus on three primary purposes: first, to determine the relative effectiveness of six commonly used simulation techniques; second, to test several hypotheses regarding the effects of specific variables, abstraction, color, and movement, on response veridicality; and thirdly to investigate the effects of several selected personal variables such as occupation or profession, sex, environmental experience, etc. on response to simulations.

The effectiveness of the simulations in obtaining responses equivalent to those of "real" environments will be assessed along three basic dimensions: 1) perception-cognition, 2) affectivity and 3) behavior. The hypotheses tested and the research design were focused on these questions; other questions or avenues of investigation were pursued only peripherally as they are the subject of interesting and extensive studies in themselves. The study involves two essentially different investigations, each of which has its own limitations. They are:

(A) An experimental comparison of the effectiveness of a specific example of six different types of simulation relative to direct experience. They are: 1) A color movie, 2) Color slides, 3) Black and white photographs, 4) Perspective drawings, 5) Slides of a three dimensional physical model, and 6) A movie of a model.

(B) An experimental investigation of the effects of controlled variation of a single variable within a specific type of simulation upon response fidelity. The variables examined are: 1) motion, 2) color, 3) abstraction.

The scientific status of each should be clearly delineated. The first is a comparative study, a carefully controlled experimental comparison of specific examples of simulations of the same environment employing different types or methods of simulation. It is an experiment in which the treatment "variable" (a simulation technique) actually involves many interacting factors or variables within itself. As such the generality of the findings (in the strictest sense) should be restricted to the status of informed hypotheses about the effects of those factors which appear to distinguish them, and about the relative effectiveness of each class of media under specific conditions. It is also possible to view such a study as a carefully controlled evaluative study of the effectiveness of particular simulation products. The generaliability of findings to other simulations is again restricted to the class of informed, but untested, hypotheses. Thus, no "definitive answers" regarding the "relative effectiveness of the various classes of simulation techniques" can be given from the first investigation.

The second is an experiment in which the hypothesized effects of a single variable, the level of abstraction, color, and motion, respectively, were studied by means of controlled variation within a class of simulations. Here all factors were held constant except those being investigated. Thus, instead of trying to "average out" differences or noncomparabilities in the treatments, the experimental and control forms of the simulations were constructed so as to be comparable in all respects save the treatment variable. The generality of findings depends only on sample considerations. For example, the comparative study examined the effects of particular groupings of encoder, channel, and decoder variables,[1] which have been standardized as much as possible, without distorting the particular characteristics of each technique. However, in phase two, it was possible to examine the effects of one variable on the receiver's responses. Thus, I was interested in: (1) comparing different types or classes of simulation in terms of their relative effectiveness, or fidelity, for replicating environmental experiences; and (2) experimentally determining the effect of various factors within each class upon its effectiveness. In both cases, the main emphasis is on the measurement of differentials in behavioral, cognitive, and affective responses between the experimental and control groups. Also in both instances the effects of population variables were examined. The procedure used was that of a field experiment. Specific research designs and analysis procedures will be discussed in succeeding chapters.

Response Measures

The principal criteria of effectiveness, or response fidelity, of the simulations was based on the lack of a differential response, along the dimensions described below, between those subjects who experienced the "real" environment (the control group) and those who experienced the simulated environment (the experimental groups). As was noted I was interested in ascertaining that response along three basic dimensions, cognitive, affective, and behavioral, as outlined below. The fidelity or effectiveness of the simulations was measured by analysis of variance along each dimension for the experimental versus the control groups.

Cognitive Response

As distinguished from behavioral and affective properties, a cognitive variable refers to the information or knowledge on the part of a receiver (R) about an "object of orientation" (X). The fundamental observation for the measurement of a cognitive variable is the expression of a belief by a person concerning the characteristics of an object, event, or situation (X).

Such beliefs are subject to verification according to rules of evidence, and as such are subject to appraisal as correct or incorrect by the holder as well as by any audience.

Thus the distinguishing characteristic of a cognitive variable is that it is a property of a belief. Examples of cognitive variables are: 1) the degree to which an object is perceived to display a particular trait, 2) the differential salience of various traits of an object, and 3) the confidence with which people attribute traits to an object.

<u>Affective Response</u>

The concept of affect refers to a person's sentiments, his pleasant or unpleasant feelings associated with objects, events or situations (X's). Affect is commonly discussed in terms of a degree of favorability-unfavorability. A pedestrian and a shopkeeper may share the same belief that the sidewalks are crowded with pedestrians, but this common perception may be associated with opposite or different affect in the two individuals. The fundamental observation of an affective measure is the expression by a receiver (R) of some degree of pro-anti orientation to an object (X).

<u>Behavioral Response</u>

Behavior, as used here, refers to the acts that a person (R) commits, advocates, or facilitates with respect to an object (X) and excludes involuntary acts such as an eye blink in bright light. Behavior refers essentially to decisions people make concerning which of several alternative actions is preferable for coping with a problem involving an object (X). Obviously, the decision to do one thing rather than another derives in part from one's beliefs or knowledge as they relate to the issue. Equally obviously, the decision stems from one's affective involvements as they bear on the issue. It is possible to observe and measure behavior, as shown by Winkel (1966), but for my purposes it would have been somewhat cumbersome to do so. Therefore, a behavioral variable is here defined as one that refers to a person's willingness to perform an act, to allow it to be performed, or to facilitate its performance. Thus, the fundamental phenomenon observed in my behavioral measurements is the endorsement or rejection by a receiver (R) of an action toward the object, event, or situation-environment (X).

The Data Collection Instrument: Written Questionnaire

As a consequence of the large number of subjects, a written, structured questionnaire was the response format chosen for the experiment. It was felt that because the subjects were students they would be accustomed to (perhaps even would prefer) responding in a written format. And, in fact, they experienced no difficulties. Most even expressed interest and said they had enjoyed the experience. The subjects utilized between fifty minutes and two hours in responding to the questions. The usual time required was just over an hour.

The questionnaire was structured in the sense that all subjects responded to identical questions in an identical sequence, but not in the sense of being a set of closed-ended questions. Generally the questionnaire was structured such that it began with very general open-ended questions with space for a lengthy response. These questions were aimed at getting a response to the experience which was as undirected and natural as possible. Then the questions were gradually focused and responses directed to specific areas of interest. Finally toward the end, the questions (mostly biographical) were of the closed-ended type which ask for a specific response in one of several a-priori categories.

There are three main parts to the interview instrument, which can be seen in Appendix A. The first part, questions 1 through 66 consists of response formats (usually questions) directed toward eliciting the subject's responses to the environmental experience. The second part, questions 1 through 24 is a recognition test; the third, questions 25 through 46 consists of personal background and other attitudinal questions which do not involve the environment. The final questionnaire was the result of four rounds of pre-testing and revision.

Part I: Response To The Environment. In the first section there are seven different response formats:

(1) Free responses: open-ended descriptions of or feelings toward the environment, memory lists, descriptions of areas liked, disliked, etc.

(2) Map: a request for a sketch map of the environment.

(3) Behavior: a series of questions intended to elicit the kinds of decisions subjects might make with regard to a number of possible behaviors or actions which might be appropriate to an area of this kind.

(4) Semantic differential: a series of twenty-nine

sets of paired adjectives which could be used to describe the environment. The adjectives in each pair were polar opposites (light-dark for example) with a seven point scale between the two extremes.

(5) Realism: a series of questions intended to elicit the subjects acceptance or rejection of the simulations as approximations of reality, to determine their "willingness to suspend disbelief", so to speak.

(6) Familiarity with the environment: subjects were asked a series of questions aimed at ascertaining whether or not they had prior experience with Harvard Street (the test area) or with similar environments, and if so to determine their feelings, memories, attitudes, etc. regarding their prior experience.

(7) Projective questions: a series of questions aimed at getting the subject to project the environment into the future and into the past, and with manipulating or changing it to be more congruent with his desires and expectations.

Part II: Recognition Tests. Twelve sets of four street scenes were shown the observer (See Appendix A). Within each group of four scenes three were of randomly chosen but similar areas throughout Boston. The fourth picture was of Harvard Street. The twelve sets were comprised of six sets of four black and white photographs, three sets of four perspective drawings, and three sets of model photographs. Subjects were requested to select the picture of Harvard Street within each group and to rate their degree of certainty regarding the accuracy of their choice on a five point scale ranging from absolutely certain to just guessing.

Part III: Personal And Attitudinal Questions. In this section were a series of closed-ended questions directed toward determining the subject's position along the following personal dimensions:

1. Age
2. Sex
3. Education
4. Major and professional or occupational interests.
5. Religion
6. National origin
7. Environmental experience, in Boston, and in large cities.
8. Environmental preference regarding city size.
9. Experience with simulations, etc.

A number of studies have shown it to be a rather difficult task to obtain accurate and complete descriptions of a subjects knowledge and affective reactions to an environment as complex as a portion of a city. Appleyard (1971) has observed that those aspects of knowledge which are revealed depend largely upon the question asked. It was for this reason that the interview schedule employed a wide range of response formats ranging from open ended questions to check lists, and employed both graphic and verbal responses, and ranged from simple reporting of facts to projective questions which symbolically placed the respondent in a number of different situations with respect to the environment in question.[1]

Instructions

I sought to program the "state of perceptual readiness" of the subjects in each of the treatment groups to be as uniform as possible. This was achieved by means of a common set of instructions to the subjects, the purpose of which was to provide a common "operating plan" for all the subjects, a plan which Carr (1969) characterized as "look around for something interesting." (See Appendix A for the Instructions.)

It would have been both interesting and valuable to have ascertained the expectations of the subjects regarding such a trip prior to the experiment. However, in order to have done this in a meaningful way I would have been forced to reveal more about the street which would have nullified other parts of the experiment. As it was all differential expectations should be randomly distributed among the treatments.

The Environment

The environment selected for the experiment was Harvard Street, located in the northern section of Brookline, Massachusetts. The section of Harvard Street used in the study runs from Coolidge Corner (the intersection of Beacon Street and Harvard Street) to its intersection with Commonwealth Avenue just over the Boston City line (See Figure 3-1).

I selected this portion of Harvard Street because it was characteristic of one important environmental type with which environmental designers and researchers are often involved.

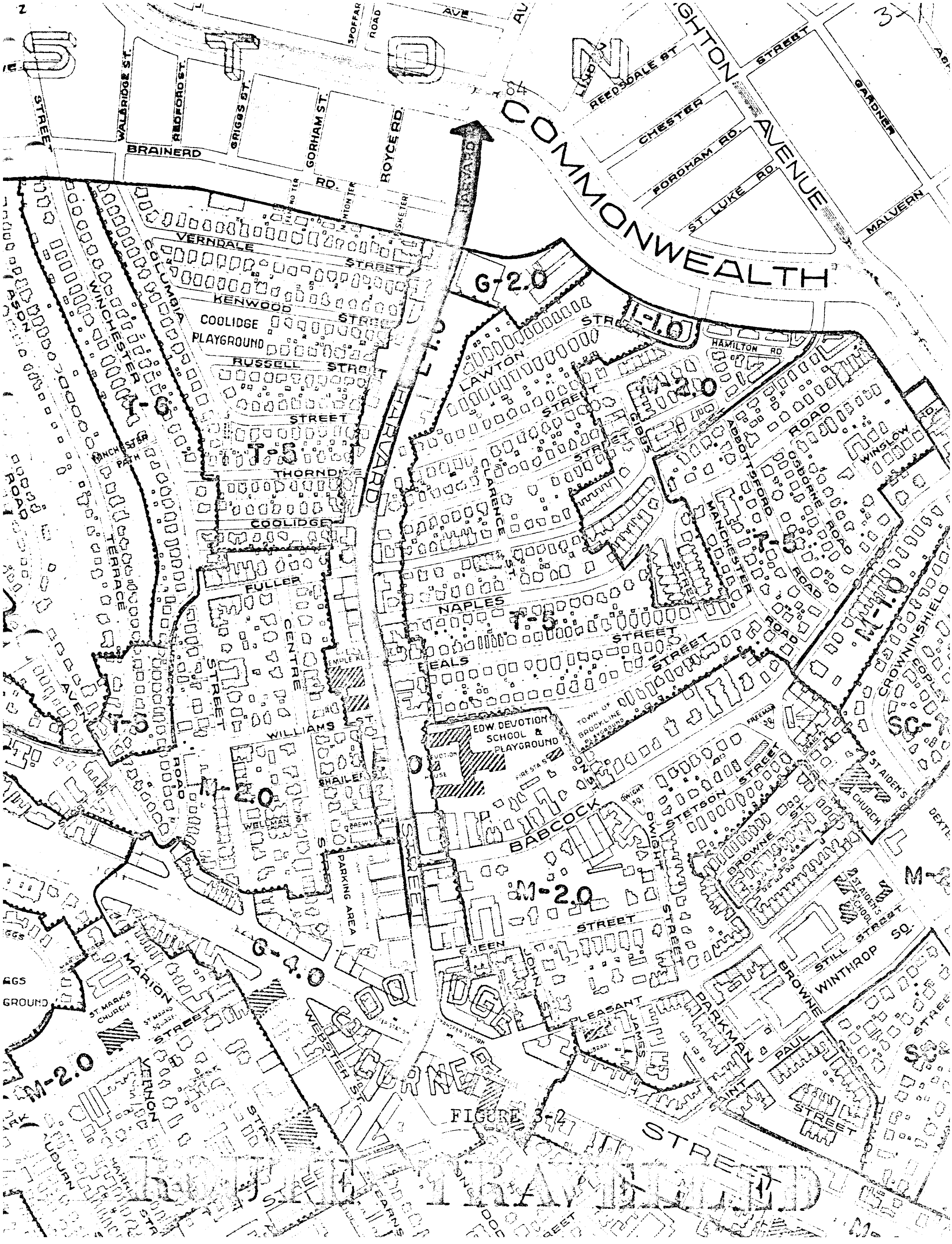

COMMONWEALTH AVENUE
BRAINERD RD.
WALBRIDGE ST.
REDFORD ST.
GRIGGS ST.
GORHAM ST.
ROYCE RD.
REEDSDALE ST
CHESTER
FORDHAM RD.
ST. LUKE RD
STREET
GARDNER
MALVERN
HAMILTON RD
VERNDALE STREET
KENWOOD STREET
COOLIDGE PLAYGROUND
RUSSELL STREET
WINCHESTER
COLUMBIA
TERRACE
WINCHESTER PATH
THORNDIKE
COOLIDGE
FULLER
CENTRE
WILLIAMS ST.
SHAILER
WELLMAN ST.
HARVARD STREET
LAWTON STREET
CLARENCE
NAPLES
STREET
BEALS STREET
GIBBS
ABBOTTSFORD
MANCHESTER
OSBORNE ROAD
WINSLOW
CROWNINSHIELD
COPLEY
EDW. DEVOTION SCHOOL & PLAYGROUND
DEVOTION HOUSE
TOWN OF BROOKLINE PLAYGROUND
FIRE STA.
BABCOCK
DWIGHT SQ.
DWIGHT STREET
STETSON STREET
FREEMAN SQ.
ST. AIDEN'S CHURCH
ST. AIDEN'S SCHOOL
BROWNE ST.
BROWNE
STILL STREET
WINTHROP SQ.
PARKMAN
PAUL
STREET
PARKING AREA
GREEN STREET
JOHN ST.
PLEASANT
JAMES
MARION STREET
ST. MARK'S CHURCH
ST. MARK'S SQUARE
VERNON
WEBSTER ST.
AUBURN
COOLIDGE CORNER
G-2.0
L-1.0
M-2.0
T-5
T-6
M-1.0
SC-1
M-4.0
G-4.0
M-2.0
PLAYGROUND

FIGURE 3-2

However, the most important reason for its selection was because of the distinct yet subtle diversity of activities, physical form, age, social composition, levels of maintenance, historic significance, etc., which were displayed along its length. It was my feeling that this diversity of non blatant meanings would provide a well rounded test of the ability of the various simulations to communicate the range of different types of information contained in the complex urban environment.[2]

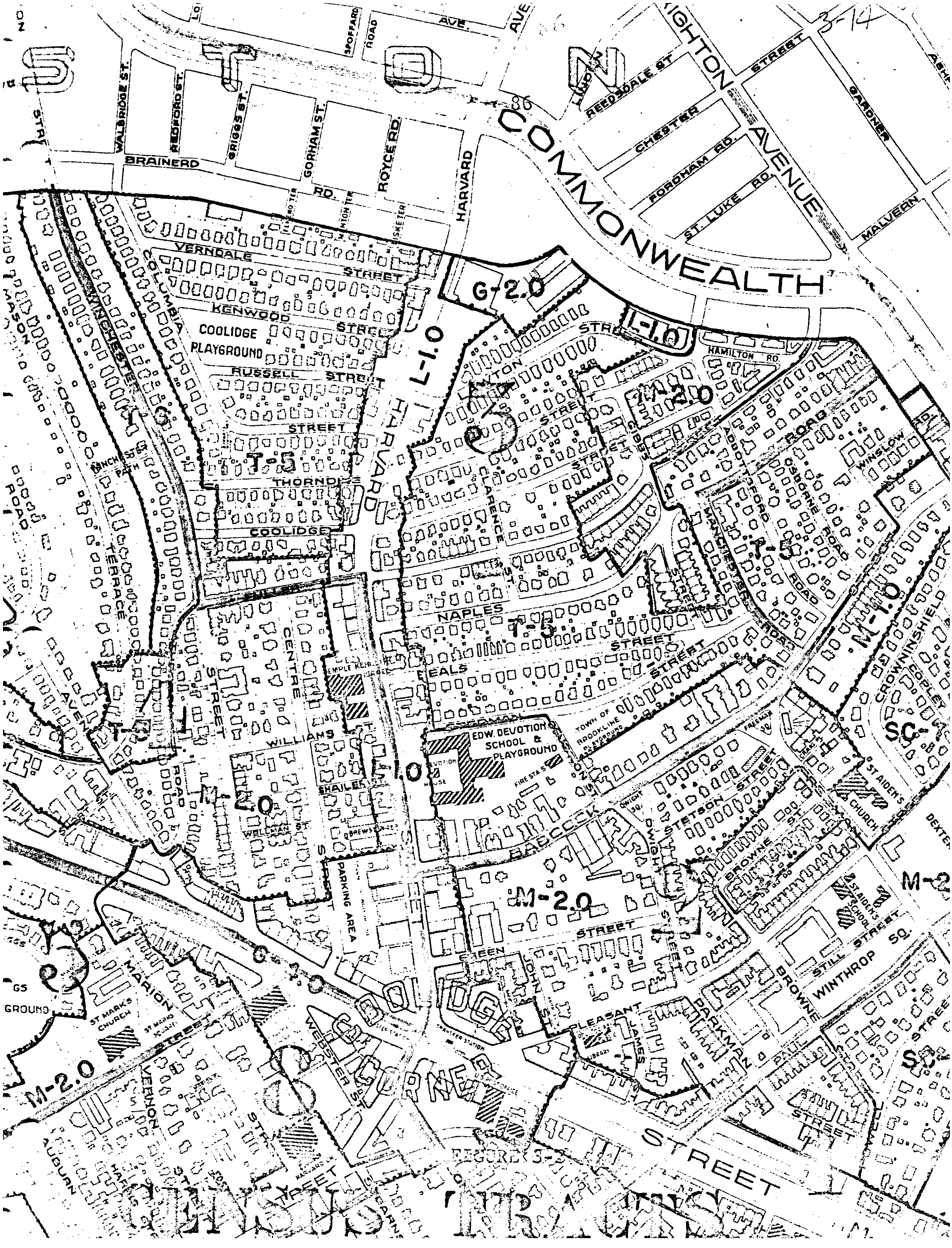
A. The Surrounding Community

A brief glance at the history of Brookline shows that although it was incorporated as a separate community in 1705, it was not until the early nineteenth century that Brookline began to develop as a suburb of Boston. At this time the only two roads leading westward from Boston were Huntington Avenue and Brookline Avenue, which converged at Brookline Village. From this point, other roads connected to Worcester (Boylston Street), Watertown, (Washington Street), and Cambridge (Harvard Street). Due to this confluence of traffic routes, Brookline Village had by 1844 become the community and trade center of the town.

However, during the 1840's population began to expand northward toward Cambridge along Harvard Street. This was the beginning of the intensive development of North Brookline which continued throughout the latter half of the nineteenth century. The importance of this area was increased with the development of Back Bay and in 1886, Beacon Street was widened to accommodate a streetcar line to downtown Boston. Coolidge Corner at the intersection of Harvard and Beacon Streets became an important trade center for the entire town. Thus the development pattern and character of Harvard Street was established primarily around the turn of the century (Brookline, 1968).

The area of North Brookline through which Harvard Street passes is dominated by the concentration of commercial activities at Coolidge Corner and the surrounding higher density residential neighborhoods. This district contains a large proportion of high quality retail space and numerous elevator apartments, as well as a good deal of middle-aged single-family housing. Census tracts 2, 4, 5, and 8 (See Figure 3.2) are primarily apartment-oriented and show evidence of continuing this trend into the future. The prevalence of apartment buildings is due largely to the convenience of Coolidge Corner and the nearby transit lines. Census tract 3 bordering on Boston is characterized by large single and multi-family residences on small plots of land (Brookline, 1960).

The Coolidge Corner retail area is the most intensive land use in the North Brookline area, It services the surrounding apartment-oriented neighborhoods, and is generally a high quality retail center based primarily on convenience shopping. Economic prospects for the area are good according to recently completed market studies by the Town Planning Board of Brookline, (1968) and about one-third of the retail trade in Brookline is carried on at Coolidge Corner at the present time.


3-14
COMMONWEALTH
AVENUE
HARVARD
BRAINERD
RD.
WALBRIDGE ST.
BEDFORD ST.
GRIGGS ST.
GORHAM ST.
ROYCE RD.
SPOFFORD ROAD
REEDSDALE ST
CHESTER
FORDHAM RD.
ST. LUKE RD.
MALVERN
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OSBORNE ROAD
WINSLOW
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CROWNINSHIELD
COPLEY
SC-1
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ST. AIDEN'S SCHOOL
DEXTER
BROWNE ST.
STILL STREET
WINTHROP SQ.
PARKING AREA
GREEN
JOHN ST.
PLEASANT
JAMES
PARKMAN
LIBRARY
U.S. POST OFFICE
MARION
ST. MARKS CHURCH
ST. MARKS SQUARE
VERNON
WEBSTER ST.
AUBURN
HARVARD AV.
STREET
COOLIDGE CORNER
FIGURE 3-2
CENSUS TRACTS

Gasoline and automobile sales form a significant and expanding sector of Brookline's retail trade. Most of this expansion has occurred along Commonwealth Avenue where Brookline borders on Boston which includes the terminus of that section of Harvard Street used in the experiment. Also, there has been considerable commercial expansion in recent years along Harvard Street itself. The resultant strip commercial development has caused problems of parking, traffic congestion and visual chaos.

The town government of Brookline has initiated a number of actions aimed at retaining and enhancing the quality of Coolidge Corner and Harvard Street. They have constructed off-street parking in the Coolidge Corner area, planted street trees along Harvard Street and carried out a code enforcement program throughout the area (Brookline, 1968).

B. Population

The area has a high proportion of Jewish residents, few non-whites, and contains about 35 percent more females than males. This latter fact is probably related to the high percentage of elderly residents and unrelated individuals living in apartments. The area has few persons in the 0-19 age group but is high in the age group 20-29. The median income for the North Brookline area was \$8,627 according to the 1960 census (Brookline, 1960).

C. Housing

Around seventy percent of the housing in the North Brookline area is renter-occupied and there is a significant concentration of these around Coolidge Corner and at the Commonwealth-Harvard intersection as well as along Harvard Street itself. The area had few dilapidated structures, about two percent, and only one-fourth of one percent deteriorated structures in 1960, according to the Census. Substandard units tend to be concentrated in census tracts 2 and 3 (Brookline, 1960).

D. Harvard Street

A more detailed look at Harvard Street itself is in order. The portion of the street selected for the experiment begins just to the south of the Coolidge Corner intersection where Longwood Avenue intersects Harvard Street, and terminates at the Commonwealth Avenue intersection (See Figure 3.3). Harvard Street was selected because in this area it exhibits a variety of characteristics arranged in a subtle and complex manner. Parts of the street, such as Coolidge Corner are unique, and have a legible and vivid spatial form whereas other sections of the street have no particular identity and might occur along a major street in any city. It was felt that these conditions offered an excellent opportunity to test the effectiveness of the simulation techniques under conditions which would reveal the basic strengths and weaknesses of each.

Harvard Street acts as a major circumferential route between the radials Beacon Street and Commonwealth Avenue. It

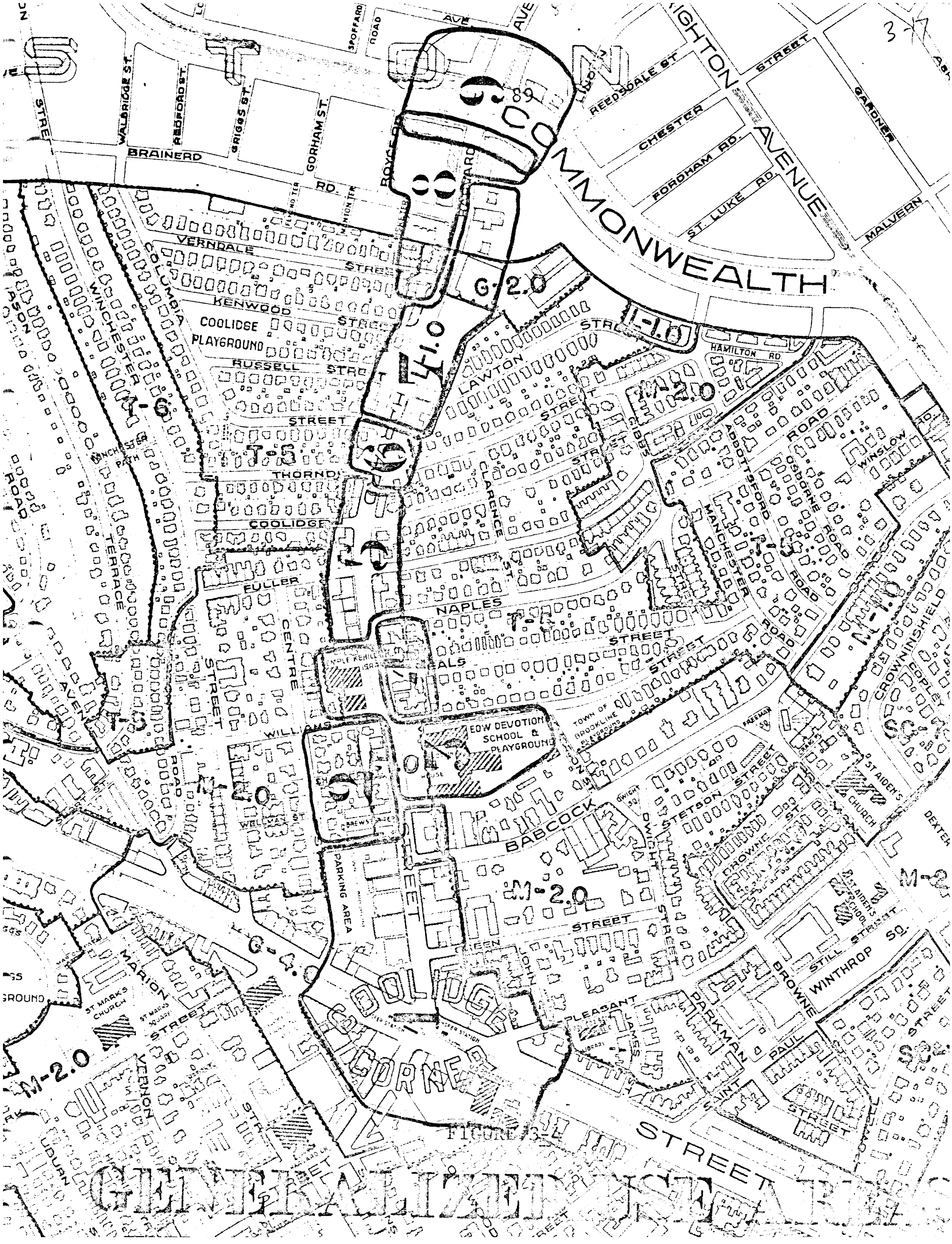


FIGURE 3-2

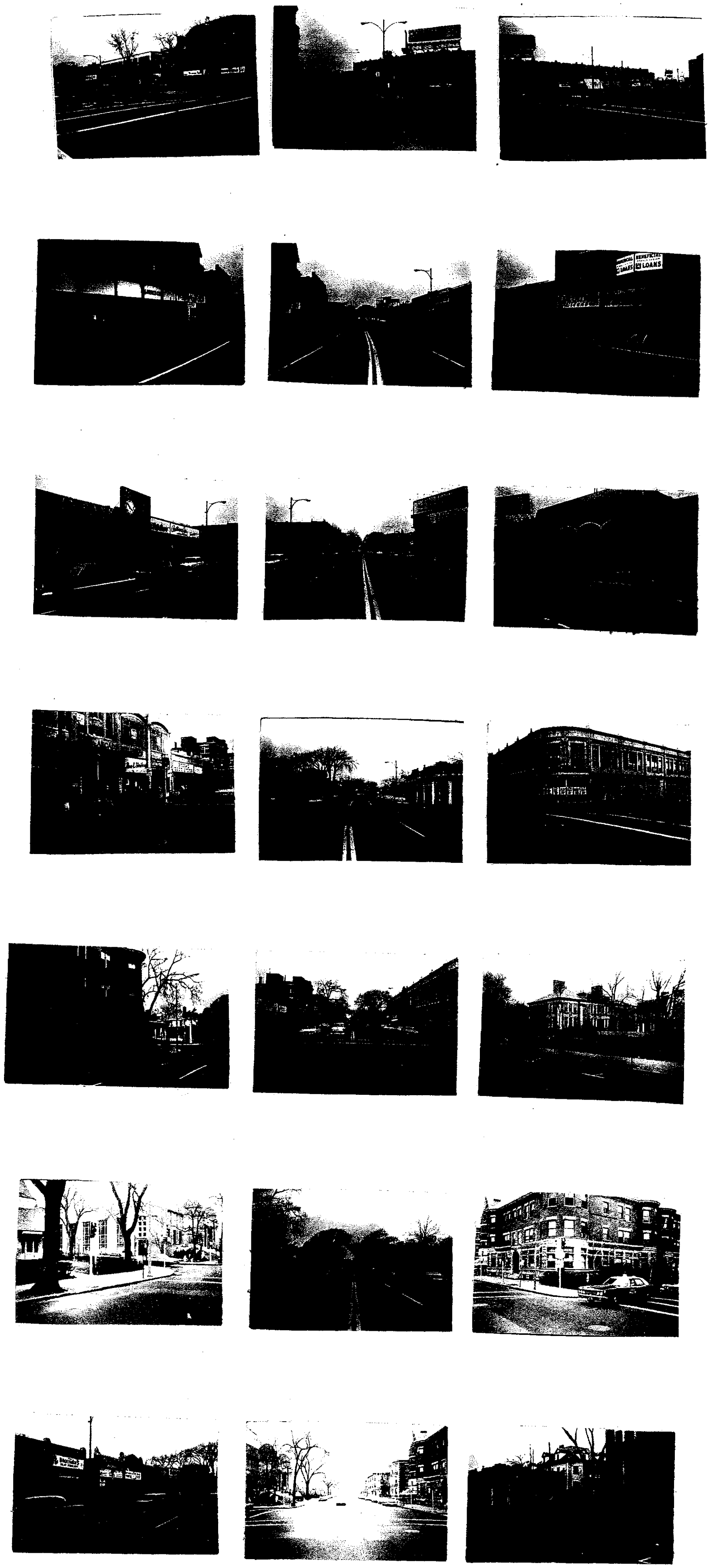
GENERALIZED USE AR

serves through traffic between Brookline Village and Cambridge as well as local shopping and service traffic within the immediate area. The street right of way is sixty feet and it has two moving lanes in each direction, as well as a parking lane on either side. Especially in the Coolidge Corner area, congestion and lack of parking is a problem.

Proceeding along the street from Coolidge Corner, there is a slight uphill grade until one reaches Thorndike Street, then there is a noticeable downhill grade leveling out around Kenwood Street with a very slight downhill grade continuing to the Commonwealth Terminus.

Figure 1-3 breaks the street down into sub-areas which will be used to describe its characteristics in more detail. Figures 1-4 and 1-5 contain a series of fourteen groups of photographs taken at regular intervals proceeding down the street. The center photograph in each group is taken from the center of the street looking straight ahead. Those on either side were taken at approximately 45° angles from the center. See Figure 1-6 for the station points of each photo group.

Area I. The Coolidge Corner area (See photographs 1-4) as was noted earlier is the largest concentration of convenience shopping in Brookline and as would be expected, pedestrian activity and parking are very intense and even congested. There are a number of well-designed "turn of the century" commercial buildings, the most significant of which is the S. S. Pierce Store with its half-timbered construction, tower and clock. Most of the buildings are two story with



Station 1

2

3

4

5

6

7

FIGURE 1–4

8

9

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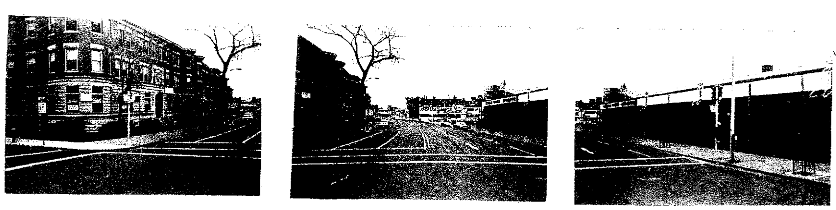

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13

14

FIGURE 1-5

3-19

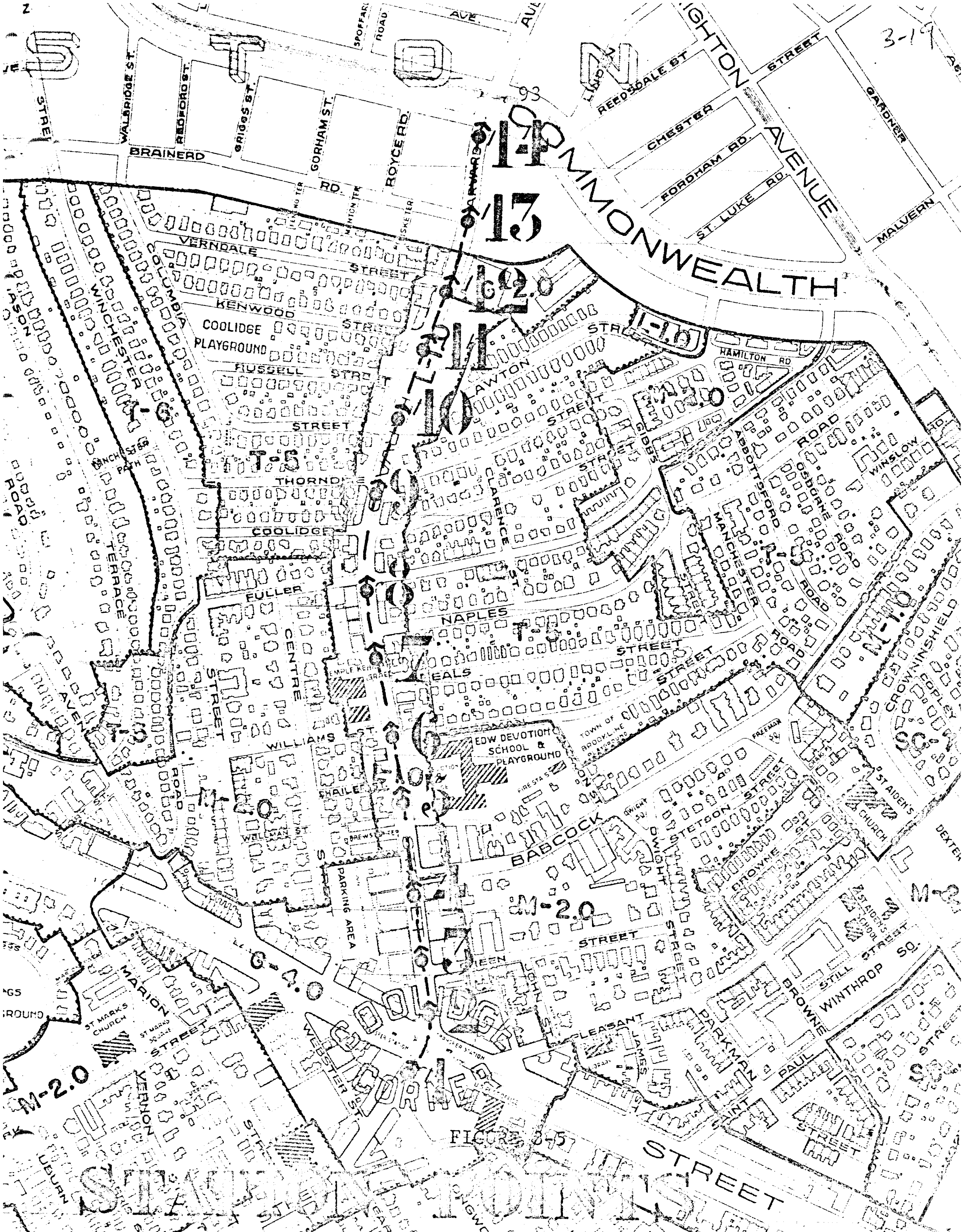

FIGURE 1-6: STATION POINTS

occasional one and three story mixed in. This area, although of generally high visual quality, does suffer from a degree of visual clutter, the proliferation of signs commonly associated with contemporary American merchandising. Most noticeable are two large billboards atop buildings on the right side of the street preceeding in our direction of travel. Beacon Street is very wide (160' ROW) with a planted median strip and a trolley line running through it. With the exception of the trolley wires on Beacon Street there is no overhead wiring. There are no street trees in this area.

Area II. This small area (See photographs 4-5) is one of three islands of residential use, along the predominantly commercial street. It is comprised of two blocks, one of which is made up of bow-front four story apartment buildings characteristic of turn of the century streetcar suburbs. Most noticeable of these is Brewster Terrace with its planted inner courtyard which provides the first trees as we proceed along our route. The second block is made up of two large single-family houses, one of which has been converted into a funeral home, and a Sunoco gas station. Street trees in this area are large and are a prominent part of the visual field.

Area III. Two large institutional buildings make up this sub-area (See photographs 5-6). On the right is the Edward Devotion School and Playground, a large yellow brick and limestone school building. Nestled in front is the Edward Devotion House, a well-preserved, early New England farm house. This area comprises the only large public open space along this section of the street. There are large trees throughout the open space.

The second major structure which sits diagonally opposite the school is the Temple Kehillath Israel, an imposing edifice with a large flight of steps and two domes over towers on either side of the entrance. This building is also set slightly back from the street and landscaped with grass, shrubs and street trees. These two buildings are the largest and most impressive structures along the section of the street used in the experiment. The trees in front of the Edward Devotion School, along with those of the Temple and the Brewster Terrace Apartments in Sector 2 are very prominent visually as one proceeds down the street through the Coolidge Corner area which has no street trees.

Area IV. This small area (Photographs 6 and 7) is the second of the three islands of residential use along the street. It, like Area II, is comprised of a two block stretch of three-story bow-front apartment buildings, well-maintained with a few shops along the ground level. This area has a few large street trees and others newly planted by the program cited earlier, but the street is largely characterized by wide barren widewalds. A small unobtrusive sign on the right side of the street notes that the birthplace of John F. Kennedy is just to the right, down Beales Street.

Areas 2, 3, and 4 might well be considered as a larger single district. They are visually quite similar and spatially sub-area II is directly across the street from the Edward Devotion School while sub-area IV lies directly across from the Temple Kehillath.

Area V. This area (See Photographs 7 and 8) represents a distinct change from sub-areas 2, 3, and 4. The buildings are mainly one story commercial spaces added in front of the existing large single family homes. Usually, the buildings are homogeneous with their similar heights, common frontage, and detailing and fairly subdued signing. There are few large on-street trees in this area but the street planting program initiated by the town government has resulted in a regular spacing of small trees with their protective staking. Pedestrian activity in this area is more intense than in the previous three sub-areas, but not so intense as Coolidge Corner.

The area has a distinctive ethnic flavor, with several kosher butchers, bagel shops, and delicatessians forming the predominent uses.

Area VI. This area (Photograph 9) is composed of a very prominent grouping of gas stations located on three of the four corners of the intersection of Thorndike and Harvard. Their signs, parked cars, and the sudden widening of the space from the continuous shop frontage of the previous area make this a very noticeable area. While its character is not at all unique in terms of American cities, it represents a very distinct change in character for Harvard Street and, in fact, is the most severe break in the design of the street.

Area VII. Area VII (Photographs 10, 11, 12, and 13) is comprised of auto-oriented businesses. The grocery store, bank, funeral homes, and cleaners accommodate the auto-borne customer with large parking areas. It is also characterized by wide, undefined spaces and no clear sense of identity. It could be any major street in any town in America. There are noticeably fewer signs than in the previous area, however. The most prominent structures in this area are the two funeral homes which utilize converted large single-family homes now surrounded by large parking lots. Also prominent is the Purity Supreme Supermarket with its large parking lot. The surrounding single-family residential areas are often visible through the parking lots. At the Purity Supreme Supermarket this district shifts to the right side of the street and continues as a series of gas stations and a small new office building. There are few large street trees but the street tree program has resulted in a steady progression of small trees up to the Boston City limit. There is a slight but nevertheless noticeable decline in the level of maintenance as one crosses into Boston. There are no street trees, the buildings have not been subjected to the code enforcement program, the street surface has a few more patches, the sidewalks are a little dirtier.

Areas VI and VII are very similar in character and might be considered as a larger district. The only real difference is in the number of signs; area VI is very pronounced with its clutter of signs.

Area VIII. Area VIII (Photographs 11, 12, and 13) represents the last of the three islands of residential use in the section of the street used in the experiment. A series of three and four floor bow-front apartments are clustered near the Commonwealth streetcar line and the shopping area located along Harvard Street just across Commonwealth. This area is pronounced in its lack of greenery. There are noticeably more young people living here than in the previous two sub-areas. The ground floor frontage along Commonwealth is commercial. The pedestrian activity is more intensive here than in the previous two areas but still not so intense as in I and V.

Area IX. Commonwealth Avenue represents the terminus of that part of the street used in the experiment. It is the beginning of an intense but lower quality commercial area stretching along Harvard Street between Commonwealth and Brighton Avenue. This area (Photograph 14) is characterized by large imposing signs, such as the Macey's Liquor Store sign and the Black and White Scotch billboard atop the building.

Commonwealth Avenue, like Beacon Street at the beginning of the trip, is a very wide street (130' ROW) with a streetcar line running along the planted median strip.

Thus the street used for the experiment is a major street, acting as a circumferential route between two radials. It has a slight but noticeable curve and an equally slight but noticeable change in grade. The street is comprised of six distinct physical districts along its length. Figure 1- 7 indicates the buildings and area which were within view as one

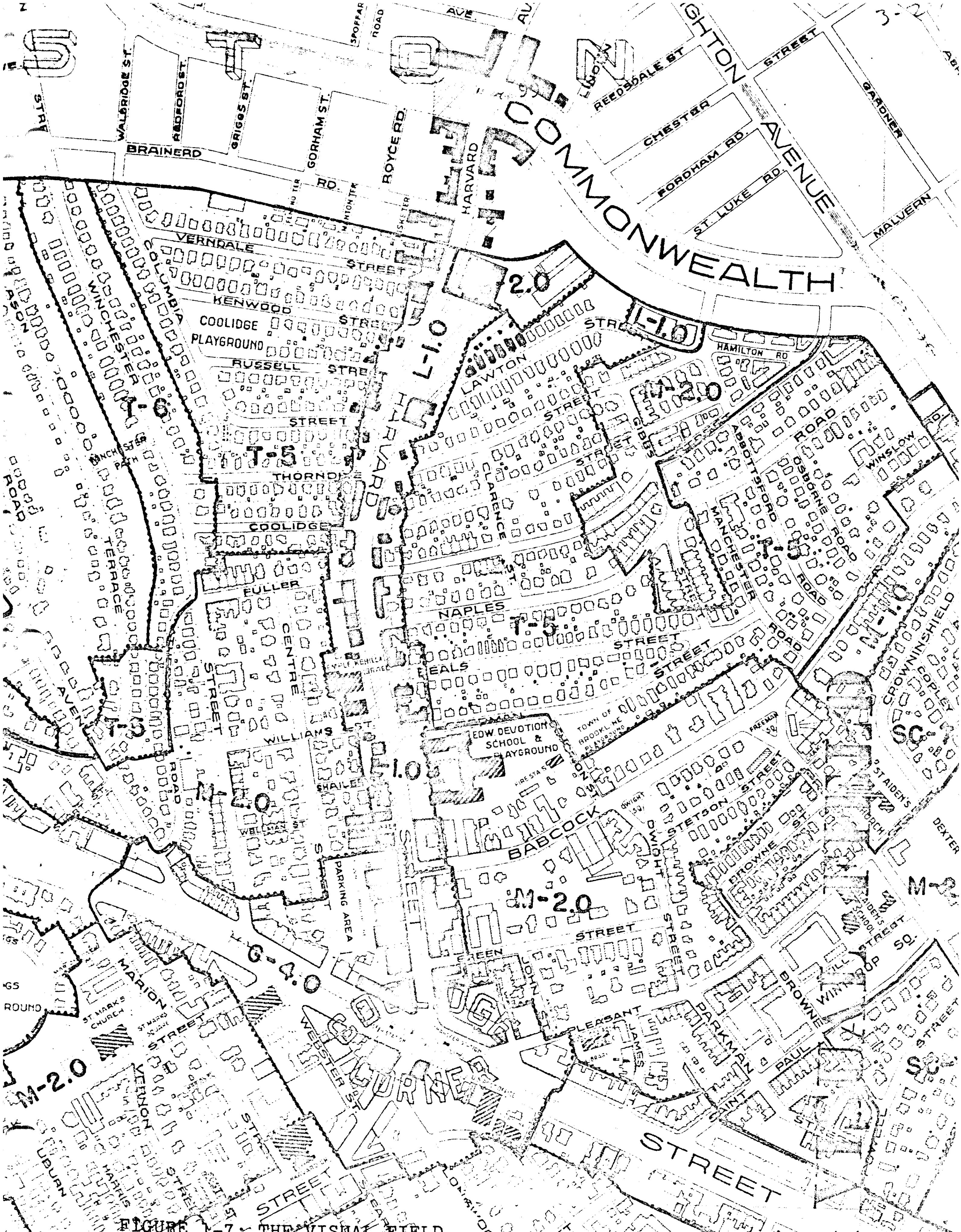

FIGURE 1-7: THE VISUAL FIELD

progressed along the route taken in the experiment.

In this chapter I have developed the rationale of the research approach, a two phased study comprised of a comparative study and three experiments. In addition I have sought to point out some of the limitations of the two different study designs. The data collection instrument and the environment were described. In the following chapter I will develop the research design used in the phase one comparative study.

NOTES

1. Good discussions of techniques for, and problems encountered in, researching peoples perceptions of the environment can be found in:

   (1) Lynch, Kevin (1971), "Social and Psychological analyses," Chapter VI of Site Planning, Second Edition, Cambridge: MIT Press.

   (2) Thiel, Phillip (1971), "Response Measures," draft manuscript for forthcoming book: Towards an Envirotecture.

   (3) Craik, Kenneth (1970), Environmental Psychology, in Theodore C. Newcombe, (ed) New Directions in Psychology, New York: Holt, Rinehart and Winston.

2. It should be noted that, although I chose to simulate an existing environment so that I could compare responses to the simulations with responses to the real environment. The simulations tested, however, are obviously capable of simulating proposed, non-existent environments as well.

REFERENCES

Appleyard, Donald (1971), "Notes on Urban Perception and Knowledge," in Mitchell (ed), Environmental Design Research and Practice, University of California at Los Angeles.

Brookline Planning Board (1960), Public Improvements Plan For The North Brookline Renewal Area, Brookline, Massachusetts.

Brookline Planning Board (1968), Neighborhood Analyses, Brookline, Massachusetts.

Winkel, Gary (1966), "An Approach to the Objective Analysis of Behavior in Architectural Space," Architecture Development Series, No. 5, University of Washington, Seattle.

CHAPTER II

PHASE ONE RESEARCH DESIGN

In this chapter I will describe the research design, as well as the procedures used to administer the experiment, to collect and analyze the data for the phase one comparative study. This phase of the study is aimed at ascertaining:

1) The effectiveness of six simulation techniques, commonly used by environmental designers and researchers, in obtaining responses which are equivalent to those of a real environment along cognitive, affective and behavioral dimensions.

2) The effect of several population variables on response veridicality, particularly the effects of professional training in environmental design.

The experiment is designed to compare the responses obtained from a group of subjects who experienced the selected environment directly (The Control Group) with those responses obtained from other groups of subjects, each of which experienced that same environment indirectly by means of a simulation (The Experimental Groups).

Six simulation techniques were chosen to be evaluated:

1) A 16mm color movie (no sound).
2) A series of 35mm color transparences (color slides).
3) Black and white photographs.
4) Perspective drawings.

5) A 16mm black and white movie taken of a 1 inch equals 50 feet scale model through an optec model scope.

6) 16mm black and white transparencies taken of the 1 inch equals 50 feet scale model with the optec model scope.

The main criterion governing the choice of those techniques to be tested was that they be reasonable examples of "the state of the art." Further, they should be of a type which is within the means of, and commonly used by most architects, planners and researchers. This same criterion of reasonableness also governed the level of quality (objective reality) sought within each simulation tested.

The simulations tested were evenly divided between those which are primarily useful in predictive tasks, such as describing proposed environments (the perspective drawings and the modelscope simulations), and those which are useful primarily for descriptive purposes such as for bringing elenents of the "existing real world" into the laboratory (the color movie, the color slides, and the black and white photographs). I had hoped to test computer-generated perspectives but this proved to be too expensive, and given the very rapid development and change occurring with this technique it appeared to be an inopportune time for such a test. The experiment on abstraction described in Chapters IV and V does provide some insights which are applicable to computer generated perspectives, however.

Simulations of Harvard Street were prepared using each of the selected techniques. Each simulation was prepared in as standardized a manner as possible without distorting the basic characteristics of each technique. These standardized procedures included such things as:

1) holding the viewing time constant for all treatments,

2) selecting identical station points and field of view,

3) selecting a standard time at which the environment would be shown such that conditions of traffic, weather and other activities would be as similar as possible.

The specifics of the standardized procedures for each treatment will be described in the section on treatments.

One difficult variable to deal within a study of this type is the person who prepares and administers the simulations, the sender-encoder in terms of communication theory. To properly enable one to generalize across all situations would involve selections from many different sender-encoders. This is clearly beyond the scope of this study. In order to standardize as much as possible the impact of that complex of sender-encoder variables noted in Chapter I, 1) skill, 2) attitudes, 3) knowledge of subject, and 4) socio-cultural context, the simulations were prepared and administered by the researcher.[1]

Subjects

The essential method of comparison was to select subjects which were as closely identical as possible with respect to all relevant factors (except the mode of experiencing the environment). Then to randomly assign them to experience the environment either directly or by means of one of the six simulations, and finally to obtain their responses to the environment by means of a structured questionnaire.[2]

The General Sample

The primary subjects chosen for the experiment (The General Sample) were the residents of the Westgate Married Student Housing Complex on the M.I.T. Campus. This group is very homogeneous along a number of important dimensions. This is so because a number of highly selective factors are at work in determining the characteristics of the people who live in Westgate. In order to be a resident of Westgate, one must have the intelligence, educational background and interests necessary for admission to M.I.T. and be married. As a further consequence of these selective factors, the subjects are of fairly similar age levels with most of them being in their twenties or early thirties. They tend to come from outside the Boston area and therefore were likely to have no prior experience with Harvard Street.[3] Thus, their environmental experience in the Boston area would tend to be somewhat similar, i.e. primarily on campus with occasional exploratory shopping or recreational trips to other surrounding areas, etc.

So that along the commonly accepted sociological stratifications of class, economic status, age, occupation, education, and marital status the subject population exhibits remarkable homogeneity and this homogeneity is furthered by a fairly similar environmental experience. Subjects were assigned to the treatments in the following manner. Each apartment was numbered and then using a table of random numbers, the residents of each apartment were assigned either to the control group (direct experience) or to one of the experimental groups (a simulation). Each subject was assigned to experience the environment only once either by means of one of the simulations or directly as a member of the control group.

After the assignment procedure was completed, a letter, under the Laboratory for Environmental Studies of M.I.T. letterhead, was sent to each resident in the building informing them in a very general way that the Laboratory was conducting a study on some questions concerning the environment and that they would be contacted in the immediate future regarding their possible participation. All participation was unpaid and completely voluntary. (See Appendix B for copy of the letter.)

A schedule for administering each of the simulations was set up and then the subjects for that treatment were contacted and appointments made for them to view the environment. The experiment was administered in the recreation room in the basement of the Westgate Tower building. This is a rather bland room which is comfortably familiar to all the subjects, with adequate comfortable seating. It is capable of being darkened to show movies and slides. In addition it has no outside windows and as such is relatively distraction free. The showings were generally to groups of from four to ten people; however, occasionally there were fewer.[4]

Environmental Designers

The secondary question which was examined in this study was the possibility that different sub-groups in the population might have different responses to the simulations. Of primary interest was the possibility that environmental designers (in this case architects and planners), due to their prior experience with simulations and with their particular involvement with and value orientations toward the environment, might have markedly different responses to the simulations as compared to the general sample of subjects. In order to test this hypothesis a small sub-sample was selected from the student population of the School of Architecture, Urban Studies and Planning at M.I.T. These subjects were obtained and randomly assigned to treatments in the following manner which was necessitated by the difficulty of reaching students during the summer semester.

I contacted students whom I knew and asked them for names of other students who were available. These names were listed and then using the table of random numbers, they were assigned to a treatment.[5] They were then contacted and appointments were made to administer the experiment.

It should be noted that because they are students at M.I.T. these subjects are similar in most respects to the Westgate sample. Important differences are: 1) They did not live in Westgate; 2) They were not necessarily married, although many were; 3) Obviously they all had training in either architecture or planning.

The samples used in the experiment are in no way purported to be representative of the general population or of the universe of environmental designers. The purpose of the experiment is to see whether or not subjects who are as homogeneous as possible on all dimensions (except those of the treatment variables) will have differential responses to experiencing an environment directly or by means of a simulation. Clearly, strongly different response patterns which have no clear or plausible connections to the biases involved in selecting the sample might with some certainty be hypothesized to hold true for other populations, but they would nevertheless have the status of informed hypotheses only.

The Treatments

In this section I will describe the seven treatments utilized in the comparative study, the direct experience or control and the six simulations. First I will detail the development and administration of the direct experience (or control treatment) followed by a description of the procedures used in constructing the simulations and concluded by a description of the procedures used to administer the simulations to the subjects.

Direct Experience: The Trip. Thirty-two subjects, consisting of twenty-two from the general sample and ten from the environmental designer sample, used as the control in the experiment, were driven along Harvard Street under conditions that were as similar to those experienced in the simulations as possible. Groups of, from one to four subjects at a time were taken through the selected environment on a holiday when conditions of weather, traffic and activity approximated those of the simulations (taken on a Sunday morning). The car used was a rented late model American four-door sedan with large windows and large comfortable seats.

The procedure was as follows: On the way to the starting point of the experiment the subjects were asked to complete the biographical parts of the questionnaire. This served as a distraction to prevent them from becoming involved with those areas passed through on the way to Harvard Street, and to minimize any learning or prior experience which might be gained in approaching the experimental environment. This part of the ride usually took from three to five minutes. Upon reaching the starting point, the subjects were told:

> "O.K., we're about to start the experiment now. We're interested in learning about what people think about their environment. I will drive down this street and I want you to just look around, and then when we're through, to answer some questions. It's a very straight forward kind of thing . . . no hidden tricks or concealed purposes, no right or wrong answers . . . its not a psychology experiment. Can everyone see? O.K., lets begin."

Then I would begin driving, at as steady a rate as permitted by traffic conditions, about 15 to 20 miles per hour and in the center lane. This is approximately the same position from which the simulations viewed the environment. The trip took about seven minutes or about the same time required to show the movie at 18 frames per second which determined the viewing time for the other simulations as well.

Upon reaching the Commonwealth intersection, the subjects were told: "That's the end. Now would you start answering the questions in the booklet." I would then turn onto Commonwealth and find a quiet parking space, just out of sight of the Harvard intersection but within two blocks. No one seemed disconcerted at any of this and all were able to answer the questions in seeming comfort.

After everyone had completed the questions which usually took about an hour, we then drove back to Westgate. During the drive I explained more fully the objectives and purposes of the experiment, and answered questions.

Indirect Experience: The Simulations, How They Were Made. As was noted earlier, the simulations were standardized to the extent possible within the limitations of the media itself and the self-imposed limitation of their being a reasonable example of the "state of the art," within the means of most environmental designers or researchers.

Clearly, however, these tests are not exactly representative of a typical environmental designer's use of simulations. They might, and probably would use several media. At least they would provide some verbal description. However, this fact has nothing to do with my basic purposes of determining just how effective these particular media are for representing environmental experience. The findings should provide some indications as to which kinds of information are best or least well conveyed by a particular media and therefore enable a practitioner to supplement his basic simulation in a weak area and generally to choose a simulation that best suits his purposes.

The Color Movie

Equipment:

A. 16mm Bolex H-16 movie camera.

B. 10mm Bolex Pailard wide-angle lens.

C. Bolex electric motor with a portable battery pack.

D. Daylight filter.

E. Two 100' rolls of 16mm Kodachrome II color movie film.

F. A standard photographic tripod.

G. A 1966 M.G. convertible with the top removed.

H. A Weston exposure meter.

Procedure

The film was shot on a Sunday morning between 11:00 A.M. and 11:30 A.M. The camera was mounted on a tripod positioned immediately behind the passenger seat of the car so as to look over the windshield. Due to the fact that the car used in the experiment is very low this puts the camera at about eye level for a passenger in an American car.

The camera was run at 18 frames per second and the lens opening set for proper exposure. The car was driven in the center lane at the speed of 15 to 20 miles per hour. (The same speed as the control groups'.) While this is somewhat slower than normal traffic it was not disturbingly so. The slower speed was necessitated by the uneven surface of the road which caused the camera to bounce at higher speeds.

Twice during the run traffic lights necessitated stopping the car. The camera was also stopped to conserve film. The film is spliced because the hundred foot length was not sufficient for the entire trip. The running time for the film was seven minutes.

Stopping the camera at the traffic lights and the splice between the two rolls of film resulted in what are called "jump cuts". Although the street and its permanent features are unchanged at these splices, pedestrians and cars jump around a little. This was noted in the instructions to the subjects as being simply a technical problem of no significance to the experiment. None of the subjects mentioned it as being disturbing or distracting.

One additional problem encountered was that of obtaining a constant exposure. This changes as a result of changes in the radiant level of sunlight as well as being affected by the tonal value of the surrounding buildings, trees, roadway, cars, etc. Thus one is forced to trade-off between an inconsistent exposure on one hand and a film with many cuts and consequently the problem of disappearing cars and people on the other. Several films of the street were shot and the best one selected for use in the experiment. The film which was used has one section of about 30 seconds duration which is somewhat overexposed. The remainder of the exposure is within accepted limits.

Color Slides

Equipment:

A. 35mm Pentax Spotmatic Still Camera

B. 35mm Asahi Super Takumar Lens (angle of view = 75°)

C. Kodachrome II, Color slide film (ASA = 25).

Procedure: The color slides were taken on the Sunday preceeding the one on which the color movie was filmed. Both were taken at the same hour, between 11:00 and 11:30 A.M. The camera was hand-held at approximately the eye level of a passenger in an American sedan. The photographs were taken from the center of the street which is a slightly different position than that of the movie and the actual trip. This was necessitated by a Brookline policeman who insisted that it was unsafe to stand in the middle of a moving traffic lane and would only permit my photographing while standing on the center white line. As can be seen from the sample views (Figure 2.1) there is no significant difference in the field of view. The photographs were taken in sequence at intersections and at half block intervals. The shots taken at intersections were from the crosswalk on the southern side of each intersection (toward Beacon Street). The camera was pointed straight ahead. Shots were also taken at an approximately 45° angle to either side but these were not used in the experiment. Fourteen shots were taken in all and the station points are indicated in Figure 1-6.

Aside from the slight difference in the field of view resulting from the center line position, there were no other

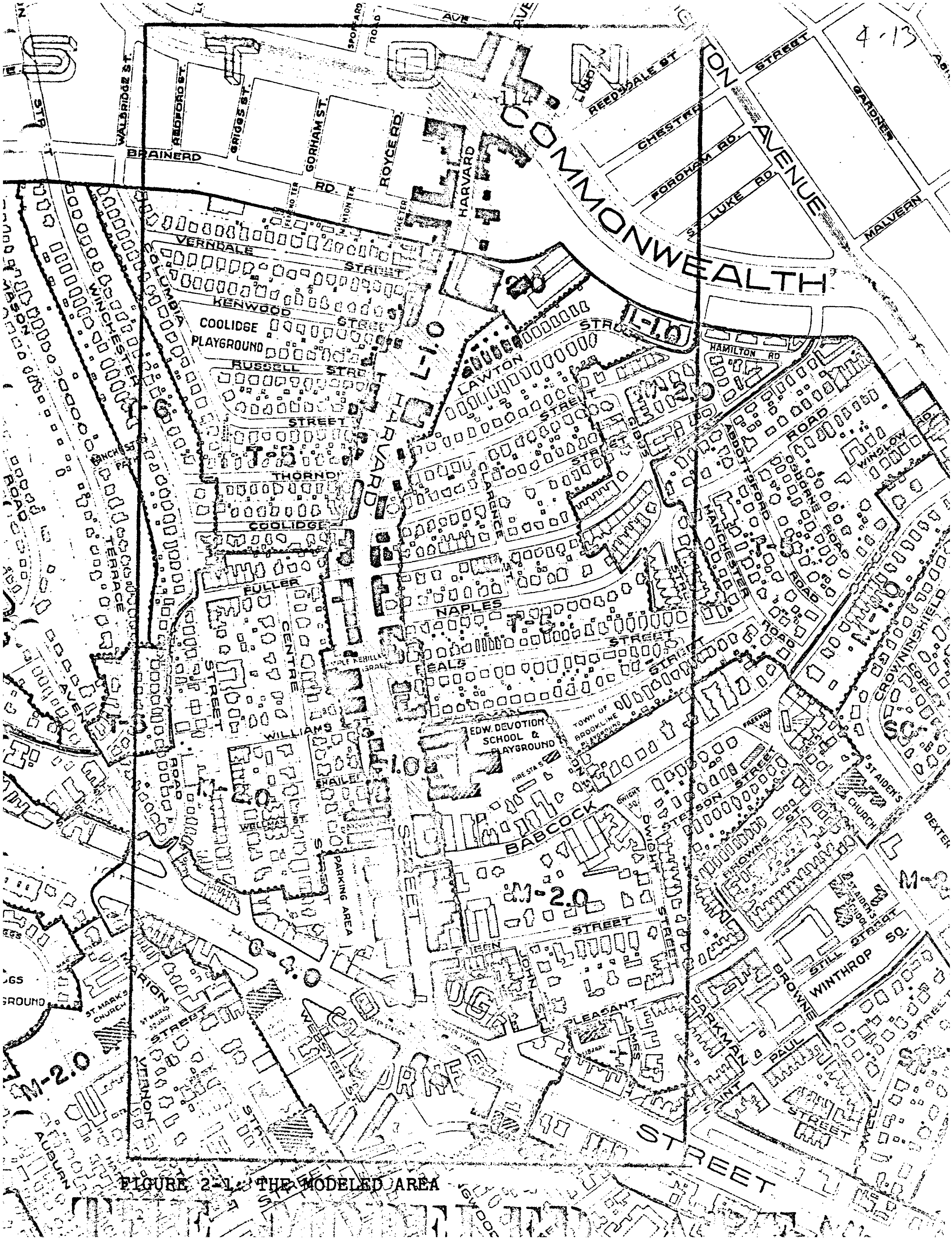

FIGURE 2-1: THE MODELED AREA

problems encountered in shooting the slides.

Black And White Photographs

Equipment:

A. 35mm Pentax Spotmatic Still Camera

B. Asahi Pentax slide copier

C. Kodak Panatomic X black and white film (ASA = 125)

D. Agfa Bovira photographic paper.

Procedure: The black and white photographs were made by copying the 35mm color slides used in the other simulation. With the use of a slide copier I was able to make an exact duplicate of the color slides. These black and white prints were eight inches by five and one-half inches, dry mounted on a thin but rigid cardboard backing. No problems were encountered in the production of the photographs.

Perspective Drawings

Equipment:

A. 35mm slide projector

B. 3' X 5' piece of ¼" plate glass

C. Dietzgen 1,000H tracing vellum

D. Eagle Draughting Pencils #314

E. A semi-darkened projection booth

Procedure: The tracing paper was taped to the sheet of plate glass and the color slides (used in the other presentation were projected onto the back side of the plate glass; the image size was 18" X 24". A line drawing was then made over the back projected image so that all the stimulus elements are identical with the exception of those which are inherent with the media of drawing itself. For example, lettering and other images on signs were reproduced if they were large enough to be reasonably delineated at this image size. This meant that a number of smaller signs, like "no parking" signs, shop signs, etc. were excluded from the drawings but were clearly visible in the color slides when projected to a normal size of approximately 32 by 48 inches. The drawings were done in a realistic style used by many environmental designers styled after the drawings of Gordon Cullen (1961). After the drawings were completed, they were photographed using Kodak High Contrast Copy Film, and printed on high contrast paper. Then using an Itek Printing process, these were reproduced at 8½" X 11" and bound into small booklets (See Appendix C).

Pencil drawings are very difficult to photograph in that the graphite in the lead is reflective in certain areas which results in a loss of the line quality. The Itek Photo Lithography Process resulted in some loss of image quality as well. Particularly for picture number five in the sequence which suffered a loss of window shading and some lines disappeared. In other drawings there was some closing up of lines which were too close together. But, overall the quality of the drawings was a close approximation to that which might be made by a practising architect or a researcher.

Modelscope Simulations

These proved to be the most difficult of the simulations because they involved: 1) constructing a three-dimensional model of the street, a fairly significant task in itself; then, 2) making a movie of a simulated trip along that street. While the model was a time consuming and laborious task, the results were fairly predictable. The modelscope movie, however, was a different matter. The problems encountered will be discussed later, first a description of the model itself.

The Scale Model

Equipment:

A. Base: a four by eight sheet of one-half inch plywood.

B. Street surface: one-eighth inch grey chip-board.

C. Building, sidewalks, and land areas: white strathmore double-ply artists board.

D. Trees: selected grasses, purchased from Charette Corporation under the name, "Charettes Nubbyies"; they are specially selected for their realism at scales from 1" = 100' to 1/8" = 1'0".

E. Cars, busses, trucks: also purchased from Charettes; they are cast lead at 1" = 50' scale and are quite realistic complete with detailing such as door handles, etc.

F. Lane markings: were drawn on the grey chip-board street surface using a ruling pen and white Pelican Ink.

G. Building windows, doors, fenestration and signs: were drawn directly on the Strath-more artists board buildings in pencil.

The original intent was to use the model itself as one of the simulations. With this in mind a larger area than just Harvard

Street was included in the model. The intent was to have two levels of detail:

(1) the Harvard Street route and the visual field possible as one travels down that street were to be modeled with as much detail as was feasible at the 1" = 50' scale and with the technique selected.

(2) the remaining area was to be left at the level of a "map model". By this it is meant that blue prints of the base maps which show curb lines and property lines and have the buildings crosshatched would be cemented to each of the blocks.

Figure 2-1 delineates the extent of the North Brookline area included in the model and indicates the two levels of detail. However, in order to economize effort the model itself was not used as one of the simulations. It was used as the stage for the modelscope movie and the modelscope slides.

Procedure

I decided upon the 1" = 50' scale because it is commonly used in urban design work, because it is large enough to show signs, cars, trees and other important detail, yet it results in a model size which is transportable. I then obtained 1" = 50' scale base maps showing building outlines, curblines and street elevations (grades) from the Brookline Town Planning Board. However, the portion of Harvard Street selected for the experiment crosses into Boston. Boston does not maintain 1" = 50' scale base maps, rather it uses 1" = 40' scale. This necessitated redrawing the base maps for this section of the street at the proper scale.

Sanborn Insurance maps were used to determine building heights and to supplement the information in the city base maps. Photographs were taken of the street facades and used to locate and size trees and to determine the facades of the buildings as well as the signs, etc. . .

The model was constructed by cutting out of grey chipboard the street grid from property line to property line for the entire area outlined in Figure 2-1. Then a vertical profile of each street was cut from chipboard. This was glued in place vertically on the plywood base and thus reproduced the basic topography of the area. Then the chipboard street surface was glued directly over the honeycomb created by the street profiles (see Figure 2-2). Following this, each city block as measured from curbline to curbline was cut from the white strathmore artists board. This differential between curbline and property line provided sufficient space for the block surface to rest on the chipboard street network and it creates a sidewalk and curb (see Figure 2-2). Holes are cut through the block surface for the buildings so that they can rest on the flat plywood base which represents grade 0.00. The buildings were laid out in an exploded box form on strathmore artists board and then cut out and folded into boxes. This is important in that it allows one to lay out accurately the facade of the building using a drafting board and T-square (see Figure 2-3). This technique allows one to use cheap materials and requires very little equipment, a T-square and

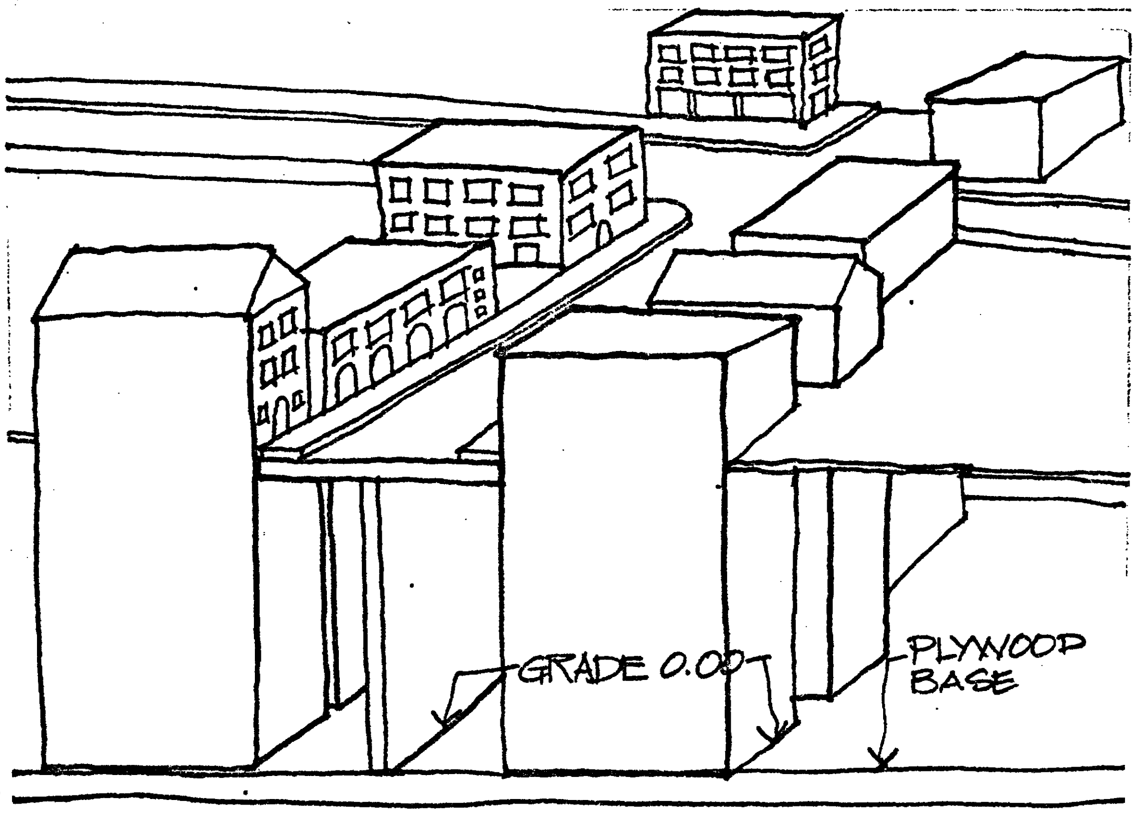

FIGURE 2-2: SECTION OF THE MODEL

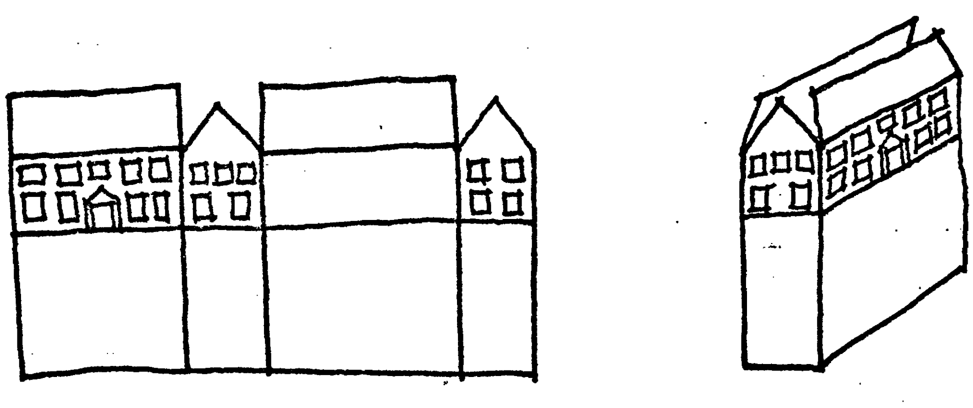

FIGURE 2-3: HOW THE BUILDINGS WERE CONSTRUCTED

triangle, an X-acto knife, pencil, etc. It does not require an extensive shop with saws, planes, and sanders, and other equipment as do wooden, plastic, or plaster models. And yet with these very limited tools one can obtain a very realistic model at this scale. This type of model is also very light and easily transported. Further, because it is constructed of cardboard, it is easily adapted to changes, which makes it a rather good design tool.

In constructing the model, I maintained a close check with the photographs so that the model approximates "objective reality" to a fairly high degree in terms of building size, shape and fenestration. Major signs were included but those which were very small and consequently difficult to reproduce were omitted. Trees were located and sized by means of the photographs so as to approximate as nearly as possible "reality". Scaled cars, trucks and buses add further touches of reality as do the reasonable approximations of building fenestration and detailing. Lacking were people and movement, small scale details such as traffic lights, street lights, overhead wires, street and traffic signs, small building signs, color and variations in texture.

Given that one is only going to use the model as a "photo stage set" then it becomes possible to construct only those things which will be seen by the camera while leaving all else blank. This allows one to invest more time and effort in detailing those things which are in the foreground of the camera, while those things in the background can be left at a fairly abstract level. Again, as in the other simulations, the main criterion determining the quality of its "approximation of reality" was that of a reasonable example of the "state of the art", within the means of most environmental designers and researchers. Finally upon completion of the model then came the task of making the modelscope simulations.

Modelscope Movie

Equipment:

A. 16mm Bolex H-16 movie camera

B. 75mm Bolex Pailard telephoto lens

C. Bolex electric motor with a portable battery pack

D. Optec modelscope and a cystoscope

E. A "homemade" adaptor to attach the modelscope to the movie camera

Procedure. The basic element involved in simulating a trip through a scale model of an environment is the modelscope. This device, a small optical periscope, allows one to obtain an eye level view of the model, as though one were reduced in size and standing inside the model itself. When attached to a still or a movie camera, this device allows one to make pictures from that perspective. As is obvious, this is a powerful tool for most designers in that it allows them to make three-dimensional scale models of their proposals and then to have them seen as they would look to the user of the full size environment. The basic procedure used in filming the trip through the model was to have one person hold the camera with the attached modelscope in a vertical position and to rest the modelscope gently on a

¼ inch by 24 inch strip of strathmore board which is in turn resting on the street surface. Then to have a second person pull the strip with a smooth continuous motion along the street in a reverse direction (from Commonwealth Avenue to Beacon Street). The lens opening of the modelscope is facing forward (toward Commonwealth Avenue). This procedure produces a trip in reverse as though one were backing up along the street toward Beacon Street. This procedure allows one to film a smooth continuous trip through the modeled street as it is far easier to pull smoothly than to push. When projecting the film for an audience it is a simple matter to run the projector in reverse producing the sensation of moving in the normal forward direction along the street (toward Commonwealth).

The model was taken outside on a sunny morning and oriented with the northern end facing real north so that shadows would be similar to those of the real street. The film was taken using available light with Tri-X reversal film. Filming out-of-doors with available light provided a natural sky and shadows. A grey chipboard background was used to shut out the immediate surroundings.

The modelscope produces a round image which when combined with a normal camera lens results in a very small circular image which doesn't fill the 16mm frame. Young (1967) discovered that when combined with a 75mm telephoto lens the modelscope produces an image which fills the 16mm frame without any distortion. This procedure was adopted for this study.

Problems: This proved to be the most difficult of the simulations and was plagued with problems from the start.

First of all, an adaptor to connect the modelscope to the Bolex Camera had to be fashioned. This was accomplished by turning a camera lens cap on a lathe so that it would slip over the lens hood of the 75mm lens. It was also necessary to drill a hole to allow the modelscope to project through the lens cap, thus holding the modelscope in place. Such adaptors are commercially available but due to time and resource limitations they were out of the question for this study.

Secondly, while the Department of Urban Studies in planning at M.I.T. has two modelscopes, an Optec Modelscope and a Cystoscope, available for student use, they both have defects. The Optec Modelscope, which is newer and has the advantages of a wider angle of view and less light loss than the older cystoscope, was found to have a defect in the lens which resulted in an out-of-focus image in the upper right hand quandrant of the frame. This is extremely disconcerting and resulted in the loss of several day's shooting, while I tried to remedy the defect. The older cystoscope with its narrower angle of view and its greater light loss did provide a clear image, some of the time. This scope was also found to be damaged. There are glass particles inside the scope and it is possible to obtain a clear focused image only if the glass particles do not fall in the field of vision. It is impossible to tell whether or not this is the case in advance of the actual shooting, however, because with the light loss of the lens one can barely distinguish the outlines of an image through the camera's view finder. This means that one must risk an entire roll of film and a day's set-up and shooting time on the chance that the glass particles had fallen into an area that was not visible. A further problem encountered was that of flickering. This was a result also of the light loss in the modelscope. In order to obtain a proper exposure it was necessary to run the camera at a very slow speed (six frames per second). When projected (at the same speed) this imparts a jerky, flickering quality to the image.

The Modelscope Slides

Equipment:

A. 16mm Bolex H-16 movie camera

B. 75mm Bolex Pailaird telephoto lens

C. Optec modelscope and a cystoscope

D. A "homemade" adaptor to attach the modelscope to the movie camera

E. Bolex electric motor with a portable battery pack

F. Kodak Tri-X Reversal film (ASA 400)

Procedure. A copy was made of the modelscope movie described previously. Then 14 frames were clipped from this movie which were selected to match the viewpoint of the color slides, photographs and drawings. These frames were then mounted in 16mm slide mounts and projected with an ordinary slide projector. No problems were encountered in producing the modelscope slides.

Procedures Used To Administer The Simulations

The conditions under which the subjects experienced the simulated trip down Harvard Street were standardized in the following ways:

<u>The Room</u>

1) For the Westgate sample who were assigned to experience the simulations the experiment was administered in the recreation room located in the basement of the Westgate Apartment Tower. This was a room which was comfortably familiar to all the Westgate subjects. It has adequate, comfortable seating and is capable of being darkened to show movies and slides. Also due to its basement location and lack of windows, it is very quiet and the subjects are not subjected to distracting outside views which might tend to affect their response.

2) For the environmental designers the simulations were conducted in Room 11-401 of the main building at M.I.T. This is a room with which these subjects are familiar. It is also capable of being darkened and of having outside views curtained off. A few of the environmental designers sample were administered in the Westgate recreation room. However, given the bland, relatively distraction-free quality of both rooms this was not considered a serious deviation in the experimental procedure.

<u>Viewing Times</u>

1) All subjects viewed the environment for seven minutes.

2) All subjects viewed the environment only once.

Those subjects who experienced the color slides, the modelscope slides, the perspective drawings, and the black and white photographs were allowed 30 seconds for each picture in sequence.

3) One sub-group of subjects were assigned to experience the perspective drawings and were allowed to look at the drawings for seven minutes with no other restrictions, but this data is not reported in this study.

Image Size

1) The image sizes for the projected media, i.e. the color movie, the color slides, the modelscope movie, and the modelscope slides were held constant at 32 by 48 inches.

2) The image size for the drawings and photographs were similar but not identical with the drawings at 8½ by 11 inches and the black and white photographs at 7 by 9 inches.

Instructions

The instructions were standardized to be as similar to those given the control group as possible. Certain small changes were necessitated for each group by the particular characteristics of the media and situation. The instructions were as follows:

1. First the subjects were assembled in one of the two rooms described earlier in small groups usually from four to ten people at appointed times. When the whole group was assembled the door was locked[6] and questionnaires and pencils were distributed.[7] Then the subjects were given the following instructions:

"As I mentioned in the letter which you received earlier, this is an experiment in which we are trying to learn something about what people think about their environment. First I'm going to show you a film (some pictures, etc. . . .) of a street environment, and then ask you to write some things about it in this booklet. It's a very straight forward kind of thing . . . no tricks or concealed purposes, no right or wrong answers . . . it's not a psychology experiment."

(for the film:)

"There are a couple of jumps in the film which are due to poor craftsmanship on my part. O.K., is everybody ready to begin?"

(for the slides, photographs and drawings:)

"The pictures are taken in sequence, as though you were driving down the street in your car and you stopped at regular intervals and took a picture. O.K., is everyone ready to begin?"

(for the photographs and drawings:)

"Please look at each of the pictures in order, don't skip ahead or go back. I'll tell you when it's time to turn to the next picture. O.K., is everyone ready to begin?"

The experiment was then run with each group viewing the environment for seven minutes followed by the instructions:

"Now I would like you to answer the questions in the booklet. It looks pretty bulky but it goes rather quickly. Most people do it in about an hour or so but you should feel free to take as long as you like. Don't worry about exact phrasing or anything like that. . . . I just want to get as much of your general reactions to the street as possible. I think the questions explain themselves, but if you have any problems raise your hand and I'll come around. O.K., now open your books and begin."

Most subjects took just over an hour to complete the questionnaire. Following their completion of the experiment I then answered any questions they had about the purposes of the experiment and cautioned them not to discuss it with their neighbors. As most of the subjects were graduate students in various scientific disciplines they understood the importance of this and to my knowledge no one knew in advance the exact purposes of the experiment.

Procedure Used To Analyze The Data

The data collected by means of written questionnaires consisted of three types: 1) responses to closed-ended questions, 2) written responses to open ended questions, and 3) graphic responses to open ended questions. The general procedures used to convert this raw data into a form suitable for analysis was as follows:

1) Closed ended questions: In a few instances the response to a question was sufficiently predictible to allow for a-priori construction of quite specific response categories. This was primarily confined to the personal data items, such as age, sex, etc., the recognition tests, and the semantic differential.

2) Open ended questions:

a) Written response: As I noted earlier the primary purpose of the experiment was to determine the response of subjects to Harvard Street along cognitive, affective and behavioral dimensions. These three dimensions derived from the theoretical background of the study (described in Appendices A and B) provided the basic overall categorization system for analyzing this set of data. Specific categories were developed by a process of reading all the responses to each question and listing each sub-category within those basic dimensions. Eventually when I was satisfied that I had a meaningful and exhaustive set of categories I tested them on a small sample of the questionnaires until I was satisfied of their validity and reliability.

b) Graphic response: I decided to analyze the subject maps according to the procedures set out by Lynch (1960), which consists primarily of counting the frequency of occurrence of elements.

Following this code development phase a coding manual was developed which contained the basic decision rules for categorizing the response to each question. This is displayed in Appendix D. Although I coded all the responses myself I did conduct a reliability check on every tenth questionnaire and although I did not calculate a reliability measure I was satisfied that there was a very high degree of consistency between the coded responses.

With the exception of the graphic responses, the data were coded directly onto IBM coding forms and were subsequently punched on computer cards for machine analysis. This data was in turn analyzed using the SPSS statistical package (Nie, 1968). Specific coding and analytical procedures are discussed in Chapter III.

To summarize, in this chapter I have sought to describe the method used to collect, code and analyze the data for the comparative study. In the following chapter I will discuss the findings from this phase of the study.

NOTES

1. It should be noted that this does not represent a controlled situation. As it is quite possible, even likely that there are variations on the part of the researcher in terms of each of those dimensions, i.e. he is more skilled at drawing than at model building or photography, etc.
2. Structured only in the sense that all subjects were asked to respond to questions in the same order. The questionnaire employed open-ended general questions at the beginning and then focused to more specific, closed questions toward the end.
3. This was not assumed, however. A specific question was asked to determine prior involvement with the Harvard Street environment and this factor was controlled in a number of the analyses.
4. The simulations were shown to groups rather than individuals not only because it greatly speeded up the data collection but also because simulations are most frequently shown to groups of clients/users in practice.
5. While there are obvious biases in the selection of the sample which in the strictest sense will prevent generalization to the larger population of architects and planners, this bias was not operating in the comparisons between the various treatments.

6. Latecomers were not permitted to enter the room, and were requested to sign up for another session.
7. The questionnaires were labeled, "Do not open until instructed."

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CHAPTER III

DISCUSSION OF FINDINGS FROM THE COMPARATIVE STUDY

In this chapter are presented the findings of the phase one study design. This portion of the study constituted a comparative study of six selected commonly-used simulation techniques. The chapter is composed of six sections. The first is an examination of the relative amounts, types and quality of information obtained by each treatment group as a result of experiencing the environment in different ways. Secondly, I sought to ascertain if there were differentials in the affective reactions of the subjects to the environment as a result of the different modes of experience. Thirdly, I attempted to find out whether or not there would be resultant differences in the behaviors which the subject would be willing to undertake in the environment. The fourth section examines the response to a number of projective questions, which ask the subject to project the environment into the future and into the past and to manipulate it or change it to be more congruent with his desires or expectations. Fifth, a selected set of personal variables are examined in order to ascertain whether or not personal differences like education, occupation, age, sex, environmental experience, etc., affect ones response to simulations. The last section presents an analysis of the subjects reactions to the quality of the simulations and some of the ways they felt the simulations might be improved.

I. Information And Knowledge: Cognitive Response Measures

As people move through their everyday physical environment, they unavoidably engage in a process of unravelling the complex meanings contained in that largely man-made surround. Those meanings, which are transmitted by means of a myriad of cues, have considerable import in the making and effectuation of the everyday and long term plans of both individuals and groups.

This first section of chapter five examines the question of whether or not experiencing that environment indirectly by means of one of the six commonly used environmental simulation techniques has the effect of altering the pattern of knowledge or the image which a person would normally obtain by experiencing that environment directly. For the purposes of this study, a cognitive variable refers to the information or knowledge on the part of a receiver (R) about an "object of orientation" (X). The fundamental observation for the measurement of a cognitive variable is the expression of a belief by a person concerning the characteristics of an object, event, or situation (X). The distinguishing characteristic of a cognitive variable is that it is a property of a belief. Such beliefs are subject to verification according to rules of evidence, and as such are subject to appraisal as correct or incorrect by the holder as well as by any audience.

The questionnaire was designed to elicit data on the following general dimensions of cognitive variables.

1. The degree to which Harvard Street is believed to display particular traits.

2. The differential salience of the various traits.

3. The confidence with which people attribute those traits to the setting.

4. The factual correctness of those assessments.

Cognitive responses were analyzed to determine:

1. The relative "effectiveness" of the six selected simulations and the direct experience in terms of their respective abilities to communicate information about the environment. The responses are analyzed for the quantity and type of information communicated and its factual correctness as compared to the "objective environment."

2. The relative "response fidelity" of the six simulations. In this case the responses obtained from the simulations are analyzed to determine how closely they replicate the response patterns of the direct experience.

It should be emphasized that the communication intent was identical in all the cases and was unspecific or object-oriented in nature rather than having specific intentions with regard to particular desired effects on the receiver. In other words, I was not attempting a learning experiment wherein I evaluated the communication effectiveness of various media in terms of their ability to produce certain specific effects (such as knowledge of <u>particular</u> facts, etc.) which the sender desires to produce in the receiver. Rather, I was interested in the differentials and the patterns of knowledge produced by the different media, given identical object oriented message contents. Basically the questions analyzed in this section were coded along the following dimensions.

1. The amount of information about the selected environment conveyed by each media and retained in memory. Two measures were selected:

    a. The number of words used in their descriptions of the environment.

    b. The number of items or elements mentioned in their descriptions of the environment.

2. The kinds of information about the environment which individuals were able to achieve via the various media and reality. Two measures were used:

    a. The different types of elements or items noted in their responses.

    b. The frequency with which they noted elements of different types.

3. The quality of information conveyed about the environment. Three measures were selected:

    a. Factual correctness of the information.

    b. The degree of assurance or confidence with which the respondents attributed the above traits to the environment.

    c. The level of discrimination revealed in the responses.

While the major intent of this first phase of the study was exploratory in nature and was to involve no testing of specific hypotheses, general indications from the theory would lead one to expect that information quantity and quality might correspond to a rank ordering of the media along a rough abstraction-realism continuum. Accordingly three judges were asked to rank the simulations along that dimension. Their rankings were in complete concordance as follows:

most realistic:	trip (control)
	color movie
	color slides
	black and white photos
	drawings
	model movie
most abstract:	model slides

FIGURE 3-1: MEDIA RANKED ON ABSTRACT-REALISTIC CONTINUUM

Although I will attempt no formal tests of this expectation, it will be referred to from time to time in the discussion which follows.

A. Knowledge Of Physical Characteristics

Knowledge regarding the physical form of an area is difficult to separate from the other social or behavioral significances which are associated with it. In fact, although it is possible to develop an accurate and extensive understanding of the physical environment without activity or other meanings, that knowledge is of little utility. Because of this close association, with activities especially, much of the analysis of the differential knowledge regarding the physical form of Harvard Street obtained by the various modes of experience will be discussed under the section on summary knowledge, particularly under the section on the composite image maps for each treatment group. This section on knowledge regarding physical attributes will center on those references to spatial or physical attributes which are least ambiguous.

Questions 1 and 2 were analyzed for references to physical elements. The findings are summarized in Figure 3-2. The data reveal no significant differences in the number of physical elements mentioned by each of the treatment groups.

	Question One	Question Two	Total
Control	5.9	11.8	17.7
Movie	7.2	9.6	16.8
Slides	7.9	11.2	19.1
Photos	6.0	12.2	18.2
Drawings	8.0	13.4	21.4
Model Movie	8.1	11.1	19.1
Model Slides	8.7	11.1	19.8
	NSS	NSS	

FIGURE 3-2: NUMBER OF PHYSICAL ELEMENTS[1]

When the subjects were asked if they noted any distinctly different parts or sub-areas along the length of the street, a number of them responded with differences in terms of the physical qualities along the street. Figure 3-2 reveals a gradually increasing reliance on physical attributes to distinguish between parts of the street and to structure it in memory as the degree of abstraction increases. There are no differences between the control group and the photographic simulations. However, for those simulations which are most useful as predictive tools for the designer there is a distinct increase from about one-fourth to almost one-half of the distinctions being physical ones. It provides a rather clear indication that even though the subjects were relying rather heavily on their prior environmental images, they were forced to fall back on those kinds of information which were most clearly conveyed by the media. Thus, in the case of the modelscope simulations where all the information was in the form of non-human and symbolic cues, we see an increase in their use to discriminate between and structure the environment.

	Physical Attributes	All Other	N*
Control	23%	77%	28
Movies	25	75	27
Slides	15	85	23
Photos	27	73	30
Drawings	30	70	33
Model Movie	48	52	29

FIGURE 3-3: THE USE OF PHYSICAL ATTRIBUTES TO STRUCTURE THE STREET IN MEMORY

Questions 6 and 8 then asked them, respectively, to describe the appearance of that section of the street which they most preferred or like best and that which they liked least. Their descriptions centered primarily around seven characteristics: 1) the presence or absence of landscaping (trees primarily); 2) the quality of maintenance; 3) the degree of visual interest, diversity or character; 4) the degree to which the environment seemed consistent, planned, and lacked a sense of being chaotic; 5) the degree of openness; 6) the amount of traffic and cars present; and 7) the age of the physical structures in the sub-areas, some preferring newer areas and some older areas.

	Presence Of Land-scaping	Well Maint.	Interest, Charac-acter Diver.	Uniform Consis-tent Planned	Open-ness Low Den.	Traffic Cars	Age	Other	N^2
Control	29%	22%	14%	7%	14%	5%	5%	3%	37
Movies	24	11	24	5	21	7	5	3	35
Slides	33	7	20	3	30	7	0	0	26
Photos	16	5	32	5	21	11	3	5	38
Drawings	28	10	20	10	18	10	0	3	39
Model Mov	40	6	9	0	36	6	3	0	33
Model Slides	46	3	6	3	34	0	6	3	37

Significance .05

FIGURE 3-4: PHYSICAL ATTRIBUTES USED IN DESCRIPTION OF PREFERRED SUBAREA

Figure 3-4 summarizes the descriptions given by the subjects of the area which they liked best. The presence of landscaping was the most mentioned quality for all groups with the exception of those who saw the photographs. Visual interest and openness were generally the next most preferred qualities. Only two media, the modelscope simulations, exhibited a significant deviation from the response pattern of the control group. Most of the treatment groups, while exhibiting a definite preference for the three qualities mentioned above, still to some degree used the other qualities in their descriptions. However, the modelscope groups noted primarily the qualities of landscaping and openness with very small mentions of the other categories. This is hardly surprising in that the cues denoting maintenance and visual interest, at least at a detailed level, and age were greatly abbreviated in these two simulations. And because much of the visual complexity of signs, people, etc. were missing most modelscope subjects had noted earlier that the whole street environment seemed planned.

	Absence Of Land Scaping	Poor Maint.	Monot-onous	Chaotic No Con-sist.	Crowded Too Dense	Traffic	Age	Other	N[1]
Control	0	20	8	25	5	23	8	10	35
Movie	3	25	0	15	15	31	10	0	37
Slides	10	10	21	21	21	0	10	3	24
Photos	0	25	10	15	10	20	10	10	40
Draw ings	23	15	15	10	20	12	3	3	40
Mod. Mov.	7	3	30	7	33	10	7	3	30
Mod. Sc.	3	3	14	25	32	10	3	7	30

Significance .05

FIGURE 3-5: PHYSICAL ATTRIBUTES USED TO DESCRIBE LEAST PREFERRED AREA

Figure 3-5 illustrates the qualities subjects used to describe their least preferred area. No visual qualities seem to dominate the least preferred list. There are some individual media variations of interest. The presence of traffic and cars was the quality noted most by the movie group. This supports the earlier observation that much of the description by this group tended to focus on traffic and cars. This media seemed to emphasize that quality of the street unduly.

While poor maintenance was noted frequently by other groups the modelscope subjects tended not to mention it, again largely because there were no cues for this quality, or alternately the cues all tended to support the conception that the entire street was well maintained, or was at a uniform level of maintenance. The modelscope groups referred to visual monotony and the crowded, dense quality most frequently in their descriptions of the area they disliked.

One conclusion possible from this evidence is a proposition that one's conception of the physical characteristics of an area are significantly tied to the cues contained in the presentation. Unlike many of the other qualities which are inferred on the basis of even very limited cues contained in the presentation ones conception of the physical quality of an area is closely related to the objective fidelity of the simulation.

As a result of these differences in the information conveyed by each simulation there are significant differences in the choices of liked and disliked areas made by the modelscope viewers and the remainder of the treatment groups whose choices were very similar. This will be discussed in more detail in the section of the chapter which deals with affective responses.

Distance. The relative size of an environment is an especially important facet of knowledge. "How far is it from here to there?" is a question with many implications for planning and carrying out one's daily life. Question 22 asked the subjects to estimate the approximate length of the street travelled in the course of the experiment.

The subjects were asked to select one of eight different distance estimates, each of which consisted of a range of five blocks along with an estimate in miles. For example 0-5 blocks (0-¼ mile). As it is possible, if one makes one's estimate in blocks, to calculate the length of that portion of Harvard Street in at least four different ways each of which yields a different length the correct answer was judged to be anything between 11 and 15 blocks or one-half to three-quarters of a mile. The results are indicated in Figure 3-6, in which the treatments are ranked in terms of their ability to enable correct distance appraisals on the part of an observer. One would have expected that those modes which afforded a continuous experience of the street both in time and space would most easily facilitate estimation of distance traveled. This is only partially borne out by the data. As can be seen the top score was obtained by a media which allows only a segmental experience of the environment. The two media which afford a continuous experience scored two and three. The control group was surprisingly ineffective in this aspect with almost 90 percent of the subjects estimating the street to be shorter

	Too Short	Approx Correct	Too Long	N	Rank
Control	86.3	13.6	0	22	6
Movie	57.1	28.6	14.3	21	3
Slides	95.7	4.3	0.0	23	7
Photos	60.0	40.0	0.0	10	1
Drawings	66.7	16.7	16.7	20	5
Model Movie	63.2	31.6	5.3	20	2
Model Slides	70.5	17.6	11.8	19	4

FIGURE 3-6: ESTIMATED LENGTH OF STREET

than it actually was, with the resultant ranking of sixth. The media which afforded the most viewers with a correct sense of the streets length was the photographs. Forty percent of the subjects viewing the photographs estimated the trip length correctly.

Most subjects regardless of mode of experience tended to underestimate the length of the trip. This tendency ranged from 95 percent in the case of the color slides to a low of 57 percent for the movie. Very few made estimates which were longer than the street actually is.

<u>Size Of Elements</u>. Steinitz (1967) has found that there is considerable overall congruence between physical and activity type, intensity and significance. He further found that there was a definite relationship between this congruence and knowledge. Because we use attributes like the size of objects to infer their social and behavioral significance, knowledge

regarding the size of elements in an environment has value far beyond that of simply understanding the formal qualities of environmental form.

Questions 1 through 9 were analyzed for references to the relative size of the elements which make up the Harvard Street environment. Figure 3-7 shows the number of references made by each treatment group, (adjusted to reflect different group sizes), and the number of elements referred to by size. While there are noticeable differences in the frequencies there is no discernible pattern. This is true also for the number of elements referred to by size by each of the groups.

	No. Of Ref. To Size 1	Rank	No. Of Elements[1]
Control	55.2	6	17
Movie	52.0	7	19
Slides	60.3	5	15
Photos	86.0	2	15
Drawings	73.0	3	20
Mod Mov.	61.0	4	18
Mod. Scope	109.0	1	23
Total	396.5		40

FIGURE 3-7: REFERENCES TO SIZE OF OBJECTS

Examination of the specific element cited by each group, shown in Figure 3-8, does reveal some expected differences. The modelscope groups continued their earlier pattern of discriminating aspects of the street by means of the most prevalent cues available, those pertaining to the physical form of the street. While the other groups tended to use both physical attributes as well as social and activity attributes. For example, the most frequently cited element by all treatment groups, except the two modelscope groups, were the "small shops" which line Harvard Street. In the case of the modelscope groups, however, this item drops to the fifth and sixth most referred to item. It was apparent from their answers (and from my hypotheses) that these two groups were afforded few cues upon which to base the judgment that this small structure was indeed a "shop" and not a "factory". This is borne out by the fact that "small buildings" was the third and first most frequently cited element by these groups.

		Control	Movie	Slides	Photos	Drawings	Mod. Mov	Mod. Sli	Total No. Of References
1.	Small Shops	19%	9%	17%	30%	15%	4%	4%	98.2
2.	Wide Street	6	9	7	6	11	16	20	54.0
3.	Small Buildings	2	3	4	8	7	7	20	50.1
4.	Large Buildings	5	8	4	4	6	8	15	49.2
5.	Large Apart. Bldgs	4	2	2	12	6	2	2	29.3
6.	Large Billboards	1	1	9	0	6	1	8	25.9
7.	Large Stores	0	1	1	4	7	1	4	18.0
8.	Narrow Street	0	5	4	0	1	0	6	16.3
9.	Small Town	0	4	2	5	0	1	2	13.6
10.	Large Intersection	3	0	4	2	1	1	2	13.1

FIGURE 3-8: ELEMENTS MOST FREQUENTLY CITED BY SIZE

Orientation. In addition to conceptions of distance and size, an effective image must include an orienting schema. Lynch (1960) has noted at least ten different types of orientation systems. Basically, however, finding one's way about the city is a problem in the utilization of paths, junctions and cues. A person moves along in a certain direction or bearing and then changes that bearing by making turns. Thus the image must include the initial direction taken from the point of origin to the goal or terminus and any turns or changes of bearing along the way. Several characteristics of this aspect of orientation in space are important. First, did the subject note the correct number of turns; second, did he maintain them in their correct topological order; thirdly, did he note the correct direction of the turns; fourth, did he maintain the proper magnitude of the turns; and finally was the essential overall bearing of the trip maintained?[2]

Like distance one would expect the continuous modes of experience to enable the subjects to most accurately represent the overall directional configuration of the street in their memory. The sketch maps were analyzed along these five dimensions.

Figure 3-9 reveals that a large percentage of the subjects from all the groups made no reference to the fact that the street was curved. In those instances where the subjects drew the street as essentially straight in their maps, questions 1 through 9 also were examined for any reference to the fact that the street curved. The data reveal no significant differences between the control group and the three most realistic of the media on this dimension. However, signif-

	Straight	Curved	N
Control	45	55	22
Movie	52	48	21
Slides	57	43	23
Photos	40	60	10
Drawings	25	75	20
Mod. Mov.	15	85	20
Mod. Sli	32	68	19
	Significant	.05	

FIGURE 3-9: SUBJECTS WHO NOTED THE CURVATURE OF THE STREET

icantly more of those subjects who experienced the abstract media made reference to the curved nature of the street.

Figure 5-10 summarizes the data, the number of turns, their order, direction and magnitude. The data reveal a tendency for most subjects to under-remember the turns made along the path. This supports the finding of Lynch (1960), Carr (1967), Appleyard (1971) and Stea (1971) that most Americans tend to normalize turns into rectangular grid coordinates which would result in some of the more subtle turns being "gated out" or ignored.

The data reveal no significant differences regarding this tendency between the treatment groups.

The control group seemed to make fewer mistakes involving transposition of the turns. Almost ninety percent of

	No. Of Turns				Order			Direction			Magnitude			
	Cor.	Incor. Too Few	Incor. Too Many	N	Cor	Incor	N	Cor	Incor	N	Cor	Too Small	Too Large	N
Control	33	67	0	9	89	11	9	73	27	11	89	0	11	9
Movie	30	60	10	10	57	43	7	57	43	7	100	0	0	7
Slides	20	80	0	10	57	43	7	63	37	8	38	12	50	8
Photos	68	32	0	6	50	50	8	72	28	7	72	0	28	7
Drawings	33	60	7	15	67	33	12	75	25	12	50	8	42	12
Mod. Mov	30	70	0	17	57	43	14	60	40	15	33	0	67	15
Mod. Sli	15	61	23	13	70	30	10	62	38	13	8	0	92	12
	NSS				Sig. .07			NSS			Sig. .05			

FIGURE 3-10: COMPREHENSION OF DIRECTIONAL CHANGES[3]

those control subjects who noted the curvature of the street were able to represent the turns in correct order versus approximately 60 percent for the media subjects. No noticeable differences were revealed between the various simulation groups. There are no significant differences in the ability to recall the direction of the turns which are attributable to the mode of experiencing the environment. It is interesting to note that a large number of subjects (ranging from 25 percent to 43 percent) for all the groups reversed the direction of the turns from left to right and vice versa.

It is with respect to the magnitude of the turns that we see rather dramatic differences in the memory representations of the subject groups. In this case the data support the hypothesis that a continuous experience is more likely to enable a subject to produce a correct orienting schema than is a segmental presentation or experience. Within the two groups of similar media, e.g. the color movie - color slides, and the modelscope movie - modelscope slides, there are significant differences. In each case the segmented media result in decreases in the percentage of subjects who correctly estimated the magnitude of the directional changes. In fact a number of the modelscope slide subjects drew the street as a series of right angled turns. Further, there seems to be a decline in this ability as the degree of abstraction increases.

The data also support the proposition that there is a tendency to normalize subtle directional changes into rectangular grid coordinates. In this case we see only a tiny percentage of subjects who represented the angular magnitude as smaller than reality, whereas most who noted the curves and who made errors tended to err in the direction of greater magnitude. It follows therefore that the remainder of subjects simply normalized the curves to a straight line path.

Finally, if we look at the conceptions which the subjects developed regarding the overall directional change of the street, we find that there are no significant differences arising from the mode of experience. In general, of those subjects who noted the curvature slightly more than half formed an incorrect impression that there was an overall change in direction when in fact the bearing of Harvard Street at Coolidge Corner is very close to that at the Commonwealth intersection.

	Correct	Incorrect	N[1]
Control	33	67	9
Movies	30	70	10
Slides	12	88	8
Photos	50	50	8
Drawings	36	64	14
Mod. Mov.	50	50	16
Mod. Sli.	38	62	13
	NSS		

FIGURE 3-11: OVERALL DIRECTIONAL CHANGE

Topography. An understanding of changes in topography or grade is of importance to many city using actions, especially those which involve pedestrian movement. While there is a subtle but noticeable change in elevation along the length of the street only three subjects referred to the topography of the street in their response to any of the questions. Of these three, two noted that the street was "flat with no noticeable hills" and one referred to the "slight downhill grade just after the church." The later subject viewed the drawings. Obviously the area chosen did not provide sufficient topograhphical change to elicit reference to this aspect in the open-ended general knowledge questions and unfortunately no direct question was included in the interview schedule regarding this dimension.

B. Social Meanings

As people move through their everyday physical environment they unavoidably engage in the game of unravelling the complex meanings contained in all the artifacts of man which surround them. One important set of meanings obtained from this interaction with the environment has to do with the attributes of that particular social group or groups who reside in or use the environment in question. Who lives here?, Whose "turf" is this?, are not trivial questions and they are questions which demand answers in order that we may act intelligently, effectively, and appropriately for that time and place. The answers are obtained both by direct interaction with the people concerned and by reading the many and subtle clues in the environment, signs, cars, people on the street, level of maintenance, presence of various decorations, etc.

In addition we come to "know" the social characteristics of an area by even more indirect means, such as the mass media, and from our peers and parents. All these cues lead to the formation of social perceptions and attitudes which inevitably influence the behaviors of individuals and groups in their use of the city. It should be noted that of the simulations tested those three which are most useful as predictive tools are rather limited in their ability to convey a number of the cues which signify the social composition of an area. Two of the simulations, the modelscope movie and the modelscope slides, contained no direct indications of social characteristics such as people and very few indirect cues such as signs, automobiles which are identifiable by make and age, building conditions, or many of the other cues which people use to read the social composition of an area. The third predictive technique tested, perspective drawings, does contain both direct and indirect cues but does not approach the photographic modes in the subtlety and range of cues available, and as Royse (1968) has indicated, the cues which an observer uses are subtle indeed. For example, it is difficult to accurately portray dress, age, or ethnic characteristics which might be obvious in real life or in a photographic medium. Consequently, one would expect that the beliefs regarding the composition and characteristics of the Harvard Street population which were held by those persons who experienced the street by means of the less sensitive media would more closely correspond to their image stereotype[4] for such areas than to the objective reality of the street itself.

In examining the response to question 2 (See Appendix A for exact wording) we find that there are significant differences between the various media and reality (Figure 3-12). Further, a ranking of the media in terms of the number of social elements mentioned in their descriptions corresponds almost exactly with our earlier ranking of the media in terms of their degree of abstraction.

If we combine the response to questions 1 and 2, both of which were undirected open ended questions aimed at getting general reactions to and memory of the street we find that the control group frequently made inferences about the character-

Info Rank		No. Of Elem.	N
1	Control	727	22
2	Color Movie	619	21
3	Color Slides	478	23
4	Drawings	250	10
5	B & W Photos	200	20
6	Model Slides	157	19
7	Model Movie	100	20
		Sig. .05	

FIGURE 3-12: SOCIAL ELEMENTS

istics of the population while the treatment groups seldom made such inferences (Figure 3-13). Further, as the following quotes illustrate, the inferences made by the control group

	Social Inferences
Control	16
Movie	1
Slides	1
B & W Photos	0
Drawings	2
Model Movie	0
Model Slides	0

FIGURE 3-13: INFERENCES ABOUT RESIDENTS OF HARVARD STREET

were very perceptive and correct.

"It appeared to be an area in which a large Jewish community lived judging by the temple and the many Hebrew signs in the stores."

"The shoppers were quite well dressed, the stores quite nice, fairly high level of income I would guess."

"The people on the streets were old ladies and old men."

"The people didn't look poor, but they weren't rich either."

"It appears to be an upper middle class residential area."

"Heavily populated by Jewish people I would guess as the signs hanging from the shops indicate."

"A variety of middle class people on the street."

These were just a few of the comments made by the control group. On the other hand, the treatment groups made far fewer references to social characteristics and in the case of the model scope simulations no references were made. Further, when they did attempt to make inference about the residents they were often wrong as the following quotes illustrate.

Movie - "I would think it was a commercial street in a lower middle class or low income area."

Color Slides - "It was a lower middle class area."

It should be noted that these responses were obtained from questions aimed at general characteristics of the street only. Next we move to their response to a more direct query regarding the social composition of Harvard Street.

Figure 3-14 illustrates the beliefs (or conception) which respondents formed regarding the kinds of people living in the area along Harvard Street. The data were obtained in response to the open ended question (No. 64): "What kind of people would you say live in the area"? The responses were coded along the dimensions indicated in the table. Multiple mentions were counted which accounts for the fact that the rows don't sum to 100 percent.

	Class			Age			Ethnicity				Other	
	Upper and Upper Middle	Middle	Lower Middle And Lower	Old	Middle Aged	Young	Wasp	Jews	Irish & Ital Catholics	Blacks	Students, Hippies	Minorities NA Which
Control Group	21	44	52	30	0	26	0	9	4	0	32	4
Color Movie	0	35	74	30	4	17	0	4	0	0	32	0
Color Slides	0	26	69	30	4	22	0	9	4	13	17	13
B & W Photos	20	0	80	40	0	40	0	0	0	0	40	0
Drawings	15	30	20	40	0	25	0	15	0	0	15	25
Model Movie	15	35	35	15	0	20	5	0	5	5	10	20
Model Slides	25	31	32	16	5	5	16	0	0	0	10	21

Significance = .05

FIGURE 3-14: PERCEIVED SOCIAL CHARACTERISTICS

Social Class. With the exception of the photo group most subjects clearly conceive of the area as being composed of primarily middle and lower-middle class people, with the lower end of the scale in slight predominance and with a steadily decreasing frequency as one proceeds up the social class scale. Those groups viewing the drawings and the model simulations (the most abstract) conceived of the area as either slightly more middle class in composition or at least about equal. The color slides and movie groups reported no upper-middle or upper class residents.

Age. The subjects were even more unanimous in their beliefs about the age composition of Harvard Street residents. All the treatment groups expressed beliefs that the population was composed almost entirely of elderly and youthful residents. In only three groups did a small proportion of subjects report the presence of middle aged occupants. While the ratio remains about the same there is a rather large differential in the number of modelscope subjects who noted the elderly aspect of the population and a somewhat less dramatic decline in all mentions of age.

Ethnicity. The data clearly show that the most abstract of the media did not afford subjects with any indications of Harvard Streets distinctly ethnic character. Only the Model Movie and Model Slides groups indicated a predominantly WASP population and even more significantly not a single subject noted the distinctly "Jewish character" of portions of the street. The Drawings Group noted this characteristic most frequently, probably a result of the increased emphasis given-- signs by this media. Perhaps the most surprising finding was that 13 percent of the Color Slide Group believed that Blacks constituted a significant proportion of the population. This is surprising because there were no Black people in the pictures shown the subjects. This was probably due to their expectation that any older "in-city" residential area would be likely to have a significant proportion of Black residents.

Finally the control group and the more realistic media noted the student oriented, flavor of certain parts of Harvard Street more readily than did the more abstract media. On the other hand those who experienced the more abstract media were more likely to make references like "it's a minority area" without further specification.

Finally, if we examine a summary measure of all references to social characteristics (Figure 3-15) we find a rather close correspondence to our initial expectations of performance.

	Number Of Social References	Rank
Control	222	1
Color Movie	196	4
Color Slides	207	3
B & W Photos	220	2
Perspective Drawings	185	5
Model Movie	165	6
Model Slides	161	7

FIGURE 3-15: NUMBER OF SOCIAL INFERENCES

In summary we find that those techniques which are most critical for environmental designers, those which can be used to describe environments which do not yet exist, are the most limited in their ability to convey information about the social composition of an area. This would suggest the need to pay special attention to the selection of a technique when this dimension is important. For example, in the case of the perspective drawings one could be especially diligent in including people, signs, cars, etc., which would offer cues about the residents of the proposed area. Possibly the drawings could be done at rather large size and reduced or one could include photographs of people, cars, etc. in a collage technique. Although in the latter instance it might tend to place rather undue emphasis on those elements.

The Modelscope simulations are another matter, however. At a scale of 1" = 50' it is impossible to include people, or many signs, and cars which one can distinguish by make and year, etc. Larger scales become impossibly large to store and difficult or impossible to transport. All of which tend to suggest a distinct inability of a model to convey this type of information. Probably the most successful way to convey the proposed social composition of an area would be by means of a number of different media such as a model of the overall physical layout, perspectives of selected areas and photographs of existing similar examples along with a textual or verbal explanation.

C. Functional Meanings

One of the more important sets of meanings which are latent in the form of the environment is that of function or activity. This knowledge regarding activities is among the most necessary meanings to be derived from the physical environment. In order to carry out our individual and group action--plans, which often involve decisions to go somewhere and to do something, people must obtain and share a knowledge of what is happening, and where. Steinitz (1967) has noted that there are three important aspects of environmental knowledge which pertain to the important question of "What goes on here?" and its counterpart, "What can I do here?".[5] First he notes that the environment should communicate the type of activity in a particular location so that a person can find, identify, and describe activity--places. Secondly, he points out that the relative activity intensity is also important information, enabling one to identify the busiest places and direct someone else to them. Thirdly, an accurate evaluation of the comparative significance of places is necessary for location and description of the most important activities.

1. Activity Type. The data clearly indicate that certain media are deficient in their ability to convey a sense of what kinds of activities go on in an environment, among the most critical attributes of a useful environmental image. Figure 3-16 provides us with a summary measure of the information obtained by the subjects regarding the functional characteristics of Harvard Street. The data were obtained by analyzing the responses to questions 1 through 4 of the interview schedule. Mention of a particular functional category by a respondent was counted only once even though it might reappear in his responses to subsequent questions, thus we have an accurate picture of the knowledge of each respondent of the activities in the Harvard Street area. The number of mentions of each category is adjusted to account for the different

Rank	Media	No. Of Categories	Adjusted No. Of Mentions	No. Of Incorrect Categories	Adjusted No. Of Incorrect Mentions
1	Drawings	36	880	2	35
2	Control	30	721	0	0
3	Photos	26	800	2	14
4	Color Slides	18	443	4	16
5	Color Movie	17	393	0	0
6	Mod Slides	11	225	7	155
7	Model Movie	10	205	7	135

FIGURE 3-16: FUNCTIONAL CHARACTERISTICS[1]

number of subjects in each treatment group.

There seem to be three major groupings in the data. First a grouping composed of the Control, Drawings and Photographs each noting around 30 different categories of uses, with around 800 (adjusted) mentions of uses and with very few errors. The second grouping composed of the subjects viewing the color slides and the color movie who noted about one-third fewer types of uses and with a frequency of about half the former grouping. They also made few errors in their reports. The third grouping composed of the two Modelscope simulations noted for fewer activity types, about one-third the number of the control group, made only about one-third as many references to uses, and most significantly, approximately 60 percent of their references regarding the functional characteristics of the street were incorrect.

Figure 3-17 lists the ten most frequently mentioned uses for each experiential mode. The two primary uses of the street, shopping and residential, were noted by all the groups.

In most of the treatment groups these uses were mentioned by almost all the subjects. The exceptions were the Modelscope simulations where the frequency of mention of shopping and residential uses drops to about half or less.

While there was unanimous agreement on the two most prevalent uses along that section of Harvard Street, there were also certain uses which seemed to be emphasized by certain media and de-emphasized by others. The presence of advertising, billboards, etc., tended to be much more frequently reported by those modes of experience which did not provide for a continuous movement sequence (i.e., the slides, photos, and drawings) than it was by those which did (the movies and the actual trip). Indeed, there was a decided propensity for those uses which were identified by prominent signs (gas stations, Macy's Liquors, etc.) to be more frequently mentioned by those who experienced the non-continuous presentations than were those uses whose identity was communicated by more subtle cues such as the temple, the school, and the funeral homes. In the case of the Control Group these later uses made up a large part of the overall character of the street. For example, only the Control Group noted the presence of the funeral homes with enough frequency to enable it to appear on the list. Indeed of the media only the

Control		Movie		Slides		Photos		Drawings		Model Movie		Model Slides	
Shops	100%	Shops	75%	Gas Station	83%	Gas Station	100%	Shops	100%	Apartments	45%	Shops	56%
Apartments	67%	Apartments	63	Shops	65	Shops	100	Apartments	85	*Factories	45	Billboards	48
Temple	63	Gas Stations	55	Apartments	61	Apartments	80	Gas Station	75	*Department Stores	40	*Factories	38
Gas Station	53	Purity Supreme	37	Billboards	52	Purity Supreme	70	Billboards	70	Open Space	40	Apartments	36
Restaurant	48	School	35	Parking	39	Billboards	50	Parking	45	Shops	30	Open Space	28
School	28	Open Space	20	Purity Supreme	34	Movie	40	Liquor Store	40	Gas Stations	25	Offices	28
Banks	28	Single Family Houses	15	Liquor Stores	30	Bakers Dozen	30	Macys	40	Offices	20	Department Stores	23
Clothing Stores	28	Billboards	15	Woolworths	30	Liquor Stores	30	Purity Supreme	38	Restaurant	20	Single Family Houses	16
Funeral	24	Parking	14	Single Families	17	Parking	30	Church	30	*Warehouses	20	*Warehouse	11
Purity Supreme	24	Woolworths	14	Bookstore	13	Woolworths	30	Sheas Clean	25	*Auditor	10	*Auto Sales	11

FIGURE 3-17: MOST FREQUENTLY CITED USES

* Indicates incorrect use.

movie and the color slides noted their pressure at all. In the case of the two modelscope simulations about 40 percent of the uses cited most frequently were in error, and did not exist on that stretch of Harvard Street that the subjects experienced. These are noted by an asterisk in Figure 3-17.

2. Activity Intensity. No direct questions were asked regarding the intensity of the activity along Harvard Street but an examination of the responses to the first set of open ended questions aimed at revealing the subjects overall image of Harvard Street reveals some interesting patterns. Figure 3-18 summarizes the references regarding the overall relative "busyness" of Harvard Street. The number of references were adjusted to account for the differences in size of treatment groups.

	Busy	Mod.	Dead	N[1]
Control	80%	10%	10%	8
Movie	50	20	30	19
Slides	35	25	40	17
Photos	37	37	26	16
Drawings	70	30	0	10
Mod. Mov.	0	26	64	11
Mod. Sli.	11	11	78	9

FIGURE 3-18: OVERALL INTENSITY OF ACTIVITY

This pattern, which essentially replicates that of the semantic differential (See Figure 3-28) for the adjective pairs occupied-deserted, alive-dead, dynamic-static, colorful-drab, and exciting-boring, reveals a strong deficiency on the part of most simulations in their ability to communicate information about the intensity of activity in an environment. This deficiency is especially severe for the modelscope simulations. One suspects that this might have been even more severe had the experiment been conducted on a more representative "busy" day, which would have supplied the control and the more realistic simulations with many more cues regarding the intensity of activity along the street.

Figure 3-19 summarizes those references made regarding the relative intensity of activity in each of the four most commonly identified subareas. Unfortunately the data are limited and in many instances there aren't sufficient cases in the cells to permit valid comparisons. There are some interesting patterns, however. Almost all those subjects who made reference to the Coolidge Corner area believed it to be an active-busy area.[6] It should be noted that, for the subjects viewing the modelscope simulations, although they believed Coolidge Corner to be busy and active, many of them believed it to be a busy-active industrial area. Regarding the second subarea, however, a relatively large number of the subjects from two of the treatments (photos and mod movie) believed that area to contain intense activity. Most groups felt it to be of moderate intensity.

	Coolidge Corner				Mixed Resid. & Inst. Area				Ethnic Shopping				Suburban Area			
	Busy	Mod	Dead	N	B	M	D	N	B	M	D	N	B	M	D	N
Con-trol	100	0	0	7.3	0	60	40	4.5	0	0	100	0.9	50	50	0	5.4
Movie	100	0	0	8.5	0	100	0	3.8	0	0	0	0	0	0	0	0
Slides	100	0	0	0.9	0	50	50	1.8	0	50	50	1.8	0	0	0	0
Photos	100	0	0	8	50	50	0	4	100	0	0	2	84	16	0	12
Draw-ings	88	12	0	8	0	50	50	4	0	0	0	0	0	60	40	5
Mod Mov.	100	0	0	4	75	0	25	4	0	0	0	0	0	0	0	0
Mod. Sli.	100	0	0	1	0	0	100	1	6	100	0	1	6	100	0	1

FIGURE 3-19: ACTIVITY INTENSITY OF SUBAREAS

3. Comparative Significance. An accurate evaluation of the comparative significance of activities is necessary for location and description of the most important places in the city. This understanding of the relative importance of the activities in an area and their relative importance in the context of the city as a whole and to ones own "life space" are of obvious import in an image which will permit effective action on the part of individuals and groups.

Steinitz (1967) defined activity significance by means of the number of people affected by it and the degree of that effect. In general he noted that more important activities have wider service areas, or realms, with greater populations. He went on to describe two other important dimensions which are important in the judgment of the relative importance of an area. First was decision significance--"places with high decision significance were defined as those where the key political and/or economic decisions are made." Second symbolic significance--"places with high symbolic significance were defined as those which are important for their social, cultural and or historical value"; these will be touched upon in other sections.

In my analysis of questions 1 through 9 I did not attempt to differentiate between different types of significance but rather sought to assess two aspects only. First I attempted to ascertain their judgments of the relative importance of Harvard Street within the context of the whole urban system. Secondly, to ascertain what they felt to be most significant about Harvard Street itself, in other words, what were the most important things going on within the Harvard Street setting. Figure 3-20 summarizes those responses made by the subjects regarding what they felt to be the predominant activity of the street. More than sixty percent of the references made by the control subjects indicated that they felt the most important activity to be "business." Almost forty percent indicated it

	Mostly Business	Mostly Resid.	Business & Resid.	Mostly Indus	N[1]
Control	63%	0%	37%	0%	7.2
Movie	93	7	0	0	13.3
Slides	23	0	76	0	3.4
Photos	50	0	50	0	24.0
Drawings	42	25	33	6	12.0
Model Movie	46	0	0	54	13.0
Model Slides	61	0	5	33	18.8

Significance = .05

FIGURE 3-20: COMPARATIVE SIGNIFICANCE OF ACTIVITIES ALONG HARVARD STREET

to be somewhat evenly balanced between business activities and residential. This overall pattern is basically shared by four of the simulation groups although with considerable variation in the relative frequencies between the two categories. More significantly, however, is the judgment made by a large number of the modelscope viewers that the predominant activity of Harvard Street was industrial in nature, consisting of factories and warehouses.

When the responses are examined for references which denote the relative significance of the street, within its context, the following pattern is revealed. In Figure 3-21 those references made regarding relative significance are summarized and grouped into six major categories. The first three all conceive of the street as being "main street," but within different contexts; a small to medium sized town; an in-city suburb; an urban neighborhood. A number of subjects referred to the street as a main shopping area but did not place it in any context. The two modelscope simulations caused subjects to form the conception that it was the industrial part of town "like South Boston." Finally, a number of subjects referred to the street as "any street USA" or simply as being "a typical city street."

It is with respect to these latter two categories that the most obvious differences between the control group and the media arise. First, because Harvard Street is in so many ways atypical when viewed with close attention to details, the distinctly ethnic character of the shops along a portion of the street, the sign denoting the birthplace of President John F. Kennedy and an early New England farmhouse surrounded by an enormous neo-classic school building are examples of this uniqueness. Because of this definite but subtle deviation from type, none of the control group referred to the street as being the stereotyped "any street USA." Further examination of their responses revealed an almost total lack of associational references--i.e. "it is like. . . .". Secondly, and probably the most severe divergence from both objective reality and from a

	Main Street in a small to medium sized town	Main Street of an in-city suburb	Main Street of an urban neigh-borhood	Main Shop-ing Area-N.A Where	Indus Part of Town	Typical Street USA NA What	Total N[1]
Con-trol	8%	23%	23%	46%	0	0	11.7
Movie	12	27	15	27	0	19	31.4
Slides	11	11	11	34	0	34	23.2
Photos	20	0	30	50	0	0	20.0
Draw-ings	19	30	11	11	0	30	27.0
Mod. Mov.	16	32	6	11	37	0	19.0
Mod. Sli.	23	27	4	15	27	4	27.5

FIGURE 3-21: COMPARATIVE SIGNIFICANCE OF HARVARD STREET (RELATIVE TO OTHER AREAS)

response pattern which is comparable to that of the control group is the large number of subjects who viewed the two model-scope simulations and came to believe Harvard Street to be "the industrial part of town - like the area behind Westgate."[7] While this problem could in all probability be minimized by "programming the subjects state of perceptual readiness" so that he expects to be viewing a "main street that passes through an important shopping area, into a residential area . . . etc." This programming of his expectations would in all probability result in his normalizing what were rather ambiguous cues into the stereotype "shopping area" and so on, but it still indicates a decided lack of communicative power and fidelity on the part of these two techniques, at least as I used them.

D. Economic Characteristics

Knowledge of the relative economic status, condition, and prospects of an area has far reaching effects upon the city shaping decisions made by most citizens. In fact, conceptions regarding the economic health or viability of an area are perhaps one of the most important factors governing the success of the many efforts at "improvement" made by the public and private agents of change in the city. And it is one which most often requires a change from an incorrect stereotype or of an earlier image of an area as "declining" etc. The formation or change of this belief regarding the prospects of economic investment in certain areas is therefore an important consideration in most predictive simulation.

Knowledge regarding the economic status and condition of an area is equally as important for daily city using plans as it is for those which involve far reaching city shaping or reshaping decisions. Are the restaurants in this area expensive or moderate in price? Will the merchandise in the stores be out of my price range or dingy and not of the right kind? These kinds of judgments are part and parcel of daily experience in cities and much of the information upon which they are based is obtained via cues read from the physical environment.

Questions 1 through 9 were first analyzed for all references regarding any aspect of the economic character of Harvard Street. The data summarized in Figure 3-22 indicate that photographs stimulated far more comment on this dimension than any other mode of experience. The color slides and control group followed with about half as many references. Those subjects who experienced the most abstract of the media did not make very many references regarding economic conditions on Harvard Street. In fact, the model movie group made no references at all to this dimension. Questions 1 through 9 were further analyzed for references to the economic prospects or future of Harvard Street. While the data are limited, they do suggest that there are differentials in the conceptions formed by subjects who experience the environment directly and those who experience it indirectly by means of a simulation. Figure 3-23 reveals two patterns of interest. First only among the control group were there subjects who made reference to Harvard Street as being prospering and viable economically. Of those

	No. Of References[1]	Rank
Photos	16.0	1
Slides	8.7	2
Control	6.4	3
Movie	3.8	4
Drawings	2.0	5
Mod. Sli.	1.9	6
Mod. Mov.	0.0	7

FIGURE 3-22: REFERENCES REGARDING ECONOMIC CHARACTERISTICS

	Prospering	Stable	Declining	Total N[1]
Control	50%	0	50%	6
Movies	0	0	100%	3
Slides	0	0	100%	2
Photos	0	0	100	12
Drawings	-	-	-	0
Model Movie	-	-	-	0
Model Slides	-	-	-	0

FIGURE 3-23: INFERENCES REGARDING ECONOMIC PROSPECTS

subjects who viewed the simulations and who made references regarding this aspect of the street they made only references which indicated that they had a negative conception of the streets economic prospects. They saw the area as declining or deteriorating. Secondly, the subjects viewing those simulations which were rated as being relatively more abstract made no references at all regarding this important dimension of environmental knowledge.

Questions 1 through 9 were also analyzed for inferences regarding the relative economic status of Harvard Street and its elements. Figure 3-24 summarizes the references made by the subjects regarding their rating of the area. Again we see a rather significant difference in beliefs regarding this dimension between the control group and the simulation groups.

	Relatively Wealthy	About Average	Relatively Poor	N[1]	Mean Rating On Rich-Poor Scale
Control	44%	44%	12%	8.2	3.53
Movies	0	33	67	2.9	4.56
Slides	20	20	60	8.7	4.65
Photos	0	17	83	12.0	4.70
Drawings	0	0	100	2.0	3.75
Model Movie	0	0	0	0	3.60
Model Slides	0	50	50	2	4.52

FIGURE 3-24: INFERENCES REGARDING ECONOMIC STATUS

First only the control group indicated in their references a belief that Harvard Street was of relatively high economic status. These subjects viewing the simulations tended to refer much more frequently to the street as a relatively poor area. However, there are not sufficient cases in the Drawings and the Modelscope groups to permit inferences. This pattern is confirmed for the most part by the ratings obtained from the semantic-differential along the rich-poor scale. Again, however, the response pattern of the subjects who viewed the perspective drawings is relatively similar to that of the control groups.

E. Maintenance Characteristics

"An old but well kept area" was a frequent judgment made by the Control Group regarding Harvard Street and its immediate surroundings. Royce (1968) found that the degree to which an area is maintained was one of the strongest cues by means of which people inferred the characteristics of others who reside or use a particular environmental setting. Along with this strong tie to the social characteristics of an area and their affect on ones city using plans, a number of studies have shown upkeep to be one of the most important aspects of "improving" an environment in the eyes of its residents (Sims, 1968) and in fact, much of the tenor of the urban renewal program in the United States has shifted toward rehabilitation and maintenance and away from major structural renovations. Thus the ability to communicate a sense of the relative maintenance level of an environment will often be an especially important aspect in the choice of a simulation technique for a designer or a researcher.

The data indicate a considerable variability in the ability of the media I evaluated to convey this type of information. Responses to Questions 1 through 9 of the interview schedule and number 28 of the paired objectives are summarized in Figure 3-25. They reveal, as might be expected, a tendency on the part of the modelscope simulations to convey the environment as being well-maintained, "clean and shiny" as one subject put it. In a situation which involves portraying a "new-environment" as it will be shortly after completion this is not necessarily a liability. However, there is some indication of a tendency to normalize the environment into a "shiny-new"

	Well Maintained	Poorly Maintained	N[1]	Mean Rating On Clean-Dirty Scale[9]
Control	60%	40%	56.4	3.37
Movies	19	81	24.8	4.93
Slides	37	63	28.8	3.65
Photos	22	78	38.0	4.20
Drawings	50	50	14.0	3.12
Mod. Mov.	100	0	4.0	2.82
Mod. Sli.	70	30	10.6	3.15

FIGURE 3-25: INFERENCES REGARDING MAINTENANCE CHARACTERISTICS

stereotype[8] which would not be at all appropriate in cases wherein one wanted to convey an impression of a rehabilitated older environment.

While I expected the deviation of the modelscope simulations toward a sense of the environments upkeep being better than it actually was, I was surprised at the performance of all the photographic simulations. An examination of Figure 3-25 reveals a dramatic reversal of conceptions toward one in which Harvard Street is seen as being decidedly "shabby, deteriorating, dirty" etc. For example, in the Control Group the split was 60-40 respectively between those who saw Harvard Street as being "old but well kept" and those who believed it to be "old and dingy." However, this proportion reverses and worsens to where approximately seven out of each ten references made by those subjects who viewed the color movie portray Harvard Street and its surroundings as being poorly maintained. The same pattern holds true for the color slides and black and white photos.

It is possible that this tendency is associated with the relative exposure-brightness of the photographs. Howard, Mylnarski and Sauer (1972) in their study of affective responses to photographically simulated environments noted a direct relationship between negative evaluations and darker exposures. The perspective drawings continue to maintain a much closer parallel with the response pattern of the Control Group than I had expected. The subjects ratings on the clean-dirty scale of the semantic differential strongly confirm the findings from the analysis of the open ended questions.

Along with a tendency toward conceptions which differ in terms of the evaluation of an areas' relative upkeep there is also a definite differential in the number or frequency of references on the part of subjects regarding this dimension of environmental knowledge. Figure 3-25 reveals a significant drop in frequency of reference to upkeep for all the subjects who experienced the environment by means of a simulation. In the case of the color movie and color slides there is roughly a 50 percent drop in frequency, while for the modelscope subjects the reduction is in the order of a magnitude of five.

These two patterns suggest the hypothesis that the simulations either do not provide sufficient cues as to the maintenance-upkeep aspects of the environment, which along with others result in incorrect normalizations toward stereotypical judgments, i.e. "all older in-city shopping streets are deteriorating", or alternatively, they provide misleading cues which suggest different or even opposite conceptions. As in the case of the modelscope simulations which provided cues to suggest a very high level of maintenance, a suggestion which in this case, (an older existing in-city environment) is misleading and false.

F. Relative Age

The relative age of an area or structure is also somewhat important knowledge for a person to have when making and carrying out many plans which involve both city using and city shaping decisions. It is associated with a host of other important characteristics of areas and with our feelings toward them. We "know" that in new-modern areas the maintenance will be low, but that we usually must wait for the trees to grow; that new areas often have "new" people and vice versa; that old areas are often unsafe and new areas often boring and bland. While none of these associations (and these are but a few) with the relative age of a place are causal or even necessarily true, nor are they the same for different individuals, they are nonetheless indicative of the importance of age as an aspect of "knowing a place".

Subject response to Questions 1 through 9 were analyzed for inferences regarding the relative age characteristics of the Harvard Street environment. The data summarized in Figure 3-26 clearly show a differential in the judgments which the subjects reached regarding the age of Harvard Street and its constituent elements. The Control Group noted the street and the various objects and subareas along it to be "older" in about seven out of ten cases. This pattern holds true to a greater or lesser extent for the simulations excepting the modelscope movie and slides. Those subjects viewing the modelscope simulations referred to the street and its elements as being new, modern, etc., at a rate of approximately six out of every ten of their references regarding age characteristics of the street. This result is very similar to that obtained with the semantic differential, wherein the subjects were asked to rate the street as a whole along a seven step scale between the polar adjectives new-old. The mean rating of each group is included in Figure 3-26.

These two sets of data reveal a definite tendency of this particular model when viewed by means of a modelscope to portray the environment as somewhat "newer" than it actually is and actually result in a reversal of the response pattern obtained

	New	Old	N	Mean Rating On New-Old Scale[10]
Control	23	77%	31	5.15
Movies	41	59	27	5.00
Slides	20	80	26	5.34
Photos	43	57	42	5.60
Drawings	29	71	24	5.09
Model Movies	64	36	11	3.90
Model Slides	57	43	28	4.26

FIGURE 3-26: INFERENCES REGARDING AGE CHARACTERISTICS OF AREA

by the Control Group for this dimension of environmental knowledge. There is a further indication of a tendency toward fewer references regarding age characteristics of the environment on the part of the modelscope movie viewers as well; however, this is not borne out by the modelscope slide group.

G. Esthetic Significance

Our use and perception of the city are not always bound by utilitarian concerns but often involve experiencing the environment in terms of its sensory qualities alone. The abstract, formal patterns of light, color, texture and movement can bring an immediate delight in the sights and sounds of the world.

Questions 1 through 9 were analyzed for evaluative comments on the formal esthetic qualities of the environment. The data summarized in Figure 3-27 reveal that while there are definite differences in the frequency of references to the

	Positive	Negative	N[1]	Rank
Control	53%	47%	95	1
Model Sli	31	69	94	2
Slides	20	80	88	3
Mod. Mov.	31	68	85	4
Drawings	42	58	72	5
Photos	26	74	62	6
Movies	31	69	52	7

FIGURE 3-27: REFERENCES TO ESTHETIC FEATURES

esthetic features of the Harvard Street environment, there is no discernible pattern to those differences. The Control Group made the most references closely followed by the most abstract of the media. The group which experienced the second most "realistic" of the media made the fewest references, about half that of the Control group.

For the Control group a slight majority of the references were positive, whereas for the photographic simulations and the modelscope simulations subjects less than one-third of the evaluations were positive. The Drawings group most closely approximated the response pattern of the Control group with 42 percent of its evaluations positive in nature.

H. Connotative Meanings: The Semantic Differential

The subjects were asked to rate the environment as a whole using an adjective checklist or semantic differential (Osgood, 1967). The semantic differential is a useful device for measuring certain aspects of meaning attached to concepts, or things, particularly connotative aspects.[11] Basically it consists of two adjectives of opposite meaning at either end of a seven step scale. The center point of the scale represents an indifferent or neutral response. The subject is asked to rate the street as a whole along the scale. The advantage of using the adjective checklist method are that simple commonly understood adjectives can be utilized, judgments can be brief and easily recorded, its application is flexible and it is amenable to many forms of analysis.

From several recently used checklists (Collins, 1969) (Hershberger, 1968) twenty-nine adjective pairs were chosen which seemed relevant to the Harvard Street environment. The adjectives chosen were only a small sample of the possible meanings contained in Harvard Street. The primary purpose was to see whether or not there would be significant differences produced along these selected dimensions by the mode of experiencing the environment rather than to ascertain the total realm of meanings.

The data clearly show a differential in the meanings assigned to Harvard Street as a function of the mode of experience. Figure 3-28 shows that while the position along the scale varies, there is remarkable degree of similarity in the pattern of this differential for the cluster of related meanings, alive-dead; exciting-boring; colorful-drab; occupied-deserted; and dynamic-static. In all cases the Drawings group most closely approximates the response pattern of the Control group. All the indirect modes would seem to convey the sense

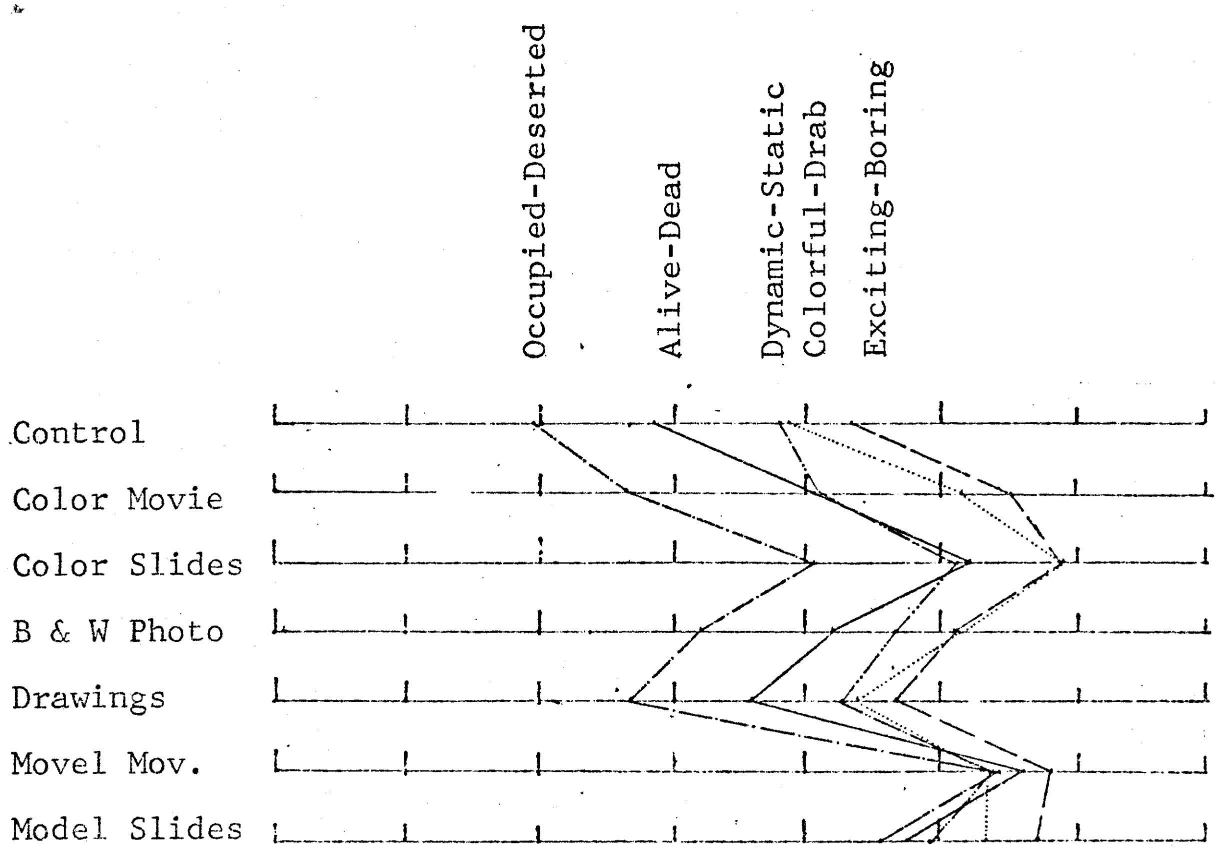


FIGURE 3-28: ACTIVITY INTEREST DIMENSIONS

of Harvard Streets being more toward the dead, boring, etc. end of the scale. The color slides and model movie are most pronounced in this tendency. Within this cluster of related concepts are the greatest differences or variation in ratings. The occupied-deserted and alive-dead continuums have a variance of 3.7 and 2.8 respectively as compared to a mean variance of 1.6 for all the scales.

For those meanings centering around the concepts, clear-confusing; orderly-disorderly; uniform-diverse; cluttered-uncluttered; and formal-informal; we find that most of the media result in fairly close approximations of the response pattern of the Control group. They rate Harvard Street as being

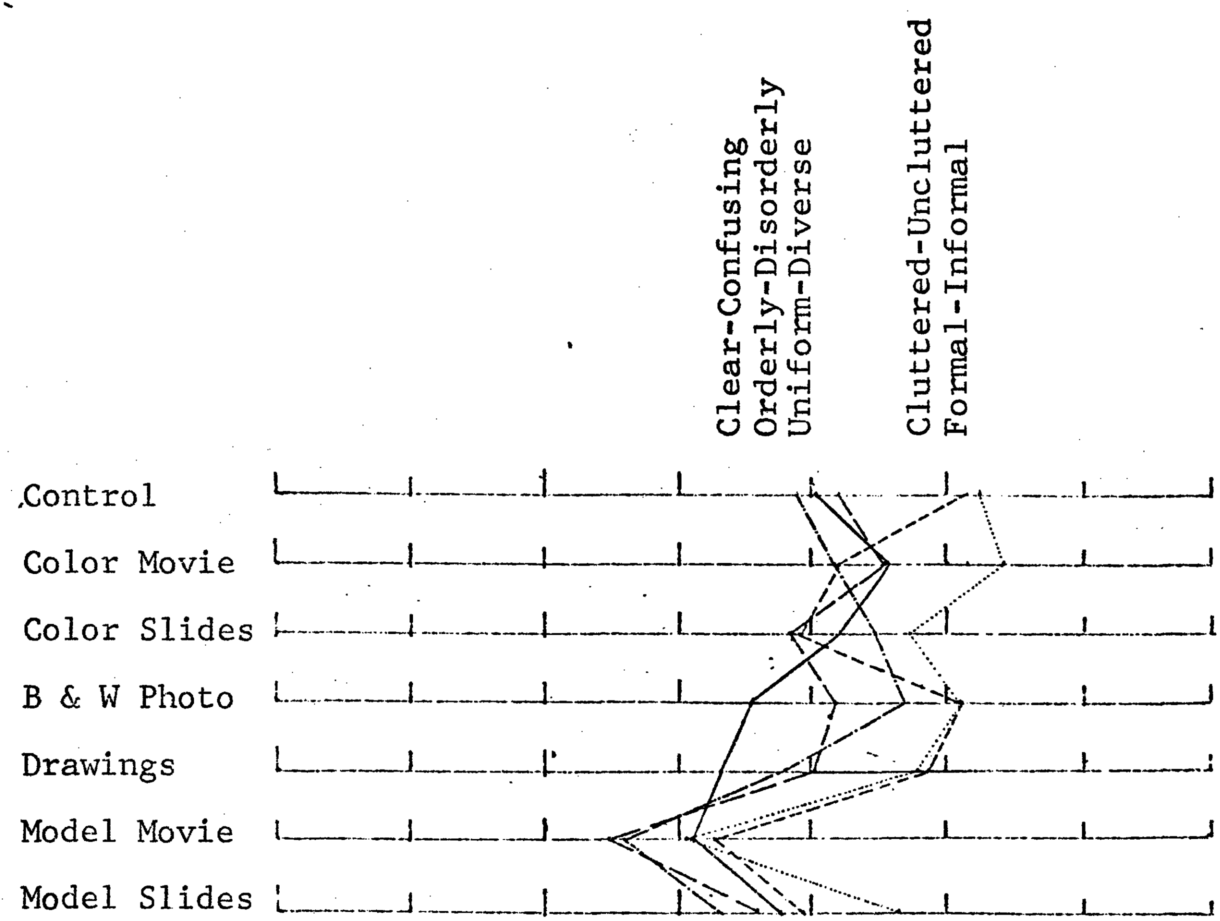


FIGURE 3-29: ORDER DIMENSIONS

slightly toward the confusing, disorderly, etc., end of the scale. The model scope simulations, however, produced a belief that the street tended more toward the clear, orderly uniform end.

In their ratings of the spatial dimensions of the street the color movie produced the only significant difference. Subjects who experienced the movie felt the street to be more toward the cramped and narrow end of the scale than did the Control group. They also felt it to be lower than did the other groups who were in close agreement that the street rated about equidistant along the low-high continuum.

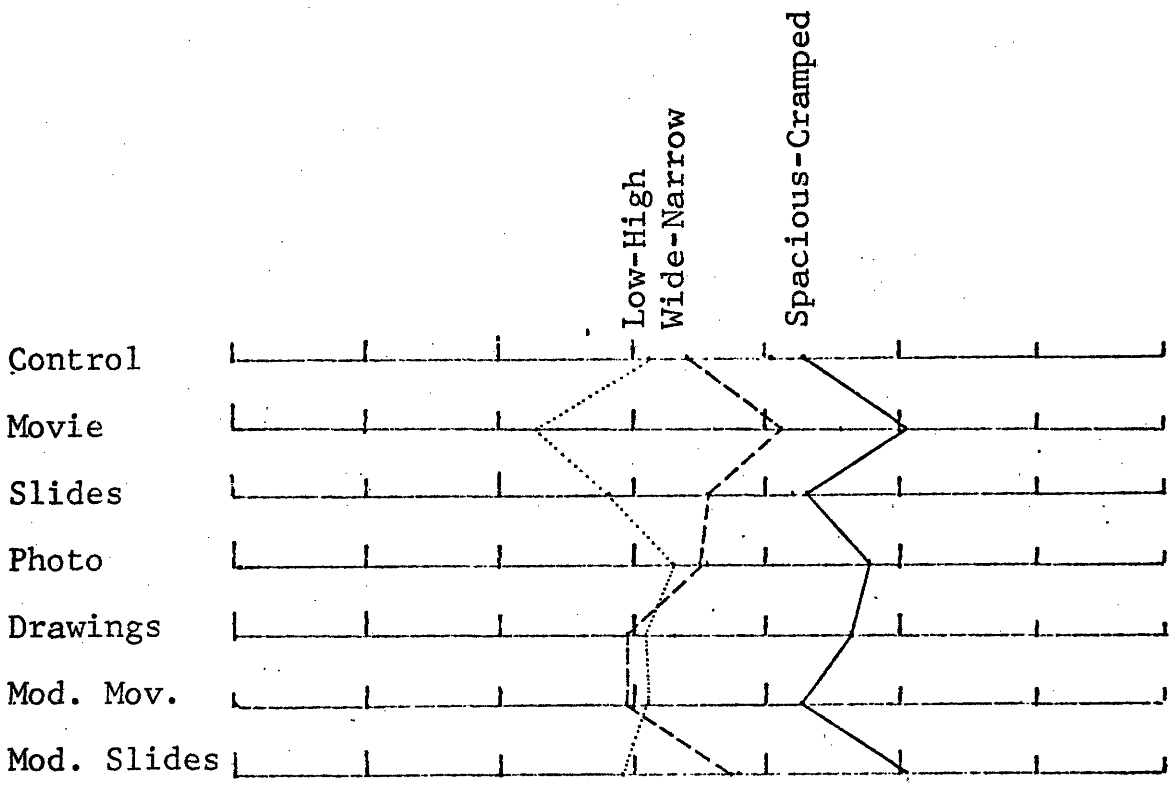


FIGURE 3-30: SPATIAL DIMENSIONS

For the related meanings, comfortable-uncomfortable, convenient-inconvenient, and safe-dangerous, all the media rather closely approximated the response pattern of the Control group, with the exception of the color movie which resulted in Harvard Streets being conceived as more uncomfortable and dangerous and at the same time more convenient.

All the subjects perceived the street to be rather more tasteless, ugly, drab and gloomy than tasteful, beautiful, colorful and pleasant. However, only the Drawings group achieved a pattern similar to that of the Control group. All the other media resulted in conceptions of the street as being still more toward the tasteless, ugly, et al. end of the scale. The color slides resulted in a rather dramatic shift in this

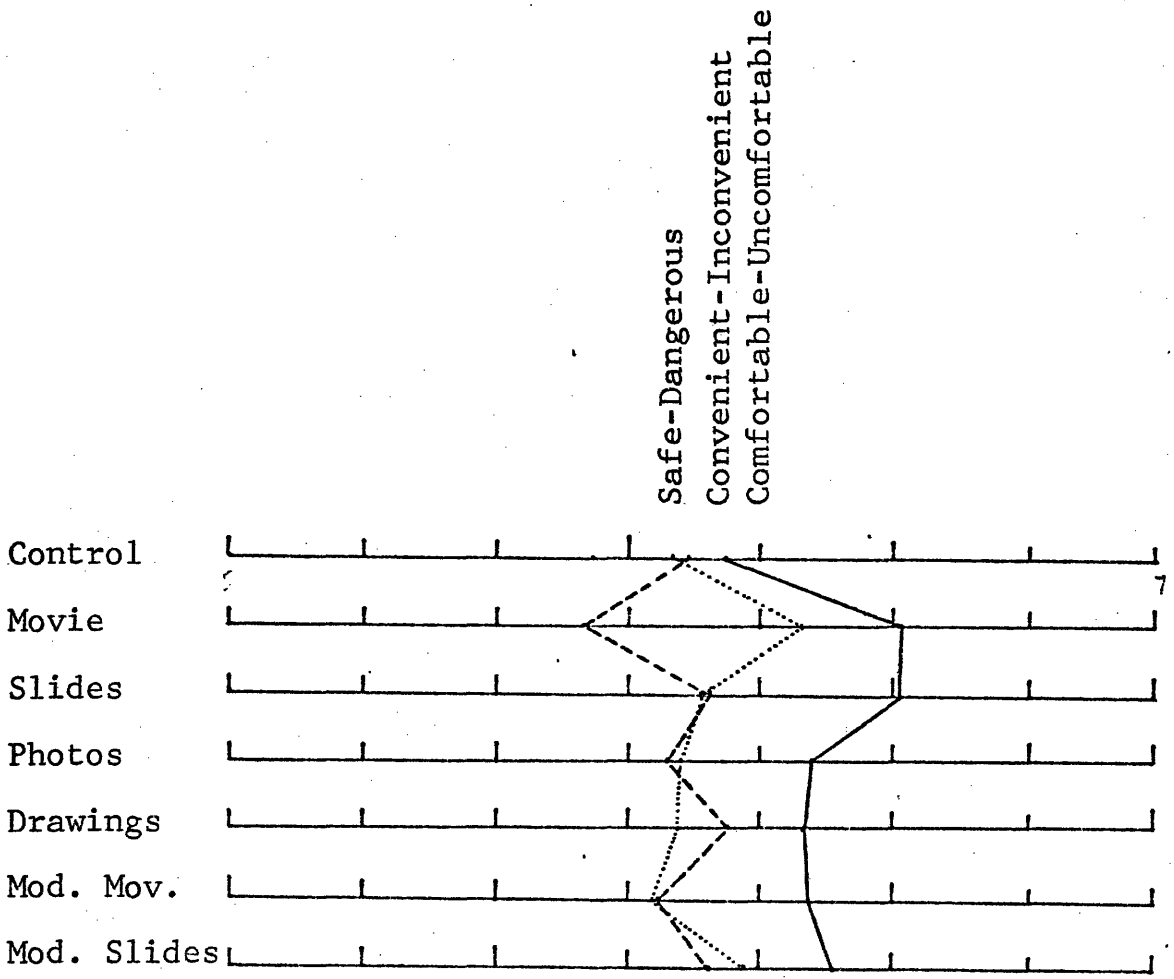


FIGURE 3-31: COMFORT DIMENSIONS

direction. The response pattern for this group of related meanings is exceptionally consistent for each media across all the semantic scales in the cluster.

No clear pattern emerges as to the subjects conceptions regarding the streets position along certain time related dimensions. The position of Harvard Street on the lasting-changing, complete-incomplete, dynamic-static, new-old, dimensions did vary considerably for each of the media from that of the Control group, however. The complete-incomplete ratings accounted for the smallest variance of all the semantic scales

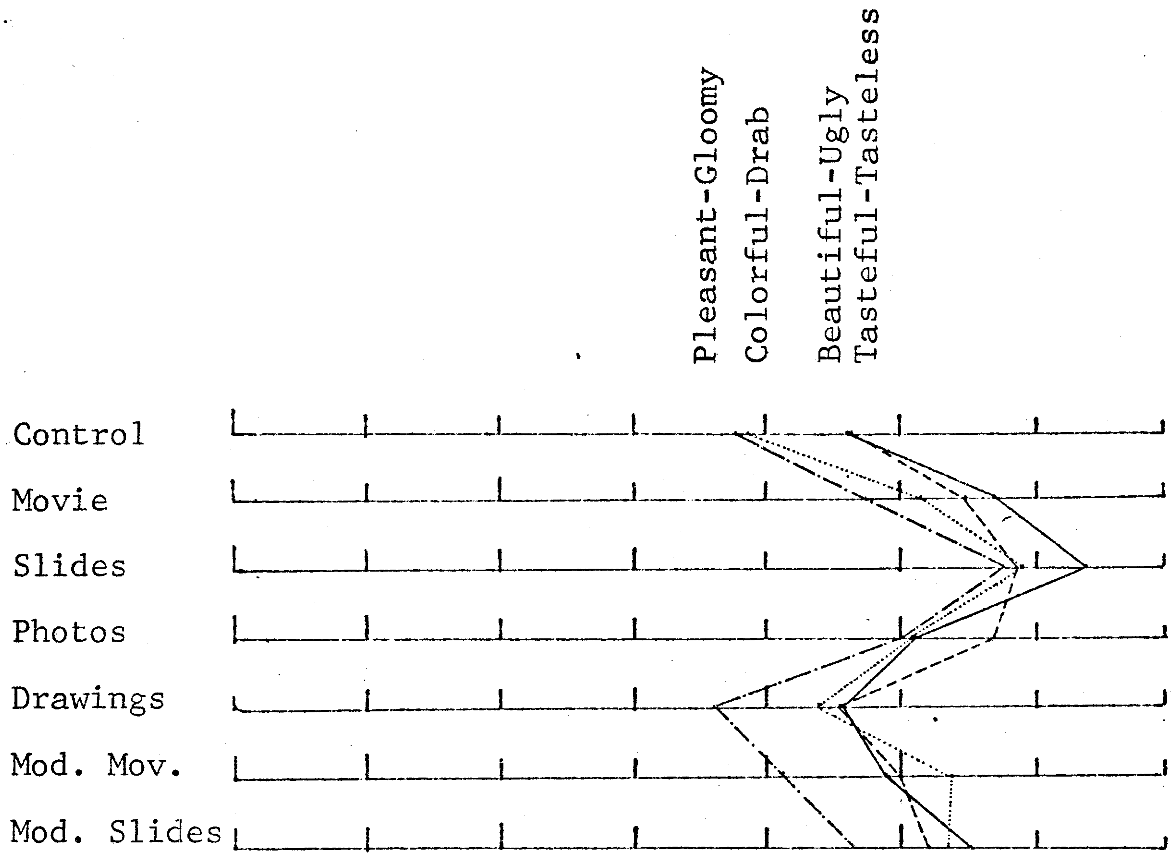


FIGURE 3-32: AESTHETIC DIMENSIONS

with a maximum difference of .65 between the high and low ratings.

The modelscope simulations resulted in significant deviation of the conception imparted subjects along several dimensions related to the tidyness of the street. The modelscope subjects believed the street to be rather more clean, uncluttered and orderly than did the other subjects. The Drawings and Photos groups came closest to replicating the response pattern of the Control group while those subjects viewing the movie felt the street to be more in the direction of being dirty, cluttered and disorderly.

The indirect experiences produce dramatic differentials

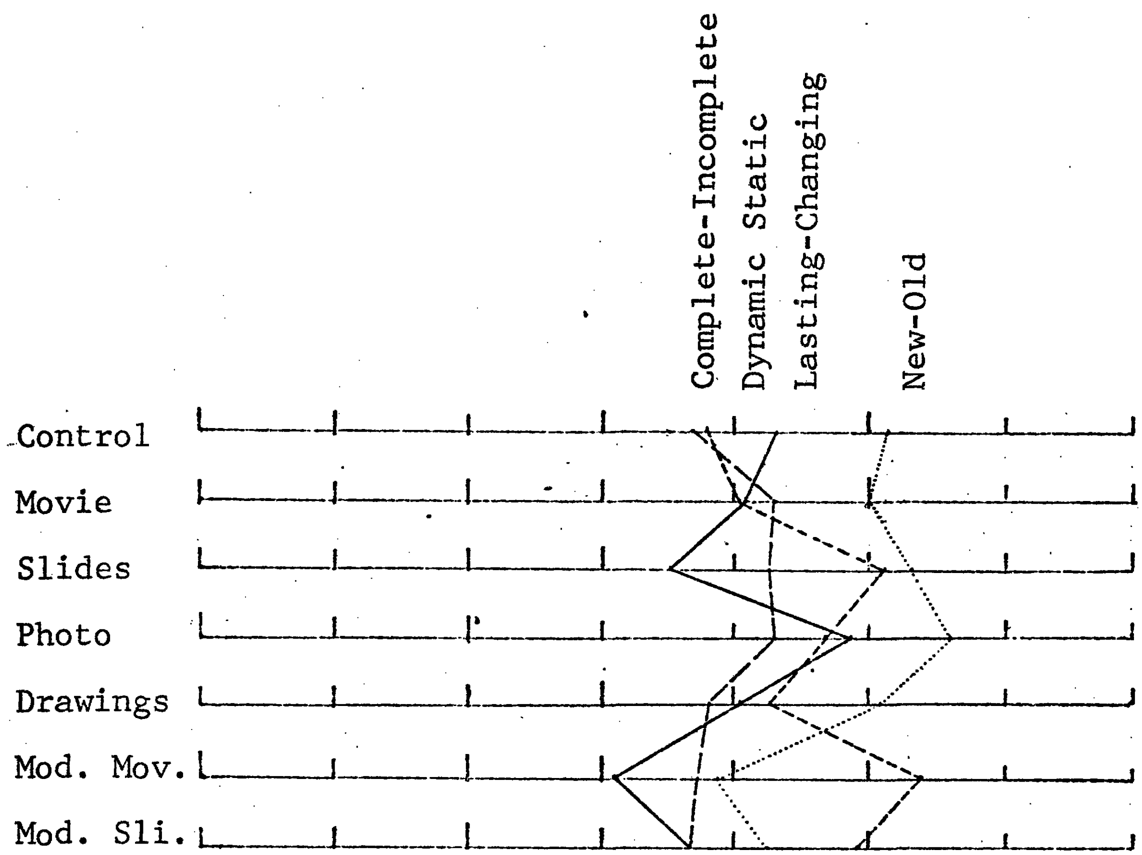


FIGURE 3-33: TIME RELATED DIMENSIONS

in meaning along the private-public, deserted-occupied, unfriendly-friendly, impersonal-personal dimensions. We see that all the media result in a conception of Harvard Street as being more private, deserted, unfriendly, and impersonal than did the direct experience itself. This is particularly true for the color slides and the modelscope simulations. The drawings come closest to replicating the response pattern of the Control group.

All the subjects felt the street to be toward the unnatural end of the dichotomy. However, with the exception of the drawings and the photographs the media resulted in a

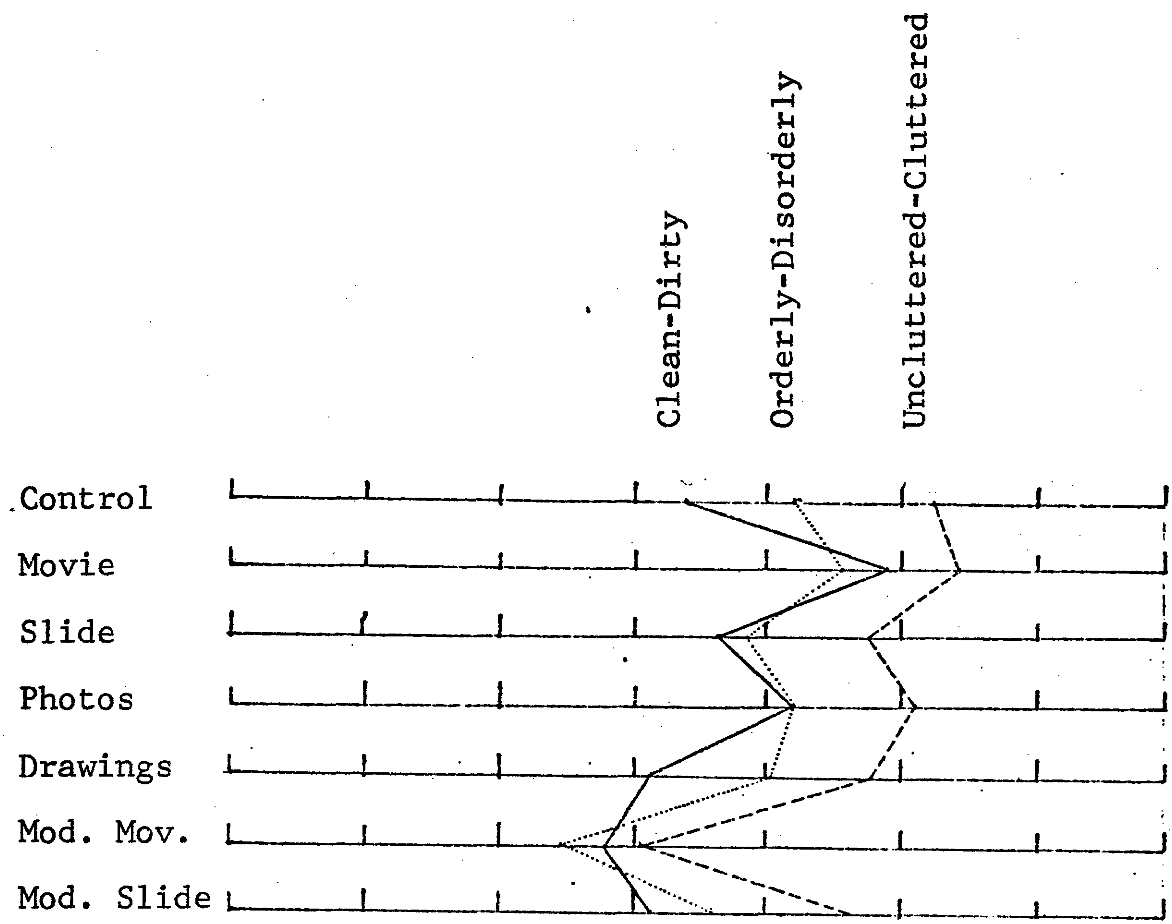


FIGURE 3-34: MAINTENANCE DIMENSIONS

conception of the street as being even more unnatural. The two modelscope simulations resulted in the belief that the street was at the same time somewhat informal while the other media and the Control group felt the street to be rather neutral on this dimension.

<u>Overall</u>. In Figure 3-37 the mean rating given Harvard Street along each of the semantic scales is graphed by mode of experience. The most striking thing about this overall pattern is its relative tightness. The largest variations are 3.7 on the seven point scale for the occupied-deserted dichotomy and

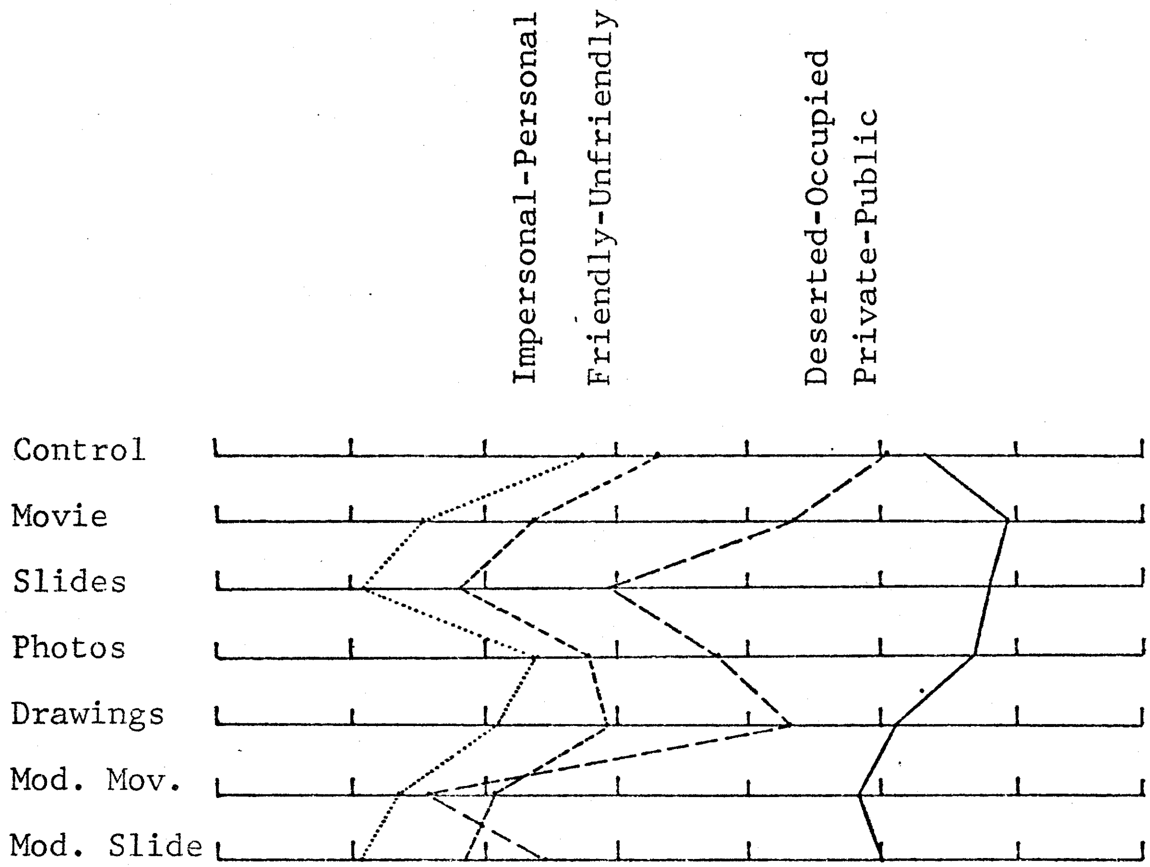


FIGURE 3-35: PERSONAL-FRIENDLY-OCCUPIED DIMENSIONS

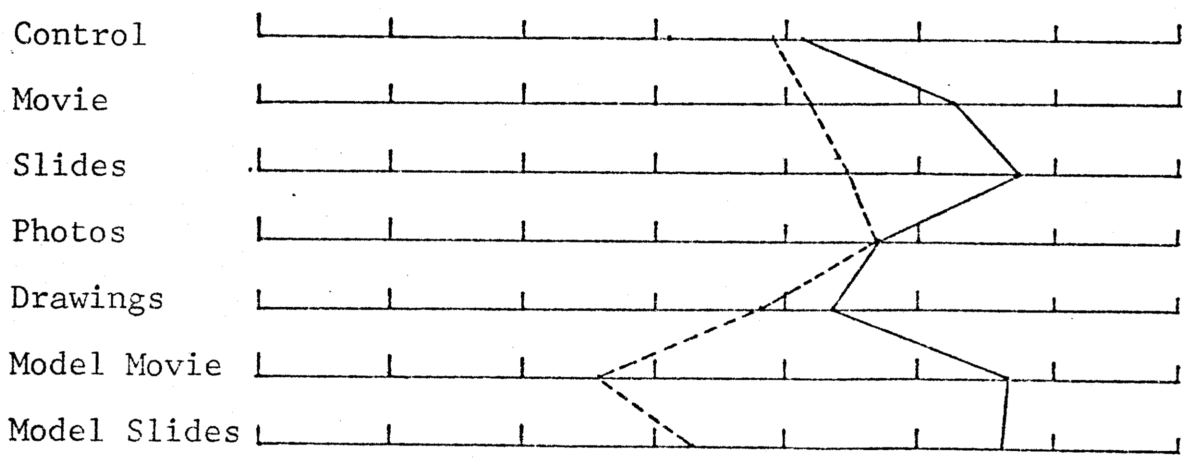
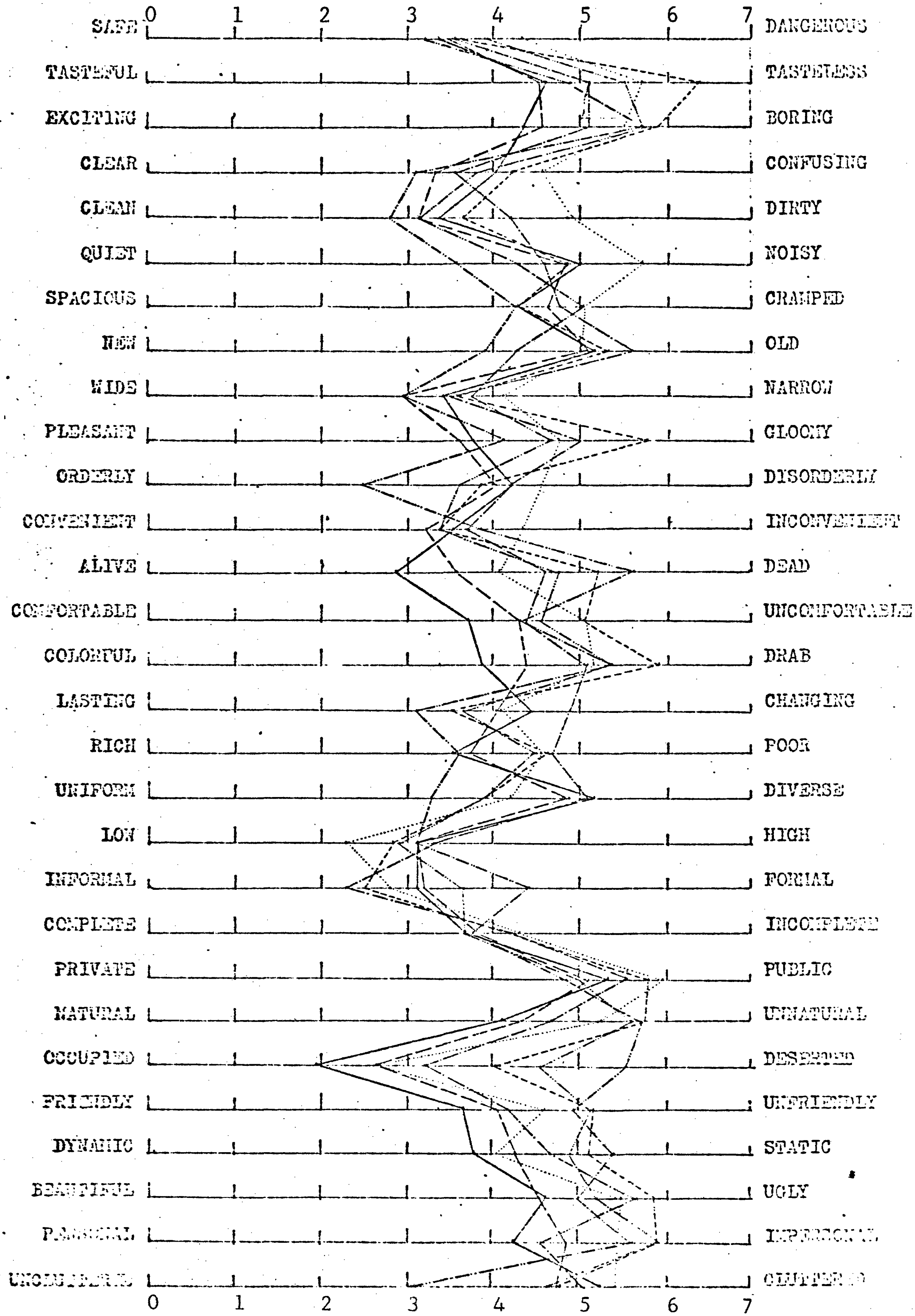


FIGURE 3-36: NATURAL-INFORMAL DIMENSIONS


0 1 2 3 4 5 6 7
SAFE
DANGEROUS
TASTEFUL
TASTELESS
EXCITING
BORING
CLEAR
CONFUSING
CLEAN
DIRTY
QUIET
NOISY
SPACIOUS
CRAMPED
NEW
OLD
WIDE
NARROW
PLEASANT
GLOOMY
ORDERLY
DISORDERLY
CONVENIENT
INCONVENIENT
ALIVE
DEAD
COMFORTABLE
UNCOMFORTABLE
COLORFUL
DRAB
LASTING
CHANGING
RICH
POOR
UNIFORM
DIVERSE
LOW
HIGH
INFORMAL
FORMAL
COMPLETE
INCOMPLETE
PRIVATE
PUBLIC
NATURAL
UNNATURAL
OCCUPIED
DESERTED
FRIENDLY
UNFRIENDLY
DYNAMIC
STATIC
BEAUTIFUL
UGLY
PERSONAL
IMPERSONAL
UNCLUTTERED
CLUTTERED
0 1 2 3 4 5 6 7

2.8 along the alive-dead spectrum. The median variance is 1.6 for the dimensions exciting-boring, and dynamic-static. The smallest variations are .65 on the complete-incomplete and .8 on the spacious-cramped scales. The most extreme ratings were 6.39 along the tasteful-tasteless, 5.96 on the private-public and 1.96 on the occupied-deserted scale.

In Figure 3-38 the media are ranked according to the summated differences of their mean scores from those of the Control group. The perspective drawings came the closest to replicating the response pattern of the Control group with a summated difference of mean score of 10.09 across 29 dichotomous choices. The most deviant responses were obtained from the modelscope movie, with summated differences of 31.73.

In Figures 3-40 and 3-45 the response pattern of each media is compared to that of the Control group. The differences between the two ratings is crosshatched. The surprising closeness of the responses of the Drawings group to that of the Control group is perhaps best illustrated in Figure 3-43.

I. Recognition Tests

After completing the introspective portions of the questionnaire and before preceeding on to the personal questions[12] the subjects were tested to determine their ability to recognize a scene from the street. The test also sought to ascertain their ability to recognize a scene which was shown in a different media than they had experienced in the experiment. In a sense the test sought their ability to transfer from one media to another.

Reality Rank	Media	Summated Difference Of Means
1	Drawings	10.09
2	B & W Photos	17.97
3	Color Slides	24.11
4	Model Slides	26.14
5	Color Movie	28.72
6	Model Movie	31.73

FIGURE 3-38: SUMMATED DIFFERENCES OF THE SEMANTIC SCALES

	Color Movie	Color Slides	B & W Photos	Drawings	Model Movie	Model Slides
Safe-Dangerous	.99	.21	.05	.02	.15	.54
Tasteful-Tasteless	1.09	1.77	.48	.03	.28	.90
Exciting-Boring	1.17	1.57	.76	.34	1.39	1.39
Clear-Confusing	.55	.19	.48	.72	.93	.25
Clean-Dirty	1.56	.28	.83	.25	.55	.22
Quiet-Noisy	.74	.13	.40	.13	1.42	.69
Spacious-Cramped	.75	.02	.52	.37	.02	.77
New-Old	.15	.19	.45	.06	1.25	.89
Wide-Narrow	.72	.16	.10	.44	.44	.33
Pleasant-Gloomy	1.00	2.00	1.22	.16	.35	.90
Orderly-Disorderly	.34	.64	.02	.19	1.74	.61
Convenient-Inconvenient	.02	.17	.17	.31	.32	.17
Alive-Dead	1.19	.34	1.33	.72	2.76	1.91
Comfortable-Uncomfortable	1.32	1.30	.66	1.60	.62	.83
Colorful-Drab	1.28	2.04	1.23	.53	1.50	1.49
Lasting-Changing	.24	.81	.57	.30	1.23	.67
Rich-Poor	1.03	1.12	1.17	.22	.07	.99
Uniform-Diverse	.94	1.24	.15	.25	1.89	1.21
Low-High	.81	.25	.20	.01	.00	.16
Informal-Formal	.29	.58	.80	.08	1.33	.58
Complete-Incomplete	.62	.57	.61	.12	.06	.01
Private-Public	.62	.48	.36	.22	.49	.34
Natural-Unnatural	1.14	1.66	.58	.24	1.57	1.51
Occupied-Deserted	.69	2.08	1.24	.72	3.47	3.61
Friendly-Unfriendly	.98	1.52	.54	.40	1.30	1.49
Dynamic-Static	.26	1.33	.90	.48	2.60	1.14
Beautiful-Ugly	.85	1.22	1.05	.09	.35	.56
Personal-Impersonal	1.21	1.76	.35	.65	1.40	1.69
Uncluttered-Cluttered	.18	.48	.15	.44	2.22	.59
	28.72	24.11	17.97	10.09	31.73	26.14

FIGURE 3-39: DIFFERENCE OF MEANS

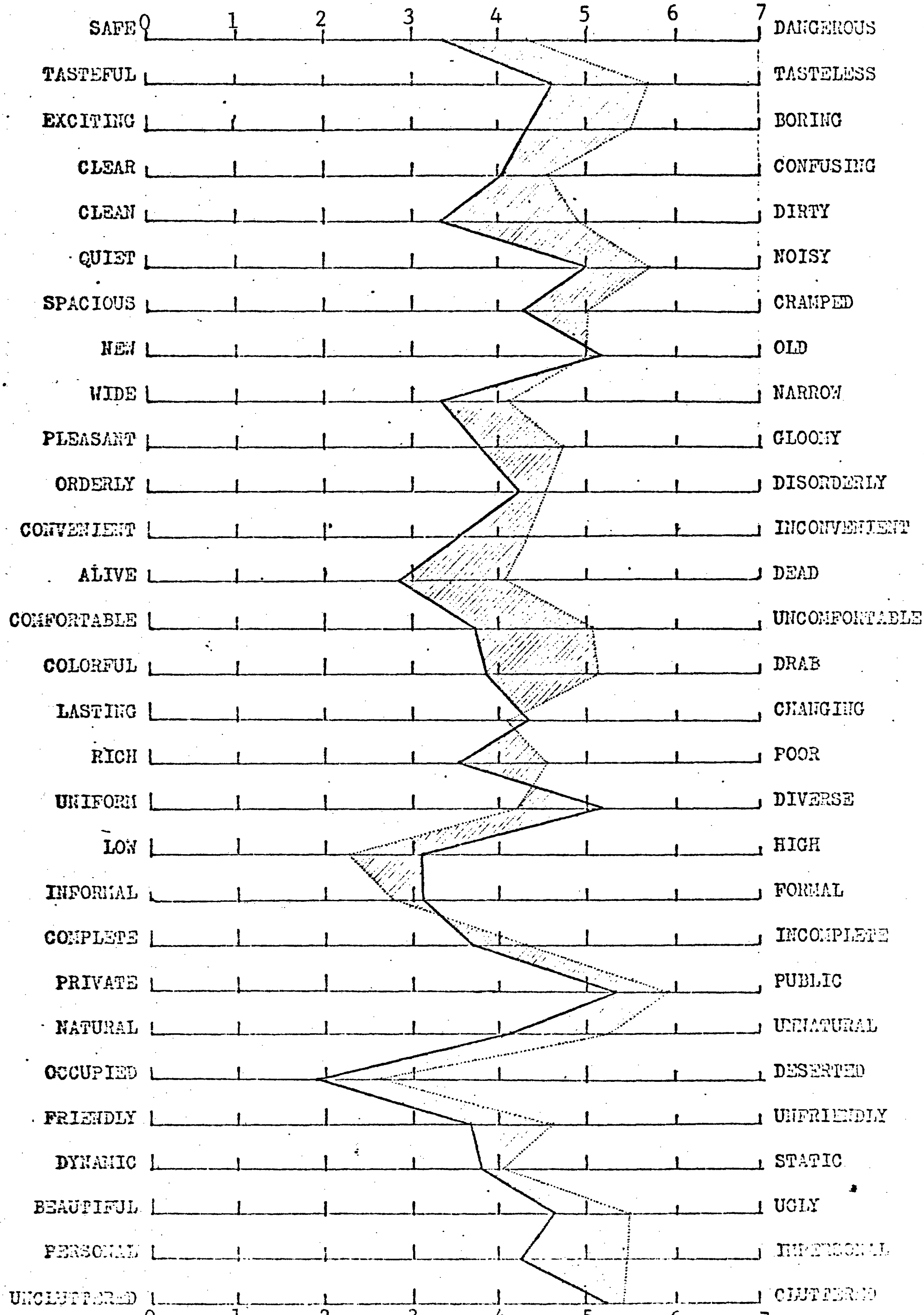


FIGURE 3-40: COMPARISON OF COLOR MOVIE AND CONTROL GROUPS

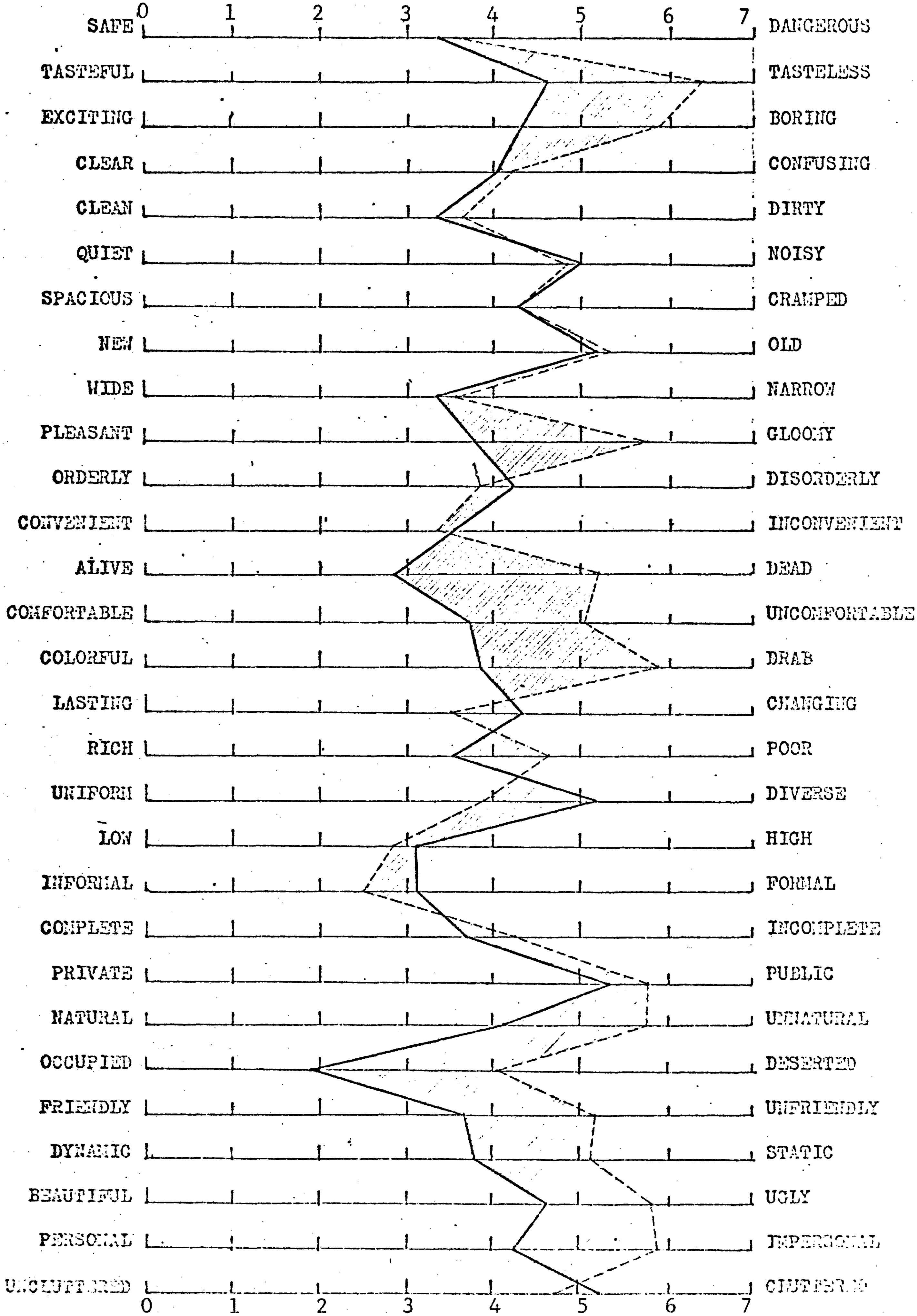


FIGURE 3-41: COMPARISON OF COLOR SLIDES AND CONTROL GROUP

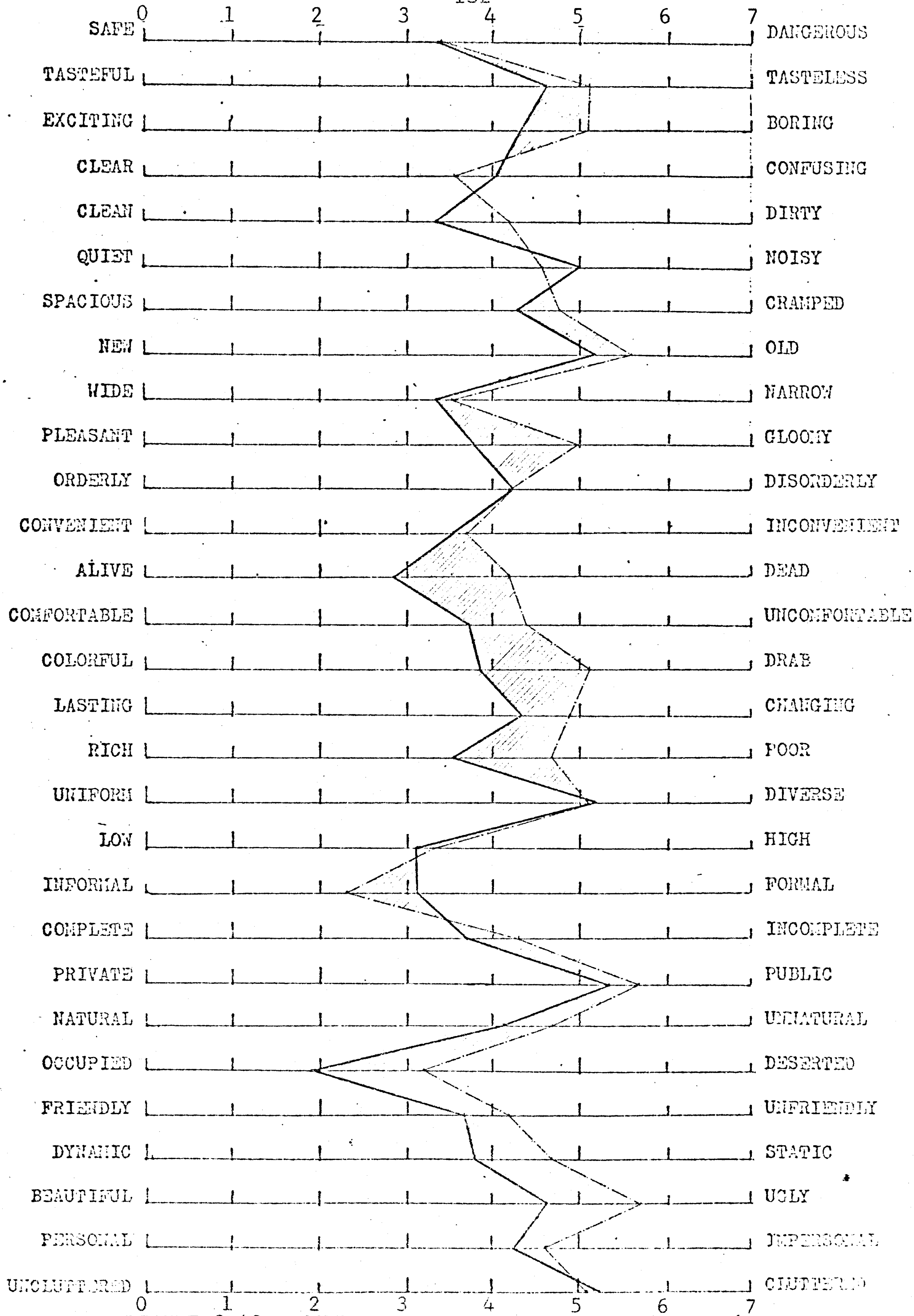


FIGURE 3-42: COMPARISON OF PHOTOS AND CONTROL GROUPS

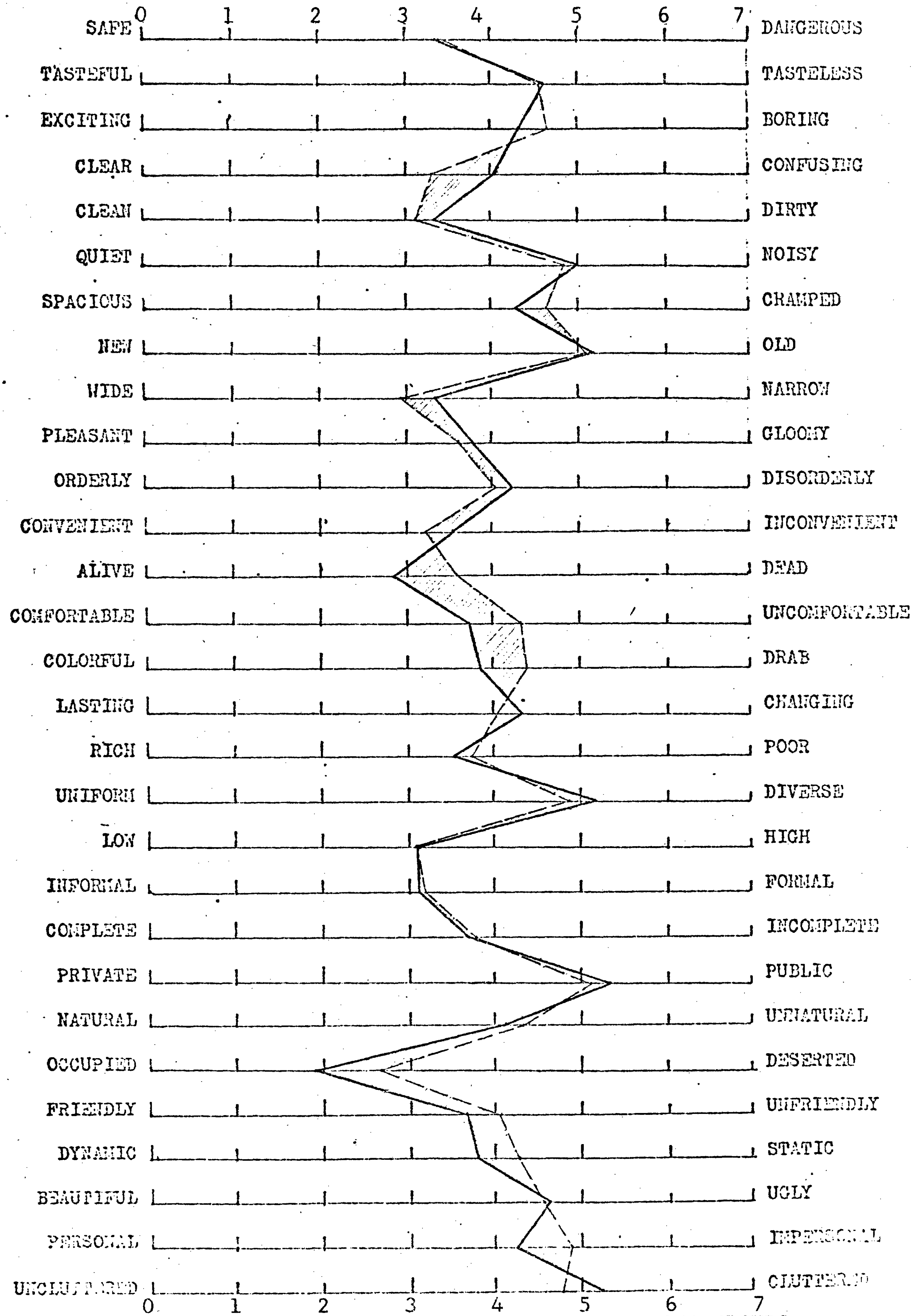
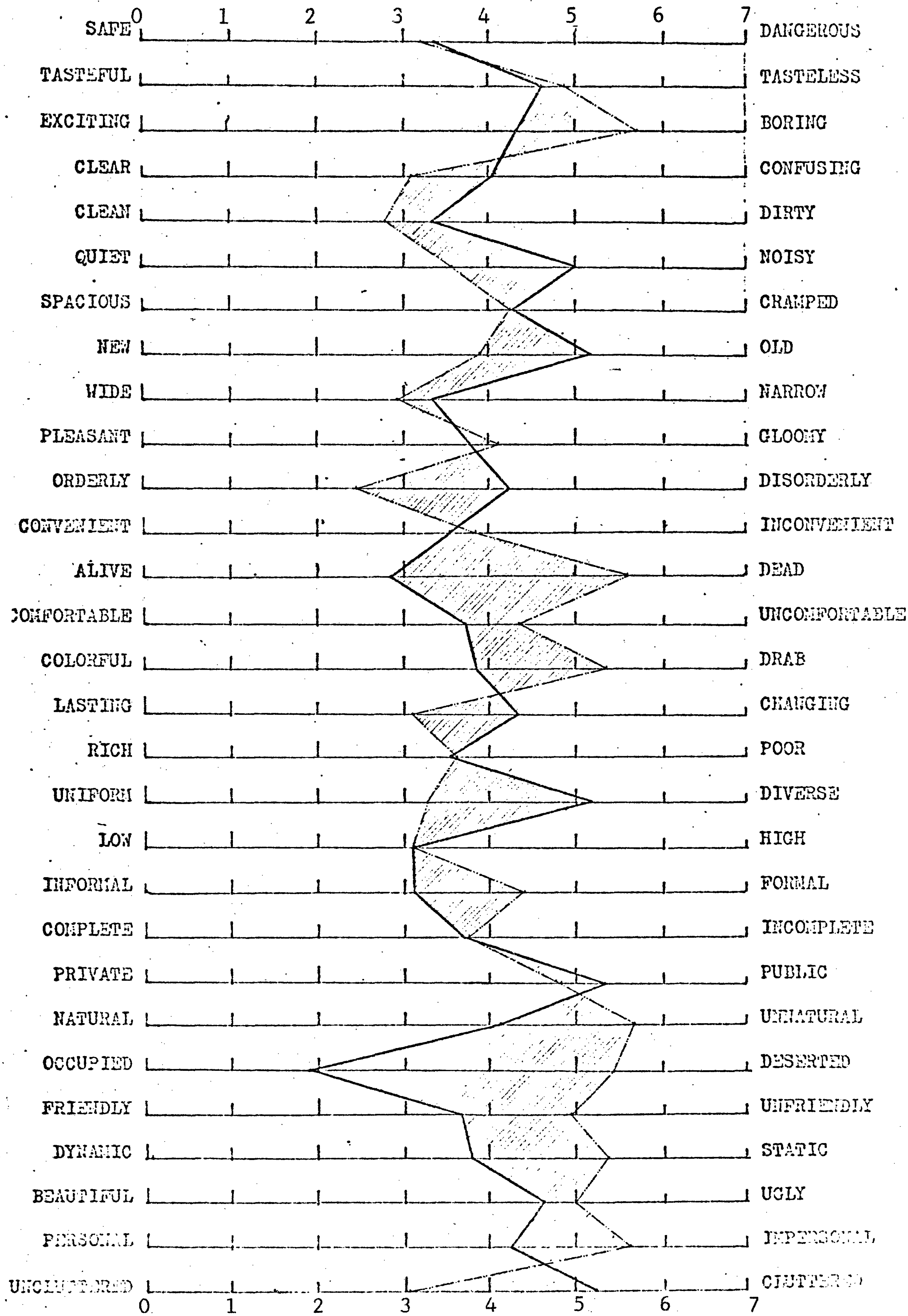


FIGURE 3-43: COMPARISON OF DRAWINGS AND CONTROL GROUPS


0 1 2 3 4 5 6 7
SAFE
DANGEROUS
TASTEFUL
TASTELESS
EXCITING
BORING
CLEAR
CONFUSING
CLEAN
DIRTY
QUIET
NOISY
SPACIOUS
CRAMPED
NEW
OLD
WIDE
NARROW
PLEASANT
GLOOMY
ORDERLY
DISORDERLY
CONVENIENT
INCONVENIENT
ALIVE
DEAD
COMFORTABLE
UNCOMFORTABLE
COLORFUL
DRAB
LASTING
CHANGING
RICH
POOR
UNIFORM
DIVERSE
LOW
HIGH
INFORMAL
FORMAL
COMPLETE
INCOMPLETE
PRIVATE
PUBLIC
NATURAL
UNNATURAL
OCCUPIED
DESERTED
FRIENDLY
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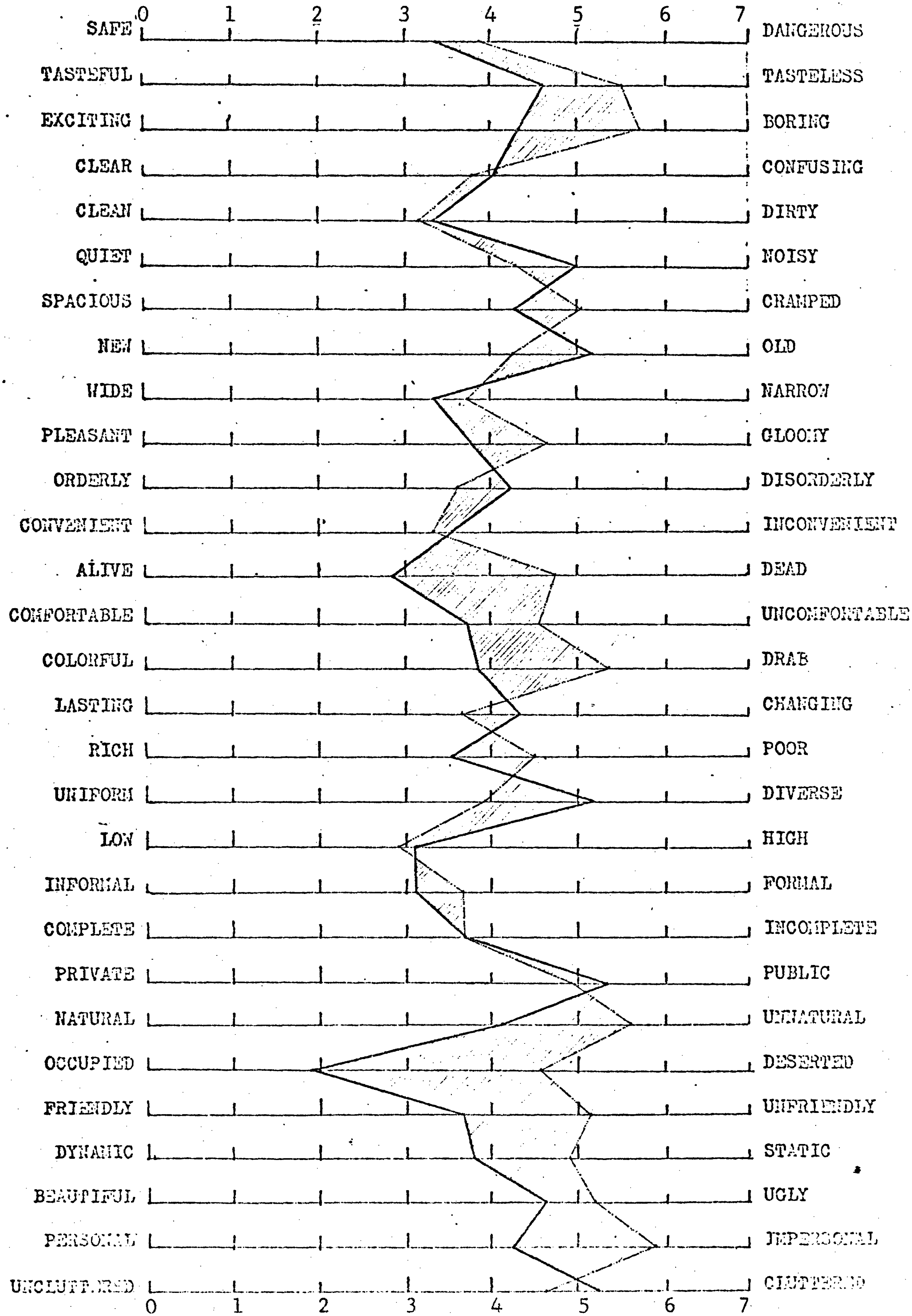
CLUTTERED
0 1 2 3 4 5 6 7


0 1 2 3 4 5 6 7
SAFE DANGEROUS
TASTEFUL TASTELESS
EXCITING BORING
CLEAR CONFUSING
CLEAN DIRTY
QUIET NOISY
SPACIOUS CRAMPED
NEW OLD
WIDE NARROW
PLEASANT GLOOMY
ORDERLY DISORDERLY
CONVENIENT INCONVENIENT
ALIVE DEAD
COMFORTABLE UNCOMFORTABLE
COLORFUL DRAB
LASTING CHANGING
RICH POOR
UNIFORM DIVERSE
LOW HIGH
INFORMAL FORMAL
COMPLETE INCOMPLETE
PRIVATE PUBLIC
NATURAL UNNATURAL
OCCUPIED DESERTED
FRIENDLY UNFRIENDLY
DYNAMIC STATIC
BEAUTIFUL UGLY
PERSONAL IMPERSONAL
UNCLUTTERED CLUTTERED
0 1 2 3 4 5 6 7

This portion of the questionnaire was comprised of twelve sets of four street scenes (See Appendix C). Within each group of four pictures, three were of randomly chosen but similar areas throughout Boston. The fourth picture was of Harvard Street, but taken from a different vantage point than those used in the simulations. Each group of four was selected to be as similar as possible such that there were no blatant cues as to the correct choice. The order of placement both within and between each of the twelve groups of four pictures was randomlized so as to prevent a recognizeable pattern from occurring.

The twelve sets were comprised of six sets of four black and white photographs, three sets of four perspective drawings done in the same style as those used in the experiment, and three sets of model photographs. The dummy or non-Harvard street model photographs were taken of project models at the Boston Redevelopment Authority. Because of the difficulty of finding models with the same characteristics as that used in the experiment, it was necessary to alter all of them to equivalent levels of detail (See Appendix A) in order again that there be no obvious external cues to reveal the correct choice.

The subjects were asked to pick the correct picture in each group of four and were also asked to rate their certainty regarding the accuracy of their choice on a five point scale ranging from "absolutely certain" to "just guessing".

The recognition tests were then scored on the basis of a combination of accuracy and the respondent's certainty regarding his choice. Certainty was scored on a five point scale (1 = just guessing, 5 = absolutely certain)--correct choices were then scored positively and incorrect ones negatively. Thus a person making an incorrect choice with a high level of certainty received a minus 5 score and vice versa. Figure 3-46 indicates the mean scores for the recognition photographs, Figure 3-47 for the drawings, Figure 3-48 for the modelscope photographs, and finally Figure 3-49 is a combined recognition score.

Rank		Mean Score
1	B & W Photographs	17.00
2	Drawings	14.50
3	Model Movie	9.77
4	Color Movie	9.20
5	Color Slides	7.82
6	Control Group (Trip)	7.40
7	Model Slides	4.68

(Max. Possible Score = + 30, Min. Possible Score = - 30)

FIGURE 3-46: RECOGNITION OF PHOTOGRAPHS

A. Recognition Of Photographs. Not too surprisingly, the Photographs group scored highest in this test indicating that the prior experience with photographs of the area proved a decided advantage in recognizing new scenes. However, on this basis one would expect the color slides and color movie to also receive high scores but this is not the case. The drawings receive a surprisingly high score in terms of their ability to facilitate recognition. The ranking's for all except the group who experienced the photographs are also rough indicators of the ease with which one can transfer experience gained from one media to another.

B. Recognition Of Drawings. In Figure 3-47 the media are ranked according to their mean scores on that portion of the recognition test which employed drawings (Questions 13 through 18). This test involved selecting the one drawing in each of three groups of four which represented a scene along Harvard Street. Again as one would expect, the prior experience of seeing drawings of Harvard Street enabled viewers to select the correct scenes more easily. The ranking of the remaining groups corresponds well with the expert judgments

Rank		Mean Score
1	Drawings	6.95
2	Control Group (Trip)	5.04
3	B & W Photographs	4.60
4	Color Movie	4.45
5	Color Slides	2.82
6	Model Movie	1.89
7	Model Slides	.73

(Max. Possible Score = + 15, Min. Possible Score = - 15)

FIGURE 3-47: RECOGNITION OF DRAWINGS

regarding the degree of abstraction of the media. The Modelscope groups did especially poorly on this portion of the test.

C. Recognition Of Model Photographs. Figure 3-48 indicates the ability of the treatment groups to recognize scenes from Harvard Street represented in the form of photographs of a three dimensional model. Again it should be noted that it is possible to view these rankings as crude indicators of ones ability to transfer experience between various media.

Rank		Mean Score
1	Model Slides	8.31
2	Drawings	8.00
3	Control Group (Trip)	7.77
4	B & W Photographs	7.40
5	Model Movie	7.32
6	Color Movie	6.88
7	Color Slides	5.82

FIGURE 3-48: RECOGNITION OF MODELSCOPE PHOTOGRAPHS

As expected the Model Slides group scored highest in this test, but this did not hold true for the Model Movie group. The Drawings group again achieved very high scores. However, it should be noted that the range between highest and lowest scores is not so great as it was in the previous two tests, and that overall the scores are quite low. This would indicate that all the subjects had difficulty in recognizing the appropriate scene.

When summed together the recognition scores provide an overall index as to the ability of a media to facilitate recall (Figure 3-49). No clear pattern is revealed although there is a very large deviation between the high and low scores. The drawings again do unexpectedly well. However, Color Slides and the Control group perform relatively poorly (unexpectedly so).

Rank	Media	Summated Mean Score
1	Drawings	29.45
2	B & W Photos	29.00
3	Color Movie	20.53
4	Control Group (Trip)	20.21
5	Model Movie	18.98
6	Color Slides	16.46
7	Model Slides	13.72

FIGURE 3-49: OVERALL RECOGNITION SCORE

J. Factual Correctness

If our environmental image is to enable us to make and carry out economic and effective plans for using and shaping the city, it must not only be extensive and well organized but accurate as well. Lynch (1960), Carr (1967) and Appleyard (1971) among others have shown that both the extensiveness and accuracy of our mental model of the city is affected by the physical form of the city.

> "The extensiveness and accuracy of this model determine our ability to predict the outcome of alternative courses of action in making our plans. Further, city form, through the model, affects accurate remembering, which is essential to effective planning. For example, the perceptual characteristics of environments may be ambiguous or mixed in incongruous ways so that they can not be easily related to our verbal concepts and to social values. Thus what appears to be a "slum" may turn out to be a haven for struggling writers and painters or a "residential street" may really be lined with institutions and professional offices. Such ambiguity and incongruity, while sometimes desireable for other reasons, inhibits effective remembering. For remembering is a process of reconstruction in which we typically begin by recalling what we believe to be the most characteristic features and concepts and proceed to fill in the picture in whatever way is most consistent with these general features." (Carr, 1967:210)

Responses to the open ended questions 1 through 9 (Appendix A) were analyzed to determine the number of factually incorrect references offered by respondents in their memory reports. In order to qualify as incorrect, there had to be clear evidence that the statement was indeed contrary to fact and not of the opinion of the researcher. In other words, in order to be classified as incorrect the statement must be on the order of "The industrial buildings at the beginning (Coolidge Corner) were very ugly." The classification of Coolidge Corner as an industrial area would clearly rate as incorrect while the interpretation that the buildings were ugly, although not necessarily congruent with the belief of the researcher, would not be classified as being incorrect.

An incorrect belief was counted only once in this analysis. For example, if a subject made more than one statement referring to Coolidge Corner as an industrial area the subsequent ones were ignored.[13] Figure 3-50 reveals a very significant difference between the Control group and the modelscope simulations. The latter groups made between four and five times as many errors as did the Control group. Most of the other media were not significantly different from the Control group with the exception of the Drawings group who made

	Incorrect Statements[1] Questions 1-9	Rank	Question 2 No. Of Errors 0	1	2+	N
Control	12	3	81.8	18.2	0	22
Movie	10	2	81.0	19.0	0	21
Slides	12	3	87.0	13.0	0	23
Photos	10	2	60.0	30.0	10	10
Drawings	5	1	85.0	15.0	0	20
Mod. Mov.	54	4	30.0	30.0	40.0	20
Mod. Sli.	63	5	63.2	26.3	10.5	19

FIGURE 3-50: FACTUALLY INCORRECT STATEMENTS

only half as many errors.

The most frequent error made by the Modelscope groups was that of inferring that a large portion of the street, usually Coolidge Corner, was an industrial-warehousing area. This single error accounted for 60 and 50 percent respectively of the total errors made by the two groups. Other mistakes common to both groups were: 1) Mistaking the Purity Supreme parking lot and surrounding single family housing development with its trees for a park (approximately 10 percent), 2) Inferring that the area was made up of new modern buildings (approximately 10 percent), 3) Inferring from the Macy's Liquor store sign a Macy's Department Store, 4) Errors stemming from difficulty understanding the direction taken in the trip along the street, errors such as right angle turns, or Y shaped intersections were common. Frequent sources of error for the other simulations were:

1) The Temple Kehillath Israel was identified variously as a library, courthouse, hospital, post office and city hall by subjects who viewed the other simulations. Usually only one or two from each group made this error.

2) The Chevron office building, a contemporary white stucco structure near the end of the trip was identified to be, a motel, a modern apartment complex, and a chevrolet car dealer.

3) The large white house occupied by a funeral home was often mistaken for a large single family house or mansion.

4) The other funeral home chapels were occasionally identified as churches.

Most other errors stemmed from the importation of some nonexistent characteristic, such as "a second supermarket" or the omission or forgetting of one which did exist such as "there were no open spaces" or "no trees along the street."

Question 24 asked the subjects to locate any subdivisions or districts they had noticed along the streets' length on their map. The response to this question was analyzed for relative correctives in locating those subareas. Responses were coded as being essentially correct, only partially correct or almost totally incorrect. The data, summarized in Figure 3-51, reveal two significant differences between the media and the control groups. First, of the modelscope viewers almost half made serious errors in their location of the subareas or districts which they conceptualized as making up the total street.[14] Further, of those subjects who experienced the modelscope simulations approximately thirty percent answered that they saw no sub-parts or divisions along the street. In the case of the Control group and the other simulations the reverse is true, at least half of the subjects were able to

	Correct	Partially Correct	Incorrect	N
Control	52.5%	42.09%	5.5%	19
Movies	82.5	11.5	6.0	17
Slides	50.0	31.0	19.0	16
Photos	50.0	30.0	20.0	10
Drawings	68.0	16.0	16.0	19
Model Movie	12.0	44.0	44.0	16
Model Slides	31.0	23.0	46.0	13

Significance .05

FIGURE 3-51: ACCURACY OF SUBAREA LOCATIONS

accurately locate the units of their overall conception of the streets structure, and very few made serious errors. Two of the simulations, the Color Movie and the Drawings, scored significantly higher in this respect than did the Control group.

Question 3 of the interview schedule asked the subjects to draw a quick, rough map of the street and surrounding areas showing its main features (See Appendix A). These maps were analyzed as follows for the relative correctness of the information contained. First the map drawn by each subject was removed from the interview schedule and identified by subject number and treatment group on the back so that it was not possible to identify the treatment group during analysis. Then the maps from all groups were shuffled to obtain a random ordering. Next the maps were rated subjectively on a scale of one to ten for their relative accuracy. This rating was accomplished by carefully examining each map and then placing it in one of ten equal sized groups according to a first evaluation of its relative accuracy. Then each of the ten groups was rank ordered internally and those maps near the upper and lower ends of this second rating were compared with their opposites in the adjacent stack. This allowed any mistakes in the first rating to be picked up and adjusted. The ten separate categories were collapsed into three for the purposes of analysis and the data are displayed in Figure 3-52.

Again the data reveal two significant differentials in the accuracy of the conceptions formed by subjects as a result of their different modes of experiencing Harvard Street. The Modelscope simulations score very low with around 50 percent of the subject maps receiving the least accurate rating, and only five percent the highest rating.

The Photographs and Drawing subjects on the other hand score significantly higher than the Control group on this dimension with 50 percent of their maps receiving the highest rating as opposed on only 22 percent for the Control group.

	Highest (1-3)	(4-7)	Lowest (8-10)	N
Control	22.7	50.0	27.3	22
Movie	28.6	33.3	38.1	21
Slides	17.4	34.8	47.8	23
Photos	50.0	30.0	20.0	10
Drawings	50.0	25.0	25.0	20
Mod. Mov.	5.0	45.0	50.0	20
Mod. Sli.	5.3	42.1	52.6	19
	Significance		.05	

FIGURE 3-52: MAPS SCORED FOR ACCURACY OF INFORMATION

The effect of the mode of experience upon a persons ability to correctly perceive and remember aspects of the physical form of an area were examined in detail in the section on physical characteristics. A continuous rather than a segmental presentation was found to facilitate the ability of a person to formulate an accurate orienting schemata. Estimates of distance and directional change were found to be more accurate for those persons who experienced a continuous presentation of the trip down Harvard Street.

In Section I.B the effectiveness of the selected modes in communicating an understanding of the social occupancy of Harvard Street was examined. Perhaps as a result the unrepresentative time selected for the experiment, which resulted in few people on the street the most significant variations from reality were obtained by the Photographic simulations. Approximately seventy percent of their references to class evidenced a belief that the area was largely populated by lower-middle and lower class residents. As was noted in Chapter I the median income for the area was $8,627 according to the 1960 census which indicates it to be solidly middle class with some rather high incomes to offset the retired elderly with their somewhat lower incomes.[15]

Aside from a noticeable decline in all references to age on the part of the modelscope simulations, all the groups were rather accurate in their conception of the area as being largely occupied by a high percentage of older residents and by the 10-29 age group, with few children and middle aged residents.

An accurate understanding of the ethnic character of the area proved somewhat more susceptible to changes in the mode of experience. For example, Figure 3-14 reveals an error of omission on the part of the Modelscope simulations in that none of the subjects from these two treatment groups noted the presence of Jewish residents. Somewhat surprisingly a significant number of those subjects viewing the color slides indicated a belief that the area was largely populated by Black residents, while the area in fact has very few non-white residents at all.

Figure 3-16 reveals a decided deficiency on the part of the Modelscope simulations to communicate an accurate conception of "what is going on" in an area. Fewer than four percent of the references made by the Control group regarding the activity structure of Harvard Street were incorrect versus slightly over 60 percent of those made by the Modelscope group.

Further, incorrect inferences regarding use constitute the largest single source of error for Modelscope viewers and make up approximately 40 percent of their total incorrect judgments regarding the street.

When we examine accuracy rather than quantity and type of information, important differences in response fidelity emerge. The more abstract of the media, the Modelscope simulations, both show very large deviations from the Control group in terms of the number of factually incorrect items noted in their memory lists.

K. Overall Knowledge Measures

A summary of the various individual cognitive measures is useful in providing us with an overview of the performance of the various media, both in an absolute sense and relative to the Control group. The first measure used to determine the relative amounts of information about the environment which the subjects obtained by means of the different modes of experiencing the environment is a relatively crude one, simply the number of words the observer used in his answers to the second question.[16]

> Question 2. Please describe what you remember of the street and surrounding areas that (were shown in the pictures) you just saw. Tell us that which first comes to your mind, those things which stand out most clearly. We don't expect you to remember every detail, but try and write down as much as you can remember in the space below.

When we examine the data for differences in information quantity, in terms of the number of words used by the respondent in his answer, we find that there is no statistically significant difference between the treatments.

	Words			N	Mean Score
	0-40	41-140	140+		(1 = 20 words)
Model Slides	26.3	31.6	42.1	19	4.21
Color Slides	73.0	60.9	26.1	23	4.13
Control Group	36.4	22.7	40.9	22	4.04
Color Movie	23.8	47.6	28.6	21	3.97
Model Movie	30.0	35.0	35.0	20	3.87
Drawings	10.0	60.0	30.0	20	3.75
Photographs	20.0	50.0	30.0	10	3.65

NSS

FIGURE 3-53: WORDS AS A MEASURE OF INFORMATION

Secondly, the responses to Questions 1 through 9 were coded for the number of elements mentioned. In this case the number of elements is probably a more reliable indicator of the quantity of information contained in the responses than is a simple word count. In analyzing ordinary text one would expect close agreement between the two measures. However, in this instance a number of subjects provided concise lists of the things which they remembered rather than descriptive prose which tends to be highly redundant.

Figure 3-54 presents a summary of the relative information conveyed about the Harvard Street environment along each of the major dimensions discussed earlier in this section. A summation of all these dimensions provides us with one crude measure of the total information about the street which

	Physical	Social	Functional	Economic	Maintenance	Age	Total	Rank
Control	18	16	880	6	56	31	1,007	1
Photos	17	1	721	4	25	27	795	3
Slides	19	1	800	9	29	26	884	2
Drawings	18	0	443	16	38	42	557	4
Movie	21	2	393	2	14	24	456	5
Model Slides	19	0	225	0	4	11	289	6
Model Movie	20	0	205	2	11	28	266	7

FIGURE 3-54: TOTAL ELEMENTS MENTIONED[1]

subjects were able to obtain by means of their different modes of experiencing that environment.

The summated scores reveal three groupings of experiential modes with rather large between group differences but with small internal differences. The first group is composed of the Control, Photographs and Color Slides subjects. As expected, the direct experience provided subjects with the most information regarding the street. The photographs and color slides also provided relatively large amounts of information. A second grouping composed of subjects who experienced the color movie and the perspective drawings made only a little over half as many references regarding these particular aspects of the street in their various memory reports. This constitutes an unexpectedly poor performance for the subjects experiencing the color movie. The third grouping composed of the two model-scope simulations obtained slightly more than one-fourth as much information regarding these aspects of the street as did the Control group.

Question 3 of the interview schedule asked the subjects to "draw a quick, rough map of the street and surrounding areas, showing its main features" (Appendix A). These maps were analyzed as follows for the relative amounts of knowledge which each treatment had obtained by means of its particular mode of experiencing the environment. First the maps drawn by the subjects were removed from the interview schedule and identified by subject number and treatment group on the back side so that it was not possible to identify the treatment group from which they originated. Then the maps were shuffled to obtain a random ordering. Next the maps were rated subjectively on a scale from one to ten for the relative amounts of information contained in each. This rating was accomplished by examining each map and then placing it in one of ten equal sized groups according to a first evaluation of the relative knowledge of the street it revealed. Then each of the ten groups was rank ordered internally and those maps near the upper and lower ends of this second rating were compared with their opposites in the adjacent stack. This allowed any mistakes in the first rating to be picked up and adjusted.[17] The ratings, presented in Figure 3-55, were further summarized by grouping ratings 1-3, 4-7, and 8-10. Three patterns are observable in this data. First, the Drawings and Photo groups exhibit a much higher proportion of their subject maps receiving the highest ratings. Secondly, the Control and Color

Overall Rank		Highest (1-3)	(4-7)	Lowest (8-10)	N	Mean Score
1	Drawings	50.0	20.0	30.0	20	4.70
2	Photos	40.0	30.0	30.0	10	4.90
3	Control	22.7	54.5	22.7	22	5.43
4	Color Movie	33.3	33.3	33.3	21	5.76
5	Color Slides	17.4	34.8	47.8	23	6.57
6	Model Movie	5.0	45.0	50.0	20	7.20
7	Model Slides	5.3	42.1	52.6	19	7.36

Significance .05

FIGURE 3-55: SUBJECT MAPS RANKED FOR INFORMATION CONTENT

Movies respondents were about evenly split between the highest and lowest categories. Thirdly, the Color Slide and the two Modelscope simulations resulted a higher proportion of their subjects receiving the lowest ratings. This pattern is essentially borne out by the mean scores of each treatment group also displayed in Figure 3-55. Finally, responses to Questions 1 through 9 were analyzed along the lines established by Lynch (1960) in order to arrive at a composite or group image for each of the treatment groups. Questions 1, 2, and 4 through 9 asked for verbal reports regarding various aspects of the area experienced. The specific questions can be seen in Appendix A. Lynch (1960) found that although there is considerable congruence between the information obtained in verbal and graphic responses that there were also some important differences. Rozelle and Baxter (1972) also reported differences in terms of the particular aspects of the overall image which were elicited by means of different types of questions and different response formats.

The subjects sketch maps were analyzed by means of simple frequency counts of the elements contained in each. The elements closely correspond to the basic categories described by Lynch. The data were then summarized into composite maps reflecting that portion of the total "group or public image" of Harvard Street for each treatment group which was elicited by the map request.

Two maps were compiled for each of the two response formats. First, a map which displays the "districts" or sub-areas which the subjects used to structure their image of Harvard Street. Secondly, a map which summarizes the other elements included in their image. Similarly, the verbal response to Questions 1, 2, and 4 through 9 were analyzed and graphically displayed in the form of composite maps.

The composite maps which can be seen in Appendix D were then rank ordered on the basis of the extent of knowledge of Harvard Street displayed in each. Figure 3-56 summarizes the rankings of the four composite maps for each group. While it can be seen that there are variations within the individual rankings, the overall ranking based on the combined scores of each of the four maps corresponds very closely to the ratings of the individual maps. In conclusion, the data have shown

	Verbal Resp.	Graphic Resp.	Sum	Ranks	Sum	Verbal Resp.	Graphic Resp.	Total Sum	Over-All Rank
Control	3	1	4	2 1	4	3	1	8	1
Movie	4	5	9	4 3	7	5	2	16	3
Slides	5	4	9	4 4	9	4	5	18	4
Photos	1	2	3	1 2	5	2	3	8	1
Drawings	2	3	5	3 2	5	1	4	10	2
Model Mov.	6	6	12	5 5	13	7	6	25	5
Model Sli.	7	7	14	6 5	13	6	7	27	6
	DISTRICTS					ELEMENTS			

FIGURE 3-56: GROUP IMAGE MAPS RATED FOR RELATIVE INFORMATION CONTENT

that there are significant differences in the quantity, type and quality of information about the Harvard Street environment as a result of the different modes of experiencing that environment. The differences were not, however, all in the direction of less information being conveyed by the indirect modes.

II. Affective Responses

Osgood (1967) has shown that much of the variance in our conceptions of objects, people, and events is accounted for by a simple evaluative factor. Whatever is being considered, a large part of an individual's conception of it or reaction to it consists of liking or disliking. Converse (1964) in his work on attitude theory has shown that cognitive content does not determine affective feelings to any large extent. Finally, Anderson (1964) has shown that an attitude can persist even after the content that produced it is forgotten, emphasizing that the affective component is more durable and central than the cognitive component. Thus, although the total structure of an attitude is complex, one important part of it consisting of feelings is often very simple.

The contrast between the cognitive complexity of an attitude and the apparent evaluative simplicity is extremely important. For example, a person might know a great deal about an area, have all sorts of complicated pieces of information about what goes on there, understand a variety of interrelationships between the area and other aspects of the world. And each of these pieces of information to some extent influences his general feelings toward that area and has a sustained effect on his behavior. Knowing what the area looks like, what kinds of things one can and can't do in it, where in it one can or cannot carry out certain plans, the differences between the various subareas, and so on affects the attitude of the individual. Changing any one of these bits of information might change his behavior. Nevertheless, the relatively simple evaluative component of the attitude is the major determinant of behavior. Although the details of the users' behavior with respect to the area is influenced by the knowledge he has, the general direction of his behavior is influenced primarily by his overall evaluation--whether he considers Harvard Street as positive or negative.

Finally, it is possible for different individuals to share the same knowledge with different affective responses. For example, a pedestrian shopper and a shop keeper may share the same conception that the sidewalks are crowded with pedestrians, but this common perception may be associated with opposite or different affect in the two individuals.

In this section we will be analyzing the subjects responses for expressions of some degree of pro--anti orientation to Harvard Street as a whole and to its various subelements or parts.

First, the response to Question 1 (Appendix A) was analyzed for specific like or dislike statements. The data, displayed in Figure 3-57, reveal no significant differences between the various treatment groups. Next, the response to Question 1 was judgmentally rated for its overall affective tone on a five point scale ranging from very positive, mildly positive, neutral, mildly negative, very negative. The data, summarized in Figure 3-58, reveal significant differences in the affective response to the street between some of the simulations and the Control group.

Of the Control group subjects who experienced the environment directly, a majority evidenced a positive overall evaluation of Harvard Street. Of the experimental groups, only one, those subjects who viewed the drawings, had their responses to Question 1 rated so positively. In this instance slightly less than half responded positively, while over a third had a neutral response. The photographic modes all resulted in an extremely negative reaction to the street, with

	Low (1-2)	High (3+)	Mean	Rank
Control	95.5	4.5	1.45	7
Movie	71.5	28.5	2.65	5
Slides	60.8	39.2	2.91	2
Photos	40.0	60.0	3.10	1
Drawings	73.7	26.3	2.85	4
Model Movie	52.7	47.3	2.87	6

NSS

FIGURE 3-57: DEFINITE LIKE-DISLIKE STATEMENTS IN RESPONSE TO QUESTION 1

	Positive (1-2)	Neutral 3	Negative (4-5)	Mean	Rank	N
Control	57.1	9.5	33.3	3.04	2	22
Movie	20.0	15.0	65.0	4.25	6	21
Slides	4.3	13.0	82.6	4.30	7	23
Photos	10.0	20.0	70.0	3.80	5	10
Drawings	47.4	36.8	15.8	2.65	1	20
Model Movie	21.0	31.6	47.4	3.44	3	20
Model Slides	17.6	41.2	41.1	3.57	4	19

Significance .001

FIGURE 3-58: AFFECTIVE TONE OF RESPONSE TO QUESTION 1 over two-thirds of the subjects responding negatively. The Modelscope groups also responded negatively but more moderately so.

Next, responses to Questions 1 through 9 were analyzed for all evaluative statements regarding Harvard Street. These statements were categorized as either positive or negative. Neutral statements were not counted. Figure 3-59 again reveals an almost identical pattern, wherein the majority of the evaluative statements made by the Control group are positive, and similarly so for the Drawings subjects at 49 percent

	Positive	Negative	N[1]	Rank	Mean
Control	55	45	240	1	12.0
Movie	21	79	169	7	8.4
Slides	23	77	220	6	11.0
Photos	30	70	186	5	9.0
Drawings	49	51	196	2	9.8
Model Mov.	39	61	194	3	9.7
Model Sli.	32	68	213	4	10.6

FIGURE 3-59: EVALUATIVE STATEMENTS FROM QUESTIONS 1 THROUGH 9

positive. Again the photographic media are extremely negative with the Modelscope group slightly less so. The Control group also tended to make more evaluative statements than did the experimental groups. However, the difference is not dramatic.

Finally in this same vein, the evaluative dimensions of the semantic differential were examined. Again the data reveal a marked tendency for the simulations to color the subjects affective reaction to the street negatively.

In Figure 3-60 the mean rating of each treatment group for each of those polar adjective scales noted by Osgood (1967) as being evaluative in meaning is summed. The data again confirm the earlier finding that the simulations result in a significantly more negative affective response to the street.

	Sum	Mean	Rank
Control	81.79	3.89	1
Movie	100.41	4.79	6
Slides	101.47	4.84	7
Photos	87.85	4.18	3
Drawings	84.64	4.03	2
Model Movie	90.23	4.30	4
Model Slides	95.46	4.54	5

FIGURE 3-60: EVALUATIVE DIMENSIONS OF THE SEMANTIC DIFFERENTIAL

In this instance all the groups evidenced a somewhat negative overall view of the environment as all were on the negative side of the 3.5 neutral point. However, the pattern is identical with that of the previous table with the Control group showing the least negative evaluation, followed by the Drawings group. The photographic simulations continue to produce the most negative response except that the group viewing the Black and White Photographs did not rate the street quite so severely as they described it. This variation is possibly attributable to the smaller treatment group size.

The previous analysis was directed at the overall affective reaction to the street. Next we will look at their evaluation of some specific features. Questions 20 and 21 (Appendix A) asked the subjects to identify those things they liked about the street and those things which they disliked.

An examination of the responses revealed that most of their evaluations were concerned with nine basic aspects of the street. The categories are as follows. First, the degree to which they felt it exhibited a planned uncluttered, unchaotic appearance; secondly, they cited cleanliness, upkeep, maintenance reasons; thirdly, the degree to which they felt the street exhibited character, interest and diversity; fourth, centered around the degree of density, and openness; fifth, landscaping, greenery reasons were cited; sixth were references to traffic, parking, and conjestion; seventh, the relative convenience exhibited by the area; eighth, use oriented references; ninth, were people oriented responses.

The data, summarized in Figure 3-61, reveal that there are differences between the Control group and the simulations regarding those features of the street which they liked. The presence of trees and greenery was the most cited feature by all groups, except for movies whose most frequent response was that they liked nothing about the street. The two Modelscope simulations also responded that they "didn't like anything about the street" with relatively high frequency. The Modelscope groups made almost no references to uses, people, or convenience as aspects of the street which they liked in contrast to small but substantial mention of these items by the other treatment groups. The relatively low density, a

	Order	Upkeep	Character	Density	Landscaping	Traffic	Convenience	Use Oriented Reasons	People Oriented Reasons	Other	Nothing	N[1]
Control	2	16	12	20	24	2	2	8	4	6	4	45
Movie	3	3	15	9	20	9	0	9	3	3	26	32
Slides	4	19	13	9	24	7	2	4	0	2	6	40
Photos	0	10	16	10	16	16	5	10	5	5	5	38
Drawings	7	9	16	23	28	12	7	12	2	0	2	48
Model Movie	4	16	11	23	25	14	2	0	0	0	4	44
Model Slides	15	15	3	23	29	9	0	0	0	0	18	38
	33	88	86	117	166	69	18	43	14	34	65	

FIGURE 3-61: FEATURES OF HARVARD STREET LIKED BY SUBJECTS

frequently cited factor by the Control group, was noted with less frequency by the photographic simulations and with greater frequency by the predictive simulations. The simulations all resulted in more frequent mentions of "little traffic congestion, noise, etc.," as desireable features of the street than did the Control group. There was a marked tendency for the Modelscope simulations to mention order more frequently and character-diversity less frequently than did the other treatment groups.

Similarly when we look at those aspects of the street which the subjects disliked, we see a complex pattern of differences between direct and indirect experience, as well as between the simulations themselves (Figure 3-62). For example, the Modelscope groups noted poor upkeep less frequently than did the

	Order	Upkeep	Interest	Density	Landscaping	Traffic	Conveniences	Use	People	Other	Everything	N[1]
Control	16	16	10	16	2	21	0	10	4	4	4	46
Movie	13	20	8	10	5	28	0	3	0	3	10	37
Slides	22	4	13	13	7	26	0	2	0	0	13	40
Photos	10	24	24	10	0	10	0	14	0	0	0	42
Drawings	19	2	8	22	16	19	0	2	0	5	5	37
Model Movie	11	0	26	26	11	5	0	2	5	5	8	38
Model Slides	16	5	13	22	11	11	0	2	8	2	8	39
	107	71	102	119	62	120	0	35	17	19	48	

FIGURE 3-62: FEATURES OF HARVARD STREET WHICH SUBJECTS DISLIKED

other groups, most probably because the model contained no information on this dimension. Monotony was cited most frequently by the modelscope movie and photographs. The Modelscope groups cited the presence of heavy traffic less frequently and the lack of people more frequently than did the other groups. The Color Slides and Movie groups again observed that they disliked everything about the street more frequently than the other groups.

While no clear patterns were revealed in terms of the differences regarding features of the street liked and disliked resulting from the different modes of experiencing the street, there are noticeable differences in the areas selected on the basis of positive and negative affective reactions (Figures 3-63 and 3-64). First there is more variation in the selection of areas for the most abstract of the media, most likely a result

	1	2	3	4	5	6	7	Didn't like any area	N
Control	32%	41	0	5	0	10	15	0	22
Movie	24	52	14	0	0	0	10	0	21
Slides	4	52	4	4	0	0	30	0	23
Photos	10	40	10	0	0	0	10	10	10
Drawings	5	70	0	0	0	0	5	20	20
Model Mov.	5	20	5	15	10	0	15	40	20
Model Sli	5	26	21	0	16	0	0	32	19

Significance .05

FIGURE 3-63: SUBAREA MOST LIKED[18]

of the presence of fewer and more ambiguous cues in these media. Also because a number of subjects viewing these media formed a conception of the street as an industrial area, a large number of them noted that they didn't particularly like any area or weren't able to choose one area over another. Secondly, only the most realistic of the simulations and the Control group chose the Coolidge Corner area with any frequency as the area they most liked.

When we shift to an examination of the areas chosen as least liked again we find differences between the Control and Simulation groups but with no clear pattern. The Control group also chose the apartment house area as the area they disliked most often of all the subareas. This area evidently provokes strong reactions; however, it was not mentioned at all

	1	2	3	4	5	6	7	NA	N
Control	27	36	9	0	9	0	18	0	22
Movie	38	14	19	0	5	5	9	5	21
Slides	43	26	4	0	4	4	17	0	23
Photos	10	30	10	0	40	0	0	10	10
Drawings	40	15	5	10	15	0	5	10	20
Model Movie	40	0	5	0	0	5	20	30	20
Model Slide	58	0	5	0	5	0	16	16	19

FIGURE 3-64: SUBAREA MOST DISLIKED

by the modelscope simulations as being disliked. Most of the simulations selected Coolidge Corner most frequently as the area they disliked, with the modelscope groups noting this almost twice as often as the Control group. Again more people were likely to observe that they disliked everything or were unable to decide which they disliked most if they experienced the street by means of one of the more abstract simulations.

In conclusion, the data have revealed a definite tendency on the part of all the simulations to color negatively the overall affective response of subjects to the street. In some cases rather dramatically so. We have also shown that this tendency to produce differential and more negative affective reactions results in variations regarding subjects reactions to elements and sub-sections of the street although no clear pattern was revealed in this tendency.

III. Behavioral Response

The data of most interest to a designer is the subjects sense of what types of behaviors he would be willing or likely to carry out in a particular setting. Conventional planning wisdom tells us that this data is most unreliable. However, some recent evidence (Dolven, 1966) indicates that specific references to intended behaviors are not so unreliable as are the more unspecific requests for preferences.

People operate (make plans and execute them) in accordance with their mental representations of the "real world." Carr (1967) has described something of the process through which an individual puts the knowledge he has acquired and retained about the environment to use in planning his actions. In all but the most habitual of actions planning requires transformation of the information in the image in order "to generate a new course of action which is different from that in which the information was gained. We may know what the river is like, but we cannot step twice into the same river in the same way." (Carr, 1967:210) The process also involves integrating information gained directly from past experience, with that from indirect sources as well as feedback from our actions currently under way. It also involves the integration of these new plans, with other plans already underway, with long term life plans and with those of other people (Miller, 1960).

Lynch (1960), Carr (1967) and Appleyard (1971) have shown that the extensiveness and accuracy of ones mental representation of the city, - his "City of the Mind," is affected by the form of the environment. We have shown earlier that that image is also affected by the manner in which that environment is experienced.[19] The extensiveness and accuracy of this model determine ones ability to predict the outcome, both desirability and feasibility, of alternative courses of action. We have also shown that both the form and the mode of experience affect ones ability to remember accurately, which in turn affects our ability to make effective plans. Especially significant in their effect on accurate remembering are ambiguity and incongruity of perceptual attributes. Ambiguous or incongruous cues are difficult to relate to our symbolic concept structure and to our values and consequently often are either ignored or normalized into incorrect categories. Because remembering is a process of reconstructing experience, which was greatly simplified for storage by a process of recalling what we believe to be the most characteristic features and concepts and then proceeding to fill in the overall picture in whatever way is most consistent with those general features, errors in our initial conceptualizations can result in the recreation of a very different world from our memory upon which we base our plans (Carr, 1967).

Finally, as certain plans require less specific environmental contexts, certain environments also can accommodate more types of plans; or they are, in other words, less specifically adapted to one particular type of plan. Thus areas of mixed use and character, if not so complex as to frustrate accurate remembering, can make it easier to plan.

In the following section we will be examining the statements of subjects regarding their willingness to engage in a number of behaviors with respect to or in the context of the Harvard Street setting. Three general types of data are examined. First, the statements regarding actions which they would or would not be willing to carry out in the Harvard Street context which were volunteered in the free response Questions 1 through 9. Secondly, the subjects were asked to state their willingness to engage in five specific types of activities along with the reasons for their position. Lastly, an overall behavioral score is determined by combining their scores on the second group of behavioral requests.

Question 10 (Appendix A) asked the subjects how they would feel about taking a walk through the area they had just experienced. The data displayed in Figure 3-65 reveal extreme differences between the Control group and most of the simulations with the exception of the perspective drawings. Over seventy percent of the Control group responded positively to the idea of going for a walk with almost the reverse being true for all except the Drawings group. The Modelscope simulations resulted in the most negative attitudes toward this behavior.

	Positive	Neutral	Negative	N
Control	72.8	9.1	18.2	22
Movie	28.6	0	71.5	21
Slides	26.0	13.0	60.8	23
Photos	30.0	0	70.0	10
Drawings	63.2	5.3	31.6	20
Model Movie	16.7	11.1	72.7	20
Model Slides	17.7	5.9	76.4	19
	Significance		.05	

FIGURE 3-65: ATTITUDE TOWARD GOING FOR A WALK IN THE AREA

Next the subjects were asked for their feelings regarding going shopping there. Again we find a reversal of attitudes between most of the media and the Control group, with the majority of Control group subjects positive, while the majority of most simulation subjects were negative (Figure 3-66). While the differential is not so severe as in the previous instance, the data do reveal a clear tendency for simulations to result in negative evaluations when subjects attempt to predict the outcome of a particular course of action, in this instance, shopping. The one rather dramatic exception to this pattern is the perspective drawings which in this instance resulted in a more positive attitude toward shopping on Harvard Street than did the Control group. The Modelscope simulations continued to produce the most negative evaluations.

	Positive	Neutral	Negative	N
Control	54.6	13.6	31.8	22
Movie	47.6	0	52.4	21
Slides	34.7	4.3	60.8	23
Photos	20.0	20.0	60.0	10
Drawings	73.7	10.5	15.8	20
Model Movie	11.1	33.3	55.6	20
Model Slides	29.4	17.6	52.7	19

Significance .05

FIGURE 3-66: ATTITUDE TOWARD GOING SHOPPING IN THE AREA

Next the subjects were queried regarding their attitude toward living there (Appendix A). For this, perhaps the most serious of choices regarding the appropriateness of Harvard Street as a setting, most of the subjects from all the groups reacted negatively (Figure 3-67). The subjects viewing the photographic simulations were almost unanimous in their negative evaluations. The Drawings and Control groups were fairly close with around 30 percent of the subjects reacting positively to Harvard Street as a living environment. Very surprising, however, is the reaction of the Modelscope Slides group of which some 40 percent were positive about the prospect of living in the Harvard Street area, whereas earlier they had reacted more negatively about walking or shopping there. An examination of the reasons cited for those decisions is enlightening. A large percentage of this group had identified

	Positive	Neutral	Negative
Control	27.2	0	72.8
Movie	4.8	4.8	90.5
Slides	4.5	0	95.5
Photos	0.0	20.0	80.0
Drawings	31.6	5.3	63.2
Model Movie	15.8	5.3	78.9
Model Slides	41.2	5.9	52.9

Significance .05

FIGURE 3-67: ATTITUDE TOWARD LIVING IN THE AREA

subarea 7 as a suburban-type residential area and had not noted any commercial or open space uses.[18]

When asked about the prospect of working in the area (Appendix A) there were no statistically significant differences in the response of the various groups (Figure 3-68).

	Positive	Neutral	Negative	
Control	45.5	27.3	27.2	22
Movie	42.8	9.5	47.7	21
Slides	21.7	13.0	65.2	23
Photos	40.0	10.0	50.0	10
Drawings	36.8	26.3	36.9	20
Mod. Mov.	22.3	44.4	33.3	20
Model Slides	29.4	23.5	47.0	19

NSS

FIGURE 3-68: ATTITUDE TOWARD WORKING IN AREA

However, examination of the data does reveal a continuation of the pattern of more negative reactions from the simulation subjects.

Finally, the subjects were queried regarding their reaction to going to a movie or a restaurant in the Harvard Street area. The pattern of more negative reactions on the part of those subjects who experience the environment by means of simulations is in continued evidence, but not so severely as in other behavioral situations (Figure 3-69). A number of the Modelscope subjects who reacted negatively to the idea of going to a movie or restaurant in the area cited the apparent lack of such facilities in the area as the reason for their negative decision.

	Positive	Neutral	Negative
Control	63.7	4.5	31.8
Movie	52.4	9.5	38.1
Slides	59.1	9.1	31.8
Photos	50.0	20.0	30.0
Drawings	50.0	33.3	16.7
Model Movie	29.4	41.2	29.4
Model Slides	35.4	11.8	52.9

Significance .05

FIGURE 3-69: ATTITUDE TOWARD GOING TO A MOVIE OR RESTAURANT IN THE AREA

Figure 3-70 presents a summary of the behavioral responses of the various groups to Harvard Street. It reveals that the Control group was far more favorably disposed toward carrying out the behaviors mentioned in the Harvard Street context than were the subjects who experienced the environment by means of simulations. In a number of instances this was by a factor of two for the Control group versus the simulations as

	Positive	Neutral	Negative	N	Reality Rank
Control	263.7	54.5	181.8	22	
Movie	175.8	23.8	300.2	21	2
Slides	146.0	39.4	314.4	23	4
Photos	140.0	70.0	290.0	10	5
Drawings	255.3	80.7	164.2	20	1
Model Mov.	95.3	135.3	269.9	20	6
Model Slides	153.1	64.7	281.9	19	3

FIGURE 3-70: SUMMATION OF BEHAVIORAL RESPONSE

a whole. Of the simulations, only the perspective Drawings group believed that Harvard Street provided adequate behavior settings for most of the activities mentioned. This group reacted only slightly less positively than did the Control group.

When we sum the rankings for both positive and negative evaluations we find that the Control and Drawings groups about equal. The Color Slides and Photographs are most negative. All the simulations excepting the Drawings result in more negative evaluations by at least a factor of three.

In summary, the data reveal a significant bias on the part of most of the simulations tested toward producing a conception of the Harvard Street environment as a less appropriate (or even inappropriate) setting for a number of the most common, everyday activities, than did direct experience.

IV. Projective Responses

As a further means of obtaining some insight into the "public images" of Harvard Street which each treatment group obtained as a result of experiencing the street in a different way the subjects were asked four projective questions. First they were asked whether the street reminded them of another place they had known, and, if so, how they felt about the other place. Secondly, they were asked to formulate a hypothesis about what Harvard Street must have been like in the past. Next they were asked to predict what it would be like in the future. Finally they were asked what they would do to improve the street if they had the opportunity to do so.

The primary purpose of these questions was simply to get the subjects to reveal further aspects of their conceptions of Harvard Street. However, an important second purpose derives out of the environmental designers concern with change. Much of the information in this section has to do with change in the environment, produced either by actively intervening or by allowing the existing forces to run their course. The data from this section hopefully will shed some valuable insights regarding how these conceptions of change are affected by the mode of experiencing the environment.

Associations. The subjects were asked whether the street reminded them of another area they had known. There were significant differences between the treatment groups in terms of the subjects ability to associate the street with others in their experience (Figure 3-71). Only three of the treatment

	Yes Spec. (1)	Yes Stereotype (2)	No (3)	N
Control	9	50	41	22
Movie	33	53	14	21
Slides	23	59	18	22
Photos	50	50	0	10
Drawings	20	55	25	20
Model Mov.	35	15	50	20
Model Slides	50	16	34	18

Significance .05

FIGURE 3-71: ASSOCIATIONS WITH OTHER ENVIRONMENTS

groups had large numbers of subjects who felt the street to be unique in their experience. These were, surprisingly enough, the Control group and the Modelscope simulations. Of those subjects who were able to associate this street with another in their experience there were two general types of association. First, a number of subjects responded with specific remembrances such as "the main street in neighborhood in Chicago where I grew up." Others tended to respond with more stereotypical associations such as "The main street in a small town."

Of those who did associate the street with another experience, the types of association differed between the Control group and the Simulation groups. There was a strong tendency for Control group subjects to respond with stereotypes wherein the media subjects often mentioned specific associations. This is probably attributable to the greater ambiguity of the simulated experience which more easily allows normalization to equivalence with a specific memory. Whereas the more redundant and complex experience of the Control group only permitted inclusion into a general category of street types.

Figure 3-72 summarizes the affective, evaluative

	Positive (1, 2)	Neutral (3)	Negative (4, 5)	N
Control	33%	8%	58%	12
Movie	22	6	72	18
Slides	0	18	82	11
Photos	20	10	70	10
Drawings	56	25	19	16
Model Mov.	12	22	66	9
Model Slides	8		92	12

FIGURE 3-72: AFFECTIVE RESPONSE TO THE EQUIVALENT ENVIRONMENT

response to the equivalent environment. Again the data reveal significant differences between the media and the Control group and between the media themselves. First, only the Direct experience and the Drawings resulted in a significant number of associations with positive affect attached. In this instance the drawings again result in a bias toward a more positive evaluation whereas all the other simulations result in dramatic deviance in the negative direction.

Natural Change. The subjects were requested to formulate an hypothesis about what the street must have been like in the past. The time period was purposely left open in order to give them as broad a range of options as possible. The subjects took the question seriously and only two responded in a flippant or non-serious manner. The questions were analyzed

	Better 1	Same 2	Worse 3	N[1]
Control	53	47	0	14
Movie	67	20	13	14
Slides	36	50	14	12
Photos	83	17	0	12
Drawings	83	17	0	12
Model Movie	50	40	10	10
Model Slides	40	50	10	11

NSS

FIGURE 3-73: WHAT THE STREET WAS LIKE IN THE PAST

first for evaluative connotations. There were no significant differences between the treatment groups. The majority of all subjects believed that the street was better in the past. The next largest group believed it to be about the same, and very few subjects felt that the street had improved over time. Whether this attitude is attributable to a general nostalgia for the past and pessimism about the present and future or to some specific associations with this type of in-city shopping street is impossible to tell from their response.

In their discussion of the streets past subjects often enumerated how it was different (Figure 3-74). The differences cited were grouped into three categories, social, functional, and physical. Again there are no significant differences between the Control group and the media. The most cited type of difference was that of use. Most subjects believed the street to have been exclusively residential in the past.

	Functional	Social	Physical	N[1]
Control	39	26	35	21
Movie	45	14	42	28
Slides	62	14	24	25
Photos	58	17	25	24
Drawings	46	15	39	26
Model Movie	43	9	48	23
Model Slides	35	17	47	18

NSS

FIGURE 3-74: HOW THE STREET WAS DIFFERENT IN THE PAST

Physical form changes were the next most mentioned difference. Subjects cited a constantly increasing density as a major change occurring over the years. Changes in occupancy of the street were mentioned least frequently and most mentioned changes in this category were increases in elderly and minority occupants.

When asked about the future prospects of the street the subjects continued in their pessimistic outlook (Figure 3-75). In all the groups large numbers of subjects felt that the street would continue the pattern of decline they had hypothesized earlier. There were no significant differences between treatment groups in the occurrence of this belief. Again, indicative of the strong sense of pessimism prevailing is the

	Better	Same	Worse	N
Control	10%	42%	47%	22
Movies	5	34	61	21
Slides	11	33	55	23
Photos	0	25	75	10
Drawings	0	21	79	20
Model Movie	8	23	69	20
Model Slides	18	46	36	19

NSS

FIGURE 3-75: WHAT WILL THE STREET BE LIKE IN THE FUTURE

small number of subjects who felt that the area would improve over time.

The majority of subjects continued to express their belief in a continuation of the earlier pattern of change wherein the area would continue to increase in density, to decline in upkeep, and to become more commercial (Figure 3-76). A smaller number felt that population would be composed of increasing numbers of elderly, poor and minorities.

In summary the subjects, regardless of their mode of experiencing Harvard Street, conceived it to be going through a continuous pattern of decline. Thus they, by and large, believed that if the forces operating in the area were allowed to run their course without intervention that the area would become a "slum".

	Functional (1)	Social (2)	Physical (3)	N*
Control	42	16	42	22
Movie	30	22	48	22
Slides	48	11	41	23
Photos	43	21	36	28
Drawings	35	3	48	29
Model Mov.	42	5	53	19
Mdoel Slides	38	14	43	22

FIGURE 3-76: WAY IN WHICH THE STREET WILL BE DIFFERENT IN THE FUTURE

Planned Intervention. Next, we asked the subjects what changes they would make in the street if they had the opportunity to intervene. They responded with eight different kinds of changes; improve or increase the landscaping; improve the maintenance; give the street more character or decrease its monotony; increase the order; modernize or "update" the buildings; lower the density, especially by providing more parks and open space; decrease the traffic and parking; and change certain of the uses. These eight categories account for over 95 percent of all the changes mentioned (Figure 3-77).

There are no significant differences between the changes suggested by the Control group and those suggested by the media subjects. The two most frequently mentioned changes were somewhat related to increase the numbers of trees and quality of landscaping and to lower the overall density by providing more open space and parks.

	Landscaping	Upkeep	Character	Order	Modernize	Lower Density	Decrease Traffic	Change Uses	N*
Control	15	17	9	17	11	6	17	9	43
Movies	26	13	2	9	6	17	21	6	45
Slides	28	6	6	12	10	24	14	0	44
Photos	17	4	9	17	13	26	4	9	46
Drawings	24	5	9	19	7	17	14	5	42
Model Movie	27	0	12	10	12	35	3	0	40
Model Slides	34	3	15	8	8	38	5	0	41

NSS

FIGURE 3-77: CHANGES WHICH SUBJECTS WOULD MAKE

V. The Effects Of Personal Differences On Response

The data were analyzed to see if there might be differential responses to the six simulations and to reality as a result of a number of personal variables. These variables, selected both on the basis of conventional social science wisdom and on the basis of the theoretical background, were controlled for, in the analysis of several cognitive, affective, behavioral, and projective variables. In all eight personal variables were examined they were: 1) occupation, more specifically Environmental Designers versus the General Sample,[20] 2) experience with simulations, 3) urban experience, prior experience with Harvard Street, 4) value orientation--specifically preference for small town versus big city living, 5) national origin, more specifically Americans versus foreigners, 6) ethnicity, 7) sex, and 8) age.

Unfortunately due to the extreme homogeneity of the sample the sub groups for most of the above variables proved too small to permit valid conclusions to be drawn. Exceptions to this were occupation and sex. Occupation because of the specially selected auxilliary sample and sex because the general sample was almost evenly divided between male and female subjects.

Analysis was confined to only a few variables within the five major response dimensions employed in the study. Cognitive or knowledge measures analyzed consisted of the map ratings based on information content and correctness. Because of the obvious bias in terms of their map drawing ability, an additional information measure was used for the Environmental Designers versus the General Sample Analysis. This additional measure consisted of a composite of all the information measures used in analyzing the verbal response to Questions 1 and 2 (See page 144 for a detailed description of how this composite information measure is calculated). The overall tone of the response to Question 2 was used as the measure of affective response. Attitudes toward walking, shopping, living, working and going to a movie or restaurant comprised the measures of behavior. The subjects hypothesis regarding the future of Harvard Street were utilized for the projective dimensions and their rating of the degree to which the simulation produced a clear impression of what the street would be like in reality was used for the comparisons.

A. Occupation: Environmental Designers Versus The General Sample

A persistent question regarding the use of simulations has been whether or not professional environmental designers with their extensive experience with media, their exposure to the subject matter, and their peer group values were likely to respond to simulated environments differently than would the general population. While the subjects in this experiment are certainly not representative of the general population, they are a homogeneous group who do not have, either the experience with simulations, or the attitude toward the subject matter which are shared by the environmental designers.[21]

For reasons of economy the environmental designers were not run on all the treatments. Rather they were selected to experience one photographic simulation, the movie; and one each of the predictive simulations, the drawings and the modelscope movie; and one group who served as a control experienced the actual street.

Information. The environmental designer (ED) group consistently gleaned more information about the environment regardless of experiential mode than did their general sample (GS) counterparts. For the ED group there is a consistent decline in information with each increase in abstraction which is not shared by the general sample where the drawings tend to achieve a higher overall information score. For example, in Figure 3-78 which summarizes all the cognitive responses to Questions 1 and 2, this pattern is very clear. In each case the ED group obtained more information about the street, but unlike the general sample the drawings do not result in higher

	Mean		N	
	G.S.	E.D.	G.S.	A.P.
Control	38.50	58.40	22	10
Movie	36.45	53.18	21	11
Drawings	41.50	43.16	20	11
Model Movie	35.89	38.10	20	10

FIGURE 3-78: COMPOSITE MEASURE OF INFORMATION

scores as they do for the general sample. This is rather surprising as one would expect the ED groups experience with this media would enable them to "read" it more expertly. In fact, for this media and for the Modelscope Movie the general sample does almost as well as does the ED group whereas for the more "realistic" simulation and for the actual environment there is a very large differential.

This pattern is borne out when we examine the ratings of the subjects maps of Harvard Street.[22] Figure 3-79 summarizes the rankings based on the amount of information displayed. Again we find a strong tendency for the ED group to obtain more information about the street. With the exceptions of the Drawings mode they consistently have a higher percentage of subjects receiving the highest ranking and a smaller percentage receiving the lowest ranking. Again the Drawings mode functions surprisingly well as a means of conveying information to the general sample. In fact a higher proportion of the general sample subjects scored highest than did the ED group.

On the mean score, however, the ED group consistently scores higher, but on this measure the ED Drawings group also scores higher than the GP Movie group.

	Highest 1, 2, 3		4, 5, 6, 7		Lowest 8, 9, 10		Mean		N	
	GS	ED	GS	ED	GS	ED	GS	ED	GS	ED
Control	22.7	60.0	54.5	40.0	22.7	0.0	5.43	2.9	22	10
Movies	33.3	45.7	33.3	27.3	33.3	27.3	5.76	4.5	21	11
Drawings	50.0	41.7	20.0	33.3	30.0	25.0	4.70	3.8	20	11
Model Movie	5.0	20.0	45.0	70.0	50.0	10.0	7.20	5.0	20	10

Significance .05

FIGURE 3-79: SUBJECT MAPS RANKED FOR INFORMATION

When the maps are ranked for correctness of information we again find a consistent bias toward better quality information, fewer errors, on the part of the ED group. They consistently have a larger percentage of subjects rated highest on this dimension and the overall mean score for each group is indicative of less erroneous information. The Drawings mode does seem to result in fewer errors for both treatment groups.

In summary then there is a difference between environ-

	Highest				Lowest		Mean		N	
	GS	ED	GS	ED	GS	ED	GS	ED	GS	ED
Control	22.7	60.0	50.0	40.0	27.3	10.0	5.6	3.2	22	10
Movie	28.3	45.5	33.3	27.3	38.1	27.3	6.0	4.9	21	11
Drawings	50.0	58.3	25.0	33.3	25.0	8.3	4.7	3.6	20	11
Model Movie	5.0	20.0	45.0	70.0	50.0	10.0	7.5	4.9	20	10

Significance .05

FIGURE 3-80: SUBJECT MAPS RANKED FOR CORRECTNESS

mental designers and the general sample. The ED group obtained more information and made fewer errors in reporting it than did the general sample. However, there don't seem to be any differential responses to any particular media, rather the pattern is fairly consistent regardless of the mode of experience.

Affective Response. When we examine their affective response to Harvard Street we find that there are significant differences between the ED and the GS subjects. Those ED subjects who experienced the environment directly and by means of the Color Movie tended to be much more extreme in their evaluations of Harvard Street than did the GS subjects (Figure 3-81). On the other hand, these ED subjects who viewed the Drawings and the Model Movie tended to be slightly more neutral in their response than did the G.S. subjects. The ED group who experienced the real environment tended to be much more positive in their evaluations than did their G.S. counterparts but the ED subjects who experienced the environment via

	Positive (1)		Neutral (2)		Negative (3)		Mean		N	
	GS	ED	GS	ED	GS	ED	GS	ED	GS	ED
Control	50	90	11	0	39	10	1.9	1.2	18	10
Movies	19	18	12	0	69	82	2.5	2.6	16	11
Drawings	47	16	26	45	21	27	1.5	1.9	19	11
Model Movie	25	10	31	50	44	40	2.2	2.3	16	10

Significance .05

FIGURE 3-81: AFFECTIVE RESPONSE TO HARVARD STREET

simulations tended to be more negative in their evaluations than did the G.S. subjects. For example, the number of ED subjects rating the street positively varied from 90 percent for the Control group to ten percent for the Modelscope viewers as opposed to 50 percent and 25 percent for the G.S. subjects.

Clearly then the environmental designers in our sample both responded to reality and to the simulations differently than did the general sample in their affective evaluations.

<u>Behavior</u>.

Taking A Walk. When asked for their reaction to taking a walk down Harvard Street the ED and GS subjects responded in significantly different ways (See Figure 3-82). First of all there was no significant difference between any of the experiential modes for the ED subjects. Those who experienced the environment by means of a simulation responded essentially the same as did the Control subjects and most of them tended to be negative to the idea. On the other hand, the GS

	Positive		Neutral		Negative		N	
	GS	ED	GS	ED	GS	ED	GS	ED
Control	37	20	11	0	53	80	19	10
Movie	12	22	0	0	88	78	17	9
Drawings	39	20	0	10	61	70	18	10
Model Movie	13	10	7	20	80	70	15	10

Significance .05

FIGURE 3-82: ATTITUDE TOWARD TAKING A WALK IN THE AREA

subjects responded differently to the movie and the Modelscope simulations than they did to the actual street and to the drawings. More of the G.S. subjects who experienced the actual street and those who viewed the drawings reacted positively to walking the street than did the ED subjects who shared those two modes of experience. On the other hand more of the GS subjects who viewed the movie and the modelscope movie reacted negatively to the idea than did their ED counterparts.

Shopping. The data also reveal significant differences between the two groups in terms of their responses to all of the media and to reality (See Figure 3-83). The ED subjects tended to react more positively to the actual street than they did to the simulations, whereas the GS subjects reacted more positively to the simulations on the question of shopping in the area.

	Positive GS	Positive ED	Neutral GS	Neutral ED	Negative GS	Negative ED	N GS	N ED
Control	26	50	16	10	58	40	19	10
Movie	35	18	0	0	65	82	17	11
Drawings	39	27	11	9	50	63	18	11
Model Movie	20	10	33	20	46	70	15	10

Significance .05

FIGURE 3-83: ATTITUDE TOWARD SHOPPING IN AREA

<u>Living</u>. Figure 3-84 indicates that all the treatment groups responded in essentially the same manner in regard to the possibility of living in the area--negatively. There are no statistically significant differences in this dimension.

	Positive GS	Positive ED	Neutral GS	Neutral ED	Negative GS	Negative ED	GS	ED
Control	21	20	0	0	79	80	19	10
Movie	0	10	0	0	100	90	16	10
Drawings	5	20	5	10	89	70	18	10
Model Movie	6	10	6	0	88	90	16	10

NSS

FIGURE 3-84: ATTITUDE TOWARD LIVING IN AREA

<u>Working</u>. Both the ED and the GS subjects tended to respond to the simulations in the same manner that they responded to reality. However, there were significant differences between the response of the ED and the GS subjects to reality. The GS subjects tended to respond more favorably to the possibility of

working in the Harvard Street area than did the ED group (Figure 3-85).

	Positive		Neutral		Negative		N	
	GS	ED	GS	ED	GS	ED	GS	ED
Control	32	20	32	0	37	80	19	10
Movie	29	18	12	6	59	73	17	11
Drawings	11	46	33	27	55	27	18	11
Model Movie	20	0	33	10	46	90	15	10
	NSS	NSS	(Overall Sig. .05)					

FIGURE 3-85: ATTITUDE TOWARD WORKING IN AREA

<u>Entertainment</u>. Figure 3-86 shows a significant difference in their response toward going to a movie or eating at a restaurant in the area. Generally both the ED and GS subjects who experienced the actual street responded more positively toward the entertainment opportunities offered by Harvard Street than did their respective counterparts who experienced the street via a simulation. However, the ED subjects who experienced the simulations responded more negatively to the question than did the G.S. subjects.

In an overall sense, the ED subjects who viewed the simulations tended to react more negatively to the suggested behavior than did the GS subjects. For example, Figure 3-87 represents a summation of each category of response across the five classes of behavior. There is a possible maximum score of 500 in each cell representing a 100 percent negative response

	Positive GS	Positive ED	Neutral GS	Neutral ED	Negative GS	Negative ED	N GS	N ED
Control	53	70	5	0	42	30	19	10
Movie	24	18	12	18	12	63	17	11
Drawings	28	18	39	27	28	55	18	11
Model Movie	36	20	36	30	28	50	14	10
	Sig.	.05	Sig.	.05				

FIGURE 3-86: ATTITUDE TOWARD GOING TO A REST OR MOVIE

	Positive GS	Positive ED	Neutral GS	Neutral ED	Negative GS	Negative ED
Control	169	180	64	10	269	310
Movie	100	86	24	24	334	386
Drawings	122	131	88	83	283	285
Model Movie	95	50	115	80	288	370

FIGURE 3-87: SUMMARY BEHAVIOR MEASURE

to each suggested behavior.

Subject Evaluations Of Media. When asked if they felt that they were able to obtain a clear impression from the simulation they experienced of what Harvard Street is like in reality the GS and ED subjects responded similarly across the media. More subjects from both ED and GS groups rated the drawings as satisfactory in this regard than did the subjects from the Movie and Model Movie groups. But the pattern is similar for both ED and GS subjects.

	Clear GS	Clear ED	Unclear GS	Unclear ED	N GS	N ED
Color Movie	47	37	53	63	19	11
Drawings	67	75	33	25	18	12
Model Movie	21	22	79	78	19	9

NSS

FIGURE 3-88: SUBJECT RATING OF HIS ABILITY TO COMPREHEND WHAT THE STREET IS LIKE IN REALITY

Future. When queried about their feelings regarding the future of the Harvard Street area very few of the subjects from either the ED or GS groups felt that things would improve. Most subjects from all groups believed the future to be rather bleak for the street. ED subjects indicated that they thought

	Better GS	Better ED	Same GS	Same ED	Worse GS	Worse ED	N GS	N ED
Control	11	10	42	30	47	60	19	10
Movie	5	0	33	63	61	38	18	8
Drawings	0	0	21	38	79	63	14	8
Model Movie	8	12	23	25	69	63	13	8

FIGURE 3-89: THE FUTURE PROSPECTS OF HARVARD STREET

it would be about the same somewhat more frequently than their GS complements. All in all the GS subjects who viewed the simulations were more negative than were the ED subjects. However, the reverse was true for those subjects who experienced the real thing.

In summary, the environmental designers response to both the actual street and the simulations was significantly different than was that of the general sample used in the study. While both samples were in no sense representative of their respective universes the findings do suggest the need for caution in generalizing professional responses to a client population.

B. Sex

As the general sample subjects were almost evenly split between the sexes it was possible to control for this variable in the analysis with somewhat meaningful results. It should be emphasized, however, that the group sizes are very small and the findings are open to some question as the differences (when there are any) are not great and not directionally consistent.

Information. There are no statistically significant differences between the sexes in terms of the information content exhibited in their memory maps. The data, summarized in Figure 3-90 reveal a very high degree of concordance between the two subgroups. The sexes react similarly both to the actual environment and to each of the simulations.

Factual Correctness. In addition to their similarity regarding the amount of information retained in short term memory, the female and male subjects also exhibited remarkable similarity in terms of the relative correctness of that information. The data, shown in Figure 3-91, show that the sex of the subject has no bearing on the factual quality of information obtained from the environment either directly or indirectly

	Highest				Lowest		N	
	F	M	F	M	F	M	F	M
Control	20	25	60	50	20	25	10	12
Movie	33	33	33	33	33	33	9	12
Slides	22	14	44	29	33	57	9	14
Photos	50	33	25	33	25	33	4	6
Drawings	46	57	15	29	39	14	13	7
Model Movie	0	9	33	55	67	36	9	11
Model Slides	0	10	44	40	56	50	9	10

NSS

FIGURE 3-90: SUBJECT MAPS RANKED FOR INFORMATION CONTENT CONTROLLED FOR SEX

	Highest				Lowest			
	F	M	F	M	F	M	F	M
Control	20	25	50	50	30	25	10	12
Movie	33	25	33	33	33	42	9	12
Slides	22	14	44	29	33	57	9	14
Photos	50	50	25	33	25	17	14	6
Drawings	46	57	23	28	31	14	13	7
Model Movie	0	9	33	55	67	36	9	11
Model Slides	11	0	33	50	56	50	9	10
	51	21						

NSS

FIGURE 3-91: SUBJECT MAPS RANKED FOR CORRECTNESS by means of simulations.

Affectivity. The data, summarized in Figure 3-92, indicate that there is some difference in affective response to

	Positive		Neutral		Negative		N	
	F	M	F	M	F	M	F	M
Control	56	58	11	8	33	33	9	12
Movie	25	17	13	17	63	67	8	12
Slides	0	7	11	14	89	79	9	14
Photos	0	17	25	17	75	67	4	6
Drawings	54	29	39	29	8	43	13	7
Model Movies	44	9	22	36	33	56	9	11
Model Slides	11	20	22	50	67	30	9	10

Significance .05

FIGURE 3-92: AFFECTIVE RESPONSE, CONTROLLED FOR SEX

simulated environments which is attributable to or related to sex differences, although there is no clear or consistent pattern to those differences. Female subjects who viewed the Drawings and the Model Movie tended to react in a significantly more positive manner to Harvard Street than did their male counterparts, who tended to react negatively. On the other hand males tended to react somewhat more neutrally to the street when it was displayed by means of model scope slides. Both sexes reacted almost identically to the actual street.

While the data are inconclusive they do indicate some degree of difference in affective response to simulations on the part of the male and female subjects in my sample.

Taking A Walk. Female subjects responded similarly both to the actual street and the simulations on the question of taking a walk in the area (Figure 3-93). The large majority were negative toward the idea. On the other hand significantly more males responded positively to the question when they experienced the actual street than they did when they experienced the simulations.

Thus the data reveal significant differences in the responses of the different sexes to the question of taking a walk down Harvard Street, for some of the simulations tested and for direct experience. Male subjects tended to react more positively to Reality, and females more positively to the Color Movie, the Photographs, the Drawings, and the Model Movie. Both groups responded similarly to the Color Slides and the Modelscope slides.

Shopping. Significantly more female subjects responded negatively to shopping in the Harvard Street area than did their male counterparts when they had experienced the actual environment (Figure 3-94). Females, on the other hand, were slightly more likely to respond positively than were males who were more neutral when both groups viewed the photographs and drawings. The two groups responded similarly to the other simulations.

Living. The data clearly show that there is no difference attributable to sex in the attitude of subjects with regard to the possibility of living on Harvard Street (Figure

	Positive F	M	F	M	Negative F	M	N F	M
Control	10	50	10	8	80	42	10	12
Movie	22	8	0	0	78	92	9	12
Slides	0	14	11	14	89	71	9	14
Photos	25	0	0	0	75	100	4	6
Drawings	46	14	8	0	46	86	13	7
Model Movie	25	0	0	18	75	82	8	11
Model Slides	11	10	11	0	78	90	9	10

Significance .05

FIGURE 3-93: ATTITUDE TOWARD TAKING A WALK IN THE AREA CONTROLLED FOR SEX

	Positive F	M	F	M	Negative F	M	N F	M
Control	20	33	0	25	80	42	10	12
Movie	33	25	0	0	67	75	9	12
Slides	0	14	11	0	89	86	9	14
Photos	25	0	0	33	75	67	4	6
Drawings	46	14	0	29	54	57	13	7
Model Movie	13	18	25	36	63	46	8	11
Model Slides	0	0	11	20	89	80	9	10

NSS

FIGURE 3-94: ATTITUDE TOWARD GOING SHOPPING IN THE AREA

3-95). Both males and females regardless of mode of experience are overwhelmingly opposed to the street as a place to live.

	Positive				Negative		N	
	F	M	F	M	F	M	F	M
Control	20	17	0	0	80	83	10	12
Movie	0	0	0	0	100	100	8	12
Slides	0	8	0	0	100	92	9	13
Photos	0	0	25	17	75	83	4	6
Drawings	8	0	8	0	85	100	13	7
Model Movie	11	0	11	0	78	100	9	11
Model Slides	0	0	0	10	100	90	9	10

NSS

FIGURE 3-95: ATTITUDE TOWARD LIVING IN THE AREA

Working. Similarly there is no difference on the part of male or female subjects within each treatment group on the question of the desirability of Harvard Street as a work place (Figure 3-96). Although each of the different modes of experience resulted in different attitudes, there was no differential within a group on the basis of sex.

Entertainment. Both male and female subjects responded similarly to going to a movie or a restaurant in the Harvard Street area. In Figure 3-97 the data show no differential reactions within each of the treatment groups based on sex. Similarly, in response to the questions about the future of the street and the ability of the media to convey a clear impression

	Positive F	M	F	M	Negative F	M	F	M
Control	30	42	20	33	50	25	10	12
Movie	22	25	0	17	78	58	9	12
Slides	0	7	11	14	89	79	9	14
Photos	25	33	0	17	75	50	4	6
Drawings	23	10	23	33	54	51	13	7
Model Movie	13	18	63	27	25	54	8	11
Model Slides	25	10	13	30	63	60	8	10

NSS

FIGURE 3-96: ATTITUDE TOWARD WORKING IN AREA

	Positive F	M	F	M	Negative F	M	N F	M
Control	50	67	10	0	40	33	10	12
Movie	33	17	11	8	56	75	9	12
Slides	11	15	0	15	89	69	9	13
Photos	25	17	0	33	75	50	4	6
Drawings	15	30	39	33	46	37	13	6
Model Movie	14	36	43	36	43	27	7	11
Model Slides	33	20	0	20	67	60	9	10

NSS

FIGURE 3-97: ATTITUDE TOWARD GOING TO A MOVIE OR RESTAURANT of what the street is like in reality; the data revealed no difference between the sexes for the sample used in this study.

In summary, aside from small and inconsistent differences in the affective evaluations and in their attitude toward taking a walk down Harvard Street, the sexes responded essentially the same to both reality and to the simulations.

VI. Subject Evaluations Of The Effectiveness Of The Simulations

The subjects who experienced Harvard Street via the simulations were asked a number of questions aimed at ascertaining their impressions of the quality of the simulation efforts. These questions were held until just before those on the personal variables. This was done so as to avoid altering their "sense of disbelief" until after they had responded to all the questions regarding their response to Harvard Street.

One especially important quality of an observers interaction with a simulated world is his ability and willingness to "suspend disbelief." To actively engage in creating reality out of his own experience given the presentation of certain cues that merely suggest a real world. This neutral game of creating an illusion of reality is a familiar one for most modern day men who experience no difficulty at all in entering into a world displayed on a ten inch square screen each evening. However, this important willingness to participate should not be taken for granted as it probably varies with the experience of the observer with the media and with the subject matter. Question 53 (Appendix A) sought to measure their ability to suspend disbelief of the presentation as non-reality so as to enable me to determine if this was affected by the media of presentation.

The data summarized in Figure 3-98 reveal that most of the simulations were quite successful in getting the subjects to accept the street shown as reality. The Modelscope simulations, on the other hand, were not so successful in this regard. Large numbers of subjects in these two treatment groups reported that they were unable to accept the street as

	Yes	Sort Of	No		Rank
Movie	81	0	19	21	4
Slides	96	4	0	23	1
Photos	90	0	10	10	2
Drawings	85	5	10	20	3
Model Movie	35	5	60	20	6
Model Slides	53	0	47	19	5

Significance .05

FIGURE 3-98: DID THE STREET SEEM REAL?

reality.

It is also interesting to note that very few subjects reacted in an intermediate way. Only three subjects out of all the treatment groups replied in terms that indicated that they felt the scene to be "sort of real". All others were sharply divided between those who had no trouble in accepting the scenes shown them as reality and those who were completely unable to "suspend disbelief."

Later on in the interview I sought to probe this aspect further and asked the subjects a second set of questions this time aimed at the clarity of the impression they received of the street, and what they felt were reasons why it was not so clear, and how the overall clarity might be improved (Appendix A).

In Figure 3-99 are displayed the subjects evaluation of their ability to obtain a clear impression of "what Harvard Street is like in reality" from the particular simulation which they experienced. A large percentage of the Movies and Slides groups rated those simulations as very poor in this regard. The majority of Photographs and Drawings subjects rated those media as very good or good. However, almost a third of these two groups rated them as poor also. Approximately eighty percent of the modelscope subjects rated those two simulations as poor or very poor.

	Very Good	Good	Poor	Very Poor	N	Rank
Movies	12	35	12	47	17	4
Slides	44	16	6	33	18	3
Photos	50	20	30	0	10	1
Drawings	33	33	28	6	18	2
Mod. Mov.	0	21	32	47	19	5
Model Slides	6	11	17	67	18	6
	Significance			.05		

FIGURE 3-99: DID THE PICTURES GIVE A CLEAR IMPRESSION OF WHAT HARVARD STREET IS LIKE IN REALITY?

The subjects cited a number of factors which in their view prevented them from gaining a good sense of the street as it might exist in reality. The factors cited are displayed in Figure 3-100. The most frequently cited factor for the most realistic simulations was the time chosen for the experiment.

	Wider Angle Of View	Needed More Sensory Modes	More Time To View Or 2nd Showing	Technical Use Of Medium	Show More Detail	More Representative Time	Other Points Of View	More Pictures Closer Together	More Than One Media	Movement	N[1]
Movies	0	0	0	25	12	37	12	0	12	0	8
Slides	14	7	7	0	14	14	21	14	0	7	12
Photos	0	33	0	33	0	33	0	0	0	0	6
Drawings	11	0	0	0	67	0	0	0	11	11	9
Model Movies	4	18	11	11	54	0	4	0	0	0	28
Model Slides	6	12	6	18	47	0	0	6	0	6	18

FIGURE 3-100: FACTORS LEADING TO UNCLEAR IMPRESSION

A number of subjects felt that the time during which the street was photographed was unrepresentative in terms of the amount of activity occurring along the street. The most noted factor by the abstract media subjects was the lack of sufficient detail to enable them to accurately read what was going on in the environment. It should be emphasized that this was a major source of error for the modelscope subjects. And that it was one which they were well aware of, as evidenced by this response and by the uncertainty displayed in many of their other answers.

Lastly, the subjects were asked to supply some suggestions as to how they felt the simulations might have been improved so as to better enable them to grasp the reality of the street. The data (Figure 3-101) should be looked at as an addition to the factors mentioned previously as deficiencies of the media as subjects tended not to repeat those factors in their suggestions for improvement but rather to go on to suggest other improvements.

Movie subjects most frequently cited the need for a wider angle of view and a somewhat more competent management of the exposure of the film. In addition they again mentioned the selection of a more representative time for shooting the film,

	Wider Angle Of View	More Sensory Modes	More Viewing Time	Better Technical Use Of Medium	More Detail	More Representative Time	Show Other Points Of View	More Pictures	More Media	Add Movement	N*	
Movies	31	8	17	25	0	14	6	0	0	0	34	21
Slides	31	4	4	4	0	23	31	0	4	0	23	23
Photos	21	21	0	7	0	21	14	7	7	0	28	10
Drawings	5	20	0	10	40	5	0	5	15	0	20	20
Model Movies	21	18	18	6	21	3	27	0	3	0	33	20
Model Slides	7	27	7	14	24	0	0	3	0	27	31	19

FIGURE 3-101: WAYS TO IMPROVE QUALITY OF PRESENTATION

the desirability of adding sound, for shooting from more than one point of view and many of them expressed the opinion that a second viewing of the film would have aided them in forming a more accurate conception of the street.

The need for a wider angle of view and for shots of the street from other vantage points such as the pedestrians sidewalk view and an aerial view were most frequently cited improvements by the Color Slides subjects. Also frequently noted was the selection of a more appropriate viewing time. A few subjects mentioned the addition of sound, longer viewing times, and the addition of other media such as a map of the street as being potentially helpful.

Subjects who experienced the street via photographs most frequently cited the unrepresentative viewing time, the narrow view angle and the lack of sound and color as features which should be corrected. A substantial number indicated the desirability of including views from other vantage points. Finally, a small number also expressed the desire to have the pictures taken closer together for additional media (again a street map), and a better technical use of the media itself.

The Drawings group most frequently cited the need for greater detail, especially the lettering on signs and the ability to see in the windows (these were blacked out in the renderings). The next most frequent suggestions were the additions of color and sound and the use of more media such as photographs and maps. A few subjects also cited the need for a wider angle of view, a more representative time of day and more frequent pictures. Some subjects also noted the loss of detail, a result of a printing error in one of the drawings (See Appendix D) as being desirable to correct.

Those viewing the Modelscope Movie had more and a wider range of suggested improvements. Most frequently cited was the need to show the street from other vantage points, and the need to include more details of the environment in the presentation, such as people, signs, window displays, etc. They also expressed a desire for a wider angle of view, for the addition of sound and color and for more viewing time, perhaps in the form of a second or third look. Finally, a few subjects noted the lack of clarity and the jerkiness of the film and expressed the desire to see the street via other media as well.

The Modelscope Slides subjects were most in agreement on the need for more detail such as people, signs, and shop displays, and the desirability of adding sound, color and movement to the display. A number expressed concern over the technical quality of the film, its forms and graininess. Finally, a few cited the need for a wider view angle, more time to view the slides and more frequent pictures.

In conclusion, it should be noted that most of the improvements suggested by the subjects are eminently plausible as well as feasible, and in fact probably represent changes which would be made by an environmental designer in his presentation to a client group. Unfortunately this is not the case for a number of the suggestions made for the Modelscope simulations. The inclusion of details such as people and shop window displays are probably infeasible at this scale and would at any rate be difficult and costly to obtain. A wider angle of view is presently unobtainable given the present modelscope equipment. The graininess produced by extreme enlargement of the image size is also difficult to overcome. Addition of color requires the use of very hot, high intensity photographic lights which in turn necessitate the use of less flammable materials. All this suggests that to improve the quality of the modelscope simulations greatly will involve moving to a much higher level of technology and an enlarged outlay of resources.

VII. Conclusions

The comparative study has shown conclusively for the sample tested that there are considerable differences between one's response to a simulated environment and his response to the real thing. The differences, however, are by no means all in the direction of a degradation of that experience. In a number of instances, where comparison with some objective reality was possible, certain of the simulations proved to be "superior" to reality.

In the remainder of this section the performance of each of the media tested is summarized.

A. Color Movie

I had expected this media to produce the most veridical response to that of real experience. This particular media was, of those tested, closest to "objective reality in that it included color, motion, and was generally accepted as being the most realistic" in reproducing the proximal stimulus distribution of the visual field. Further, it was a media with which all the subjects were intimately familiar, as opposed to say the perspective drawings. However, my expectations in this respect did not prove to be the case.

1. Knowledge. In general, the movie subjects did not gain as extensive a knowledge of Harvard Street as did some of the other groups but on the other hand they didn't form as many misconceptions either. Of the types of knowledge measured and analyzed in this study that group of subjects who viewed the color movie consistently ranked about third relative to the six media tested. The group did, however, tend to score slightly higher on measures of factual correctness and was usually ranked second on this dimension. However, it should be noted that often the direct experience did not result in the most extensive or the most correct memory reports.

2. Affect. It is in terms of affective responses to the environment that the movie tested resulted in its most serious distortion from the response pattern produced by the real environment. There was consistently, through all the affective measures utilized, a rather large deviation toward more negative evauations. For example, in one summary measure forty-five percent of the Control subjects reacted negatively to the street as compared to over 80 percent of the Movie subjects. In all only one other media resulted in a greater distortion of affective responses from those produced by the Control

group.

3. Behavior. The Movie subjects also tended to be much more negative in terms of their willingness to engage in those everyday behaviors suggested in the questionnaire, such as taking a walk, going shopping, etc., in the Harvard Street area than were the Control subjects. In general almost twice as many Movie subjects responded negatively as did Control subjects. Compared to the other media, however, several others resulted in even greater deviations from the Control response also in the negative direction.

4. Projective. Movie subjects extended their negative bias into the future and significantly more Movie subjects believed the streets prospects to be negative than did Control subjects.

5. Effect Of Population Variables. Environmental designers reacted to the movie in essentially the same fashion as did the general sample of subjects. However, both groups responded to the movie differently than they responded to the real street. Both sexes tended to respond similarly as well.

6. Subject Ratings Of Effectiveness. The movie rated fourth on both its ability to enable subjects to suspend disbelief and in terms of their belief that it gave them a good impression of what the street was like in reality. For example, only twelve percent of the subjects rated it as very good as opposed to 50 percent for the photographs. When

asked how they would improve the presentation the most frequently cited changes were a wider angle of view, a better control of exposure, selection of a more representative viewing time, and perhaps more than one showing.

To summarize, the color movie used in the experiment did result in a relatively accurate and moderately extensive conception of Harvard Street. It also, however, resulted in a rather serious negative affective bias of subjects toward that environment and the people and activities within it, and toward their willingness to carry out selected activities in it. These findings, while limited by sample and methodological considerations, do suggest the need for caution in the use of color movies as a substitute for real environments both in research and as a means for conveying environmental design proposals to subjects.

B. Color Slides

This medium, perhaps the most frequently used indirect means of bringing the environment to groups, was also expected to result in a high degree of response fidelity as compared to reality. However it, like the movie tested, proved to produce some very serious distortions.

1. Knowledge. The group image or mental representation of the area gained by means of the color slide viewing, proved to be similar or slightly greater in extent to that produced by the movie. Usually ranking second or third. It did result in somewhat more factual errors than did the color movie and

the Slide subjects tended to exhibit a relatively poor orienting schema. The Color Slide subjects did rank very high in terms of their knowledge of the functional characteristics of the street.

2. Affect. The color slides, as did the movie, resulted in a very serious negative bias in the subjects affective response to Harvard Street. In fact this media consistently resulted in the most severe variance from the Control group response of any media tested, and the variance was consistently in the negative direction.

3. Behavior. The Color Slides subjects also were significantly more negative than the Control group in terms of their willingness to carry out the suggested behaviors in the Harvard Street context. Almost twice as many Color Slides subjects responded negatively as did Control subjects, and the group ranked fourth in terms of overall variance on this measure.

4. Projective. The color slides appeared to result in projective responses which were fairly similar to those of the Control group, only slightly more negative in evaluative content. For example, on the future of Harvard Street there was no statistical difference between the response of the two groups.

5. Effect Of Population Variables. This media was not included in the test of difference in response between environ-

mental designers and the general sample. Both sexes, however, tended to exhibit almost identical response patterns to the color slides.

6. Subject Ratings Of Effectiveness. This media scored highest on authenticity with almost all its subjects (96 percent) able to "suspend disbelief". It was rated second in terms of the number of subjects who believed it to portray an accurate picture of the street as it exists in reality. When asked how they would improve this presentation the most mentioned changes were the inclusion of a wider angle of view, the selection of a more representative time and the addition of sound.

In summary, then, we find that this media resulted in a high level of confidence on the part of its subjects that they "know" what the street was like but in fact their response was significantly different from that of the Control group on a number of important dimensions. In an overall sense this group, as did the Movie subjects, obtained a moderately extensive and accurate knowledge of Harvard Street but were far more negative in their evaluation of it and in their willingness to carry out a number of everyday activities there. As in the case of the color movie caution is suggested in the use of this media. However, in both cases it should be noted that it would seem to follow that if subjects responded positively to an environment shown by means of these two simulations that one could be assured that they would be very positive indeed about the real thing.

C. Black And White Photographs

This medium, the most abstract of the "Descriptive" simulations, is also one of the most frequently used simulations by both researchers and designers to portray existing environments to an audience. As in the case of the other two photographic media, I had expected a much higher approximation of the response pattern of the direct experience than actually obtained.

1. Knowledge. This media was somewhat less consistent in its relative effectiveness at conveying factual information about the selected environment than were the two other photographic modes. It tended to rank second on most of the knowledge measures but in several instances deviated sharply from this pattern. For example, it appeared to afford subjects little information on the relative maintenance and esthetic characteristics of the environment. Overall, however, the black and white photographs enabled its subjects to construct an extensive and accurate image of Harvard Street.

2. Affect. As in the other two photographic media the black and white photographs resulted in a large and pervasive negative bias in the affective response of the subjects to the Harvard Street environment. The photographs ranked fifth of a field of six in terms of its relative response fidelity on this dimension. Approximately seventy percent of the subjects who experienced this medium responded negatively to the environment as opposed to 33 percent for the Control group.

3. Behavior. Similarly this group of subjects responded in a far more negative fashion to the suggested behaviors than did the Control group, also ranking fifth in terms of its relative response fidelity on this dimension.

4. Projective. The negative bias also was operating when the subjects were asked to describe the future of Harvard Street wherein 75 percent asserted their belief that it would be worse than the present. This seventy-five percent was compared to 40 percent for the Control group who shared that negative evaluation of the future.

5. Effects Of Population Variables On Response Fidelity. This media also was not included in the sub-experiment to determine whether environmental designers responded differently to simulated environments than did the general sample. In the analysis for sex related differences the data revealed that while the sexes both obtained a similar amount and quality of information, the males tended to respond more negatively to the photographs on both the affective and behavioral dimensions.

6. Subject Evaluation Of The Relative Effectiveness Of The Media. This media also scored very high in terms of its ability to enable subjects to suspend disbelief in the presentation. It ranked second on this dimension with 90 percent of subjects responding positively. It ranked first of all the media tested in terms of the number of subjects who felt that the photographs gave an accurate picture of the street as it really is. Fifty percent of the subjects who viewed the

photographs rated it as "very good." As in the previous media, the most mentioned suggestions for improving the presentation were to increase the angle of view, to add color and sound and to select a more representative time of day and week to shoot the photographs.

To summarize the overall performance of this media it generally ranked second in terms of extent and accuracy of information conveyed but resulted in a very severe negative bias along the affective, behavioral and projective dimensions.

D. Perspective Drawings

This medium, perhaps the one most relied upon by environmental designers to explain their proposals for future environments performed far better than I had expected on almost all the dimensions. In fact, of the six simulations tested, this one came closest, in an overall sense, to replicating the response pattern of the Control group. And in a number of instances where it was possible to compare the response to some objective reality the Drawings actually exceeded the performance of the real thing. This came as a complete surprise to me as I had expected it to be much less effective than the photographic media.

1. Knowledge. The drawings resulted in a somewhat mixed performance by subjects on the cognitive measures used. The Drawings group ranked first on a number of important knowledge dimensions, it's subjects exhibited more knowledge of the activity structure of the street than even the Control group.

It ranked first of the media in knowledge of the social composition and character, on the recognition tests and the relative level of maintenance. It resulted in an almost identical response pattern to that of the Control group on the semantic differential, with a total variance of less than one-third that of the color movie or color slides. In terms of the factual accuracy of knowledge the Drawings group made fewer errors than did the Control group. However, the Drawings group scored fifth on knowledge of the economic characteristics of the street and fourth on esthetic evaluations.

2. Affect. The Drawings group came closest to replicating the affective response of the Control group to Harvard Street. This media resulted in an almost insignificant negative bias.

3. Behavior. On the behavioral dimension as well the Drawings group comes closest to the Control group, overall there is a very slight difference between the two groups. The Drawings group proved to be slightly more positive toward shopping and living on Harvard Street than did the Control group.

4. Projective. There were no significant differences between the Control group and the Drawings group on this dimension.

5. Effects Of Population Variables On Response Fidelity. The environmental designer sample responded similarly to the general sample on the cognitive and behavioral variables but

were significantly more negative on the affective dimensions, 16 percent positive to 47 percent for the general sample. The analysis for sex related differences revealed that males and females obtained similar knowledge, but that females were significantly more positive on the affective and behavioral dimensions than were the males in the sample.

6. Subject Ratings Of Effectiveness. Eighty-five percent of the subjects reported that they were able to suspend disbelief of the simulation, which gives the drawings a rank of third on this dimension. Some sixty-six percent reported it to be good to very good at affording them a clear picture of what the street is "really like", the second highest percentage. The most frequently mentioned improvement had to do with increasing the level of detail in the pictures, this was mentioned by 67 percent of the sample. Eleven percent suggested a wider angle of view, that the pictures be taken at closer intervals, and that more than one media be used in the presentation.

In summary, this media, one of the most traditional and frequently used of the predictive tools in the environmental designers kit, has proved itself to be a remarkably effective one as well. There is a slight tendency revealed for it to bias response in a positive direction, which in a sense is more dangerous than a negative tendency. However, it was very slight and not consistent by any means. The suggestion so frequently made by the subjects, to increase the level of detail in the drawings, particularly the contents of shop windows, and more filling in of, and inclusion of signs is quite easily accomplished using this media and perhaps might still further increase its response fidelity.

E. Modelscope Movie

This technique is a fairly new one, and is not yet widely used by architects and planners as a predictive tool because of the expense and technical difficulties involved in its application. It is, however, one which is likely to see increasing use as video tape--servo mechanisms are developed similar to that of the College of Environmental Design at Berkeley.[23] The version tested is perhaps somewhat primitive when compared to possibilities resulting from this sophisticated technology. The example tested, is however in my view, a reasonable approximation of the quality possible without that expensive technical equipment, and represents therefore an adequate example of "the state of the art" available to most practitioners and researchers.

1. Knowledge. The Modelscope Movie subjects tended to rank either fifth or sixth on almost all the knowledge measures used in the experiment. In some instances the Modelscope Movie subjects demonstrated very serious deficiencies in their knowledge of Harvard Street. For example, the subjects who viewed the modelscope movie noted only one-fourth as many functional elements as did the Control group and of those cited over half were in error! As might be expected there was a tendency on the part of these subjects to conceive of the area as newer and

better maintained than it actually was. The groups responses to the semantic differential exhibited a total variance from that of the Control group three times that of the Drawings subjects. Subjects viewing the modelscope movie made over five times as factual errors as did Control subjects, and noted only one-fifth as many elements.

2. Effect. While the modelscope movie resulted in a very poor showing on the knowledge measures, the subjects affective response to the environment displayed was not so deviant as were the three descriptive simulations tested. The Modelscope Movie subjects were ranked third on this dimension. This media, as did most of the simulations, resulted in significantly more negative affective response to the environment than that of the Control group.

3. Behavior. The Modelscope Movie subjects were as a group the most negative of those tested toward all the behaviors suggested in the questionnaire. They responded negatively almost three times as often as did the Control group on this dimension.

4. Projective. This group did not respond in a significantly different manner on the projective dimensions than did the Control group.

5. The Effect Of Population Variables On Response Fidelity. The Environmental Designer group displayed more information in their answers, and were more negative in their

affective and behavioral responses than were the general sample. Both sexes exhibited similar levels of knowledge. The females in the sample responded far more positively on the affective dimension than did the males (41 percent to nine percent). The two groups responded differently on each of the behavioral questions. However, there was no consistent direction to that difference.

6. Subject Rating Of Effectiveness. The modelscope movie received the lowest rating on authenticity with only 35 percent of the sample reporting that the street seemed "real". In addition only twenty-one percent reported that it afforded them a good idea of what Harvard Street was like in reality, less than one-fourth the frequency of the Black and White Photographs group.

The subjects most suggested improvements were to increase the level of detail, to increase the angle of view, and to include shots from other vantage points.

In summary, the modelscope movie did not perform well at all relative to the other media. It resulted in the least extensive knowledge and more importantly it resulted in many misconceptions about the street. As did the other simulations, it resulted a significant and serious negative bias in the affective and behavioral responses of the subjects in the sample.

Given the scale I was working at (which is commonly used in Urban Design), and the level of technology there seem to be some severe limitations on improving the performance of this media also. First at 1" = 50' scale it is very difficult to include more detail like signs, people, etc. Also given the present technology it is not possible to significantly increase the angle of view. In short, given the enormously disproportionate amount of effort and expense involved in this media relative to others and the fact that of the media tested it is the least effective it would seem to suggest that modelscope movies are not worth the effort. This rather serious assertion should obviously be tested in other studies and in other contexts.

F. Modelscope Slides

This media was ranked most abstract of the six techniques evaluated and it was my expectation that it would exhibit the lowest degree of response fidelity. Generally this expectation was confirmed by the data, but by no means was it true for all the dimensions tested.

1. Knowledge. In general the memory reports both verbal and graphic of the Modelscope subjects were rated in the lowest two categories. For example, Modelscope Slide subjects noted only one-fourth as many activity types as did the Control group and more than one-half of those noted were erroneous! In all the Modelscope Slide subjects made more errors than any other group and made over five times as many as did the Control group. In the overall knowledge ratings the Modelscope Slides subjects were rated in the lowest two categories. There were exceptions to this pattern, however. The Modelscope Slides

subjects rated high (in the first three categories) in terms of their comprehension of the purely physical form of the area. Their estimates of the relative maintenance was second closest to that of the Control group. In terms of total variance on the semantic differential scales the Modelscope Slides subjects were rated as fourth in their approximation of the Control group response. The total variance was over twice that of the Drawings subjects but was smaller than that of the Color Movie group.

2. Affect. Modelscope Slides, as did most of the other simulations tested, resulted in a significantly higher frequency of negative affective responses than did the Control group. In fact only eighteen percent of Modelscope Slide subjects expressed a positive affective evaluation of the street versus almost 60 percent of the Control subjects. Overall this group was ranked fourth on it's relative response fidelity on this dimension.

3. Behavior. In addition those subjects who experienced the modelscope slides were significantly more negative about engaging in the suggested behaviors in the area, with one exception. Rather strangely, forty-one percent of the Modelscope Slide subjects expressed a positive attitude about living in the area shown in the slides as opposed to only 27 percent for the Control group. This is surprising when only seventeen percent stated that they would be positive toward taking a walk in the area. Overall the Modelscope group was

ranked third in terms of the degree to which it replicated the response pattern of the Control group on this dimension.

4. Projective. No significant difference was noted on this dimension between the response pattern of this group and that of the Control group.

5. The Effect Of Population Variables On Response Fidelity. The sub-experiment to test for differential responses between environmental designers and the general sample was not conducted for this media. The analysis for sex related response differences revealed that the sexes obtained similar knowledge both in extent and accuracy from the modelscope slides. The affective response of males was slightly more positive but both groups responded similarly on the behavioral dimensions.

6. Subject Ratings Of Effectiveness. The Modelscope Slides subjects rated this media lowest on authenticity with only 53 percent stating that they were able to accept the presentation as that of a "real" environment. They also rated the slides lowest in terms of the degree to which they felt the presentation afforded them a clear idea of what Harvard Street was like in reality. Only seventeen percent rated the presentation as good on this dimension versus 70 percent of the Photograph subjects.

The most frequently suggested improvements were the inclusion of more detail, the use of sound and color, and the inclusion of movement in the presentation.

In summary this media, as did the modelscope movie, displayed a very low level of response fidelity in this experiment. It was most lacking in its ability to convey an accurate and extensive conception of functional and social meanings. It resulted not only in far less extensive knowledge of the street but in many outright misconceptions! It is probable that this would be much improved with supplemental information--such as verbal or textual explanation. Relative to the modelscope movie this medium is far less demanding technically and is much less expensive while maintaining approximately the same level of response fidelity.

Overall

Because the findings are complex it is not possible to reach a definitive conclusion regarding which media is "best" in terms of its ability to replicate the response pattern of reality. However one media, the perspective drawings, did receive higher performance ratings somewhat more frequently than any other single simulation, this to my own surprise. The color movie and color slides performed consistently far worse than I had expected. The modelscope simulations, while ranked lowest in my expectations also performed even worse on the knowledge measures than I had expected, and resulted in far less extensive knowledge, and perhaps more importantly much more inaccurate knowledge than did direct experience.

All the simulations, with the exception of the drawings, consistently resulted in more negative affective and behavioral response to the street than did direct experience, and in some instances rather severely so. It should be noted, however, that this is perhaps less of a problem than a positive bias in that it would seem to follow that a positive response to a simulation would certainly be indicative of a positive response to reality.

And finally, it should be remembered that the simulations were employed in this study in a much more strictly limited manner than would be normal practice for the average practitioner. The limitations, necessary for valid comparisons such as only using one media with no supplemental text or description, the fairly rigid angles of view, etc., would hardly apply to an environmental designers presentation to an audience of clients/users.

The findings should, however, provide the practicing environmental designer or researcher with some conceptions of the particular strengths and weaknesses of each of the techniques tested. This knowledge should provide some limited basis upon which to select appropriate techniques for particular kinds of tasks. It should also assist in the selection of combinations of techniques in which the strengths of one would complement the weaknesses of the other.

NOTES

1. The frequencies are adjusted for different group sizes. The adjustment is based on treatment groups composed of twenty subjects. Multiple mentions account for N in some cases being larger than the total number of subjects in a particular treatment group.
2. For good discussions of the general problem of orientation see; Lynch, Kevin, Image of the City, pp. 123-140 and Stea, David, "Environmental Perception and Cognition: Toward a Model for Mental Maps," Unpublished manuscript.
3. The fact that N is not the same throughout a row in this table is the result on non-ascertained data items.
4. It would have been valuable to ascertain in advance their stereotype or expectations regarding a street like Harvard Street. However, this was not possible for two reasons. First, it would have necessitated revealing certain aspects of the street in advance, which would have nullified other important purposes of the experiment. Secondly, the time and resources required for the additional data collection and analysis were prohibitive.
5. This behavioral aspect of knowledge of the activities which are personally appropriate and desirable in a particular place will be examined in the third section of this chapter.

6. It should be noted that, although the Modelscope subjects believed Coolidge Corner to be busy and active, many of them believed it to be an active bustling industrial area.
7. An industrial section of Cambridge, Massachusetts which is adjacent to the Westgate Married Student Housing where the subjects reside.
8. See Figure for an indication of this tendency toward normalizing as new.
9. From Item Number 28 of the interview schedule. The semantic differential scale clean = 1 and dirty = 7.
10. From Item 31 of the interview instrument, the semantic differential. In seven step scale new = 1 and old = 7.
11. I should add that in my own view the semantic differential is currently a much over used and misused technique in environmental research. Indeed in some circles it has come to be synonymous with research.
12. The recognition tests were placed after the introspective portions of the questionnaire so as not to contaminate the experience of Harvard Street.
13. This accounts for the discrepancy between Figure 3-40 and Figure 3-16, in which each incorrect functional category was counted.
14. It should be noted that in the section on functional meanings it was ascertained that in the case of the model-scope simulations almost 40 percent of the uses they identified for various subareas of the street were incorrect.

15. Lowered income later in life does not usually constitute a change in class status.

16. Word counts are frequently used in content analysis as measures of information.

17. Using this same procedure for rating another set of similar maps this authors evaluations were almost identical to those of two other evaluators (concordance of 90 percent).

18. Numbers refer to subareas shown on Figure

19. In this instance we are referring in effect to experiencing the same environment in a different way or in another form, i.e. directly or by means of a simulation.

20. It should be remembered that a second sub sample of Architects and Planners was used for the portion of the study, unlike the other personal variables.

21. It should also be emphasized that the Architects-Planners tested are also not representative of the general population of Architects and Planners, but are rather a group of Architects and Planners who are similar to the general sample on all dimensions save that of concern.

22. It should be noted that even though the maps were not ranked for graphic quality, but rather solely on the basis of the quantity and quality (correctness) of information contained there is still a bias operating in favor of the ED group.

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CHAPTER IV

PHASE TWO RESEARCH DESIGN

It is possible to distinguish between object or event (objective) simulation and human response (psychological) simulation. The objective fidelity of simulations refers to the degree of similarity between the objective features of the simulation and the "reality" being simulated. Response fidelity of simulations, on the other hand, refers to the degree to which the human behavior evoked by or involved with the simulation is similar to that which would be evoked by or involved with the "true-life" situation. It would seem to be a rather plausible hypothesis that there is a direct relationship between the objective fidelity of a simulation and its response fidelity. In other words, one would expect the similarity between responses evoked by simulated versus "real" environments to increase with increases in the objective fidelity of the simulation and vice versa.

As each link in the communication chain can affect the fidelity of the process, it is possible to formulate hypotheses regarding the effects of each of those variables upon fidelity. However, it obviously is impossible to investigate the effects of all such factors in a study of this scope. With that limitation in mind, I have selected three hypotheses to be tested.

1. Response fidelity varies directly[1] with the "realism" (inversely with the abstraction) used in representing an environment.

2. Response fidelity should increase with the inclusion of color in an environmental display.

3. Response fidelity should increase with the addition of motion to a display.

As in the previous comparative study response will be measured along cognitive, affective and behavioral dimensions. In each case the null hypothesis will be rejected if the difference between the response obtained from the experimental groups versus the Control group exhibits the hypothesized relationship at the .05 level of significance. This second phase of the study consists, in effect, of three separate experiments. Each consisting of an experimental investigation employing controlled variation of a single variable within a specific type of simulation. In each experiment all factors were held constant except those being investigated. Thus instead of "averaging out" differences or noncomparabilities between treatments as was the case in the phase one comparative study, the experimental and control forms of the simulations were constructed so as to be comparable in all respects save the treatment variable. The generality of findings depends only on sample considerations.

Because of the control used in preparing and administering the treatments in the comparative study it is possible to test the hypothesis regarding the effects of color and motion by utilizing data gathered for that study. Hypotheses 2 will be tested by comparing the response of those subjects who experienced the environment by means of color slides with those who experienced the black and white photographs. Hypothesis 3 by comparing the response of the Color Slide subjects with that of the Color Movie group.

Hypothesis 1 regarding the effects of abstraction required the conduct of a separate experiment which is described below.

The Effects Of Abstraction On Response To Simulations.

This, the first of the two secondary experiments, is designed to test the hypothesis that response fidelity varies inversely with the degree of abstraction utilized in encoding the simulation content. Two sets of perspective drawings were utilized in this test. The first were those used in phase one of the study (See Appendix C). They are delineated in a realistic style, and are similar to those used by an environmental designer to simulate reality. They were made by tracing over the projected image of the color slides used in phase one. All elements of the display were included which are within the means of the medium of drawing. See Chapter I for a detailed description of the level of detail and the procedure used to construct the drawings.

The second more abstract set were line drawings of the major building forms with no texture and with many of the detailed elements removed. They included major fenestrations, outlines of forms such as awnings and billboards, and the major curb line between the street and sidewalk (See Appendix F). The abstract drawings are almost identical in style and content to computer-generated perspectives. This similarity was purposeful in the hope that the findings from this part of the study might have some general application to that rapidly developing and promising technique.

The abstract drawings were made by overlaying the realistic drawings and simply tracing off the major outlines, fenestration, etc., thus the drawing sets are identical in all respects save their relative abstraction.

The Sample. The subjects selected for this second phase test were a group of married students at the University of Washington in Seattle. This group of subjects are similar in most respects to those of phase one. They are young, mainly in their twenties and thirties, middle-class college students. The primary intent in selecting the subjects was, as previously, to obtain a sample which was as homogeneous on as many dimensions as possible. A list of potential subjects was compiled, from the student directory. These potential subjects were then contacted to ascertain their willingness to participate in "a study of what people think about their environment."

Those subjects who indicated that they were willing to participate in the study were listed alphabetically and numbered. Then, using a table of random numbers, they were assigned to one of the two treatment groups. One, to experience the Harvard Street environment by means of a sequential series of abstract perspective drawings (Abstract), the other by means of an identical sequence of realistic perspective drawings (Realistic).

The Method. Appointments were then made and the experiment administered in a classroom at the University of Washington. The subjects were allowed to view each drawing in sequence for thirty seconds for a total of seven minutes. Immediately after they had finished viewing the entire sequence of drawings they were asked to complete an identical version of the questionnaire used in the phase one comparative study (See Appendix A).

NOTES

1. By directly I do not mean that the variation would be linear, in fact I would expect jumps and thresholds to occur. Instead, by directly I simply mean that the direction of the relationship will be similar. Obviously the identification of those jumps and thresholds would be of great value to discuss. But this would require further systematic study which is beyond the scope of this study.

CHAPTER V

DISCUSSION OF FINDINGS FROM THE SECOND PHASE EXPERIMENTS

This chapter presents the findings of the second phase experiments designed to test the effects of abstraction, color and motion on response fidelity. The chapter is in three parts. The first is a report on the findings of the experiment on abstraction. The second is a report on the results of color on response veridicality. Finally, the third consists of the findings of the experiment to determine the effects of adding motion to a display. In each experiment several different measures of cognitive, affective and behavioral response are utilized so as to ensure a rigorous test of each of the hypothesis. The different measures of cognitive, affective and behavioral response were determined in advance of the analysis and are not the result of "fishing" or in other words of looking for results which support a particular conclusion.

I. The Effects Of Abstraction On Response

In this experiment I have chosen to test the general hypothesis that response fidelity varies inversely with the degree of abstraction used in delineating or representing an environment. The specific sub-hypotheses to be tested are:

1. Cognitive Response Fidelity

Hypothesis of Interest.

a. Cognitive response fidelity should be greater for those subjects viewing the Realistic drawings.

The Tested Hypothesis.

b. Cognitive response fidelity should be the same or lower for those subjects viewing the realistic drawings.

2. Affective Response Fidelity

Hypotheses of Interest.

a. Affective response fidelity should be greater for those subjects viewing the Realistic drawings.

The Tested Hypothesis

b. Affective response fidelity should be the same or lower for those subjects viewing the realistic drawings.

3. Behavioral Response Fidelity

a. Hypothesis of Interest.

The behavioral response pattern of the subjects viewing the Realistic Drawings should more closely approximate those of the Control group than those viewing the Abstract Drawings.

b. The Tested Hypothesis.

Behavioral response fidelity should be the same or lower for those subjects viewing the Realistic drawings as compared to the Abstract drawings.

In all cases the tested hypothesis will be rejected if the data exhibit the specified relationship at a significance level of .05 or higher.

1. Cognitive Response Fidelity. The tested hypothesis, that cognitive response fidelity will be the same or will vary with the degree of abstraction, is clearly rejected by the data. Figures 5-1 and 5-2 reveal a definite inverse relationship between abstraction and cognitive response fidelity at a

significance level of greater than .05. This relationship is borne out by the data in Figure 5-8 which reveal that the Abstract group made eight times more incorrect statements about the street than did the Control subjects, while the Realistic group made less than twice as many.

However, although the data do clearly reject the tested hypothesis (1-b) they do not unambiguously support the hypothesis of interest (1-a). While the data do reveal a consistent directional pattern which seems to support the hypothesis that there is an inverse relationship between cognitive response fidelity and abstraction, in only two instances is that relationship significant at the .05 level or greater. For example, when the subjects maps were ranked according to the amount and accuracy of information (Figures 5-6 and 5-7) the data do exhibit the desired relationship, but at a significance level of only .10. In other instances such as the inferences which subjects made regarding the relative age and condition of the elements along Harvard Street (Figure 5-4 and 5-3) the data also exhibit the desired relationship but that relationship is not statistically significant and could have occurred by change alone. However, given the fact that in all seven cases the data do support the hypothesis of interest, even though in four instances at a low level of significance, the consistency of that relationship would seem to strengthen the plausibility of the hypothesis that there is an inverse relationship between the degree of abstraction of a simulation and the ability of a subject to acquire knowledge about the environment being simulated.

	No. Of Correct Categories	No. Of Mentions	No. Of Incorrect Categories	No. Of Mentions
Control	30	721	0	0
Abstract	17	264	9	58
Realistic	24	486	4	12

Significance .05

FIGURE 5-1: FUNCTIONAL CHARACTERISTICS NOTED (QUESTIONS 1-9)[1]

	Prospering	Stable	Declining	N[1]
Control	50	0	50	6
Abstract	0	17	83	11
Realistic	20	20	60	15

Significance .05

FIGURE 5-2: INFERENCES REGARDING ECONOMIC CONDITION (QUESTIONS 1-9)[2]

	Well Maint.	Poorly Maint.	N[1]
Control	60	40	56
Abstract	73	27	27
Realistic	63	37	29

NSS

FIGURE 5-3: INFERENCES REGARDING MAINTENANCE (QUESTIONS 1-9)

	Old	New	N[1]
Control	77	23	31
Abstract	70	30	36
Realistic	80	20	60

NSS

FIGURE 5-4: INFERENCES REGARDING AGE OF ELEMENTS (QUESTIONS 1-9)

	Highest (1-3)	Middle (4-7)	Lowest (8-10)	N[1]	Mean
Control	23%	55	22	22	5.38
Abstract	9	36	55	11	6.27
Realistic	23	54	23	13	4.00

Significance .10

FIGURE 5-5: SUBJECT MAPS RANKED FOR INFORMATION CONTENT

	Highest (1-3)	Middle (4-7)	Lowest (8-10)	N[1]	Mean
Control	23	50	27	22	5.42
Abstract	9	36	55	11	6.27
*Realistic	15	62	23	13	4.35

Significance .10

FIGURE 5-6: MAPS RANKED FOR ACCURACY OF CONTENT

	Incorrect Statements[1]
Control	12
Abstract	95
Realistic	23

FIGURE 5-7: FACTUALLY INCORRECT STATEMENTS (QUESTIONS 1-9)

2. Affective Response Fidelity. The data support the hypothesis that greater affective-response fidelity is obtained from simulations which involve a realistic rather than an abstracted mode of encoding content. In Figure 5-9 the data indicate that the Realistic subjects responded affectively to the simulated street in a manner remarkably similar to that of the Control subjects in their response to the actual street. The Abstract group on the other hand were significantly more negative in their evaluations of the street. 5.8.

	Positive	Neutral	Negative	N[1]
Control	55	0	45	240
Abstract	26	2	72	93
Realistic	52	7	41	173

Significance .05

FIGURE 5-8: EVALUATIVE STATEMENTS FROM QUESTIONS

This relationship is further borne out in the relative frequency of affective responses. The Abstract group made significantly fewer evaluative references than did the Realistic and Control groups. The tested hypothesis is clearly rejected.

3. Behavioral Response Fidelity. The results are somewhat inconclusive regarding this set of hypotheses. The pattern of the responses of the subjects to the five suggested behaviors does exhibit a consistent direction which supports the hypothesis of interest. However, in only one case is that relationship at a sufficiently stringent level of significance to allow the alternative hypothesis to be rejected.

As can be seen in Figure 5-9 the Realistic and Control groups responded similarly to the idea of taking a walk along Harvard Street whereas the Abstract group were considerably more negative to the suggestion. This relationship is significant at the .05 level.

The response of the subjects regarding their willingness to shop, live, work or go to a movie or restaurant in the Harvard Street area shown them was somewhat more inconclusive. In each case the data do exhibit the relationship suggested, that is, the response of the Realistic group more closely replicates that of the Control group than does the Abstract group. However, in each of these cases the relationship is at a very low level of significance. Thus the data seem to support the hypothesis of interest but do not allow for the rejection of the alternate hypothesis.

	Positive	Neutral	Negative	N
Control	73	9	18	22
Abstract	27	9	64	11
Realistic	62	15	23	13

Significant .05

ATTITUDE TOWARD TAKING A WALK IN AREA

Control	55	14	32	22
Abstract	45	9	46	11
Realistic	46	15	38	13

NSS

ATTITUDE TOWARD SHOPPING IN AREA

Control	27	0	73	23
Abstract	10	27	63	11
Realistic	23	15	62	13

NSS

ATTITUDE TOWARD LIVING IN AREA

Control	45	27	27	22
Abstract	18	36	46	11
Realistic	38	31	31	13

ATTITUDE TOWARD WORKING IN AREA

Control	63	5	32	22
Abstract	36	18	46	11
Realistic	54	15	31	13

ATTITUDE TOWARD GOING TO A MOVIE OR RESTAURANT

FIGURE 5-9: BEHAVIORAL RESPONSE

In conclusion, the results of this experiment designed to test the hypothesis that there is an inverse relationship between cognitive, affective and behavioral response fidelity and the degree of abstraction of a simulation, would seem to support that hypothesis. In any event it is clear that the alternate hypothesis that there is a direct relationship between abstraction and response fidelity can be rejected. A second alternate hypothesis that there is no difference between abstract and realistic simulations in terms of their response fidelity is also rejected by the data. The only alternate to that defined as the hypothesis of interest which is not clearly and unambiguously rejected by the data is that there is no relationship between the degree of abstraction and cognitive response fidelity. However, the plausibility of this hypothesis is somewhat questionable given the fact that although often at a low or questionable level of significance the data consistently revealed a pattern and direction of response that was consistent with the hypothesis of interest.

II. The Effects Of Color On Response

This the second of the three second phase experiments is designed to test the hypothesis that response fidelity should increase with the inclusion of color in a visual display. The hypotheses are:

1. Cognitive Response Fidelity

   a. Hypothesis of Interest

      Cognitive response fidelity should increase with the inclusion of color in a visual display.

   b. Tested Hypothesis

      Cognitive response fidelity will be the same or will decrease with the addition of color to a display.

2. Affective Response Fidelity

   a. Hypothesis of Interest

      Affective response fidelity should be higher for those subjects viewing a color display than for those who view a black and white display.

   b. Tested Hypothesis

      Affective response fidelity will be the same or lower for the color display.

3. Behavioral Response Fidelity

   a. Hypothesis of Interest

      Behavioral response fidelity should be higher for a display which includes color than for one in black and white.

b. Tested Hypothesis

Behavioral response will be the same or lower with the inclusion of color into the display.

<u>1. Cognitive Response</u>. The data clearly reject the hypothesis that cognitive response fidelity will increase with the inclusion of color into a display. For example, Figure 5-12 reveals that those subjects who viewed the black and white photographs noted slightly more functional activities than did the Control group (110 percent) while the color slide viewers noted far fewer (60 percent). In addition all three groups made approximately the same number of references to the social characteristics of the resident population (Figure 5-11). Finally when the subjects maps were ranked for information content there was no statistically significant difference (Figure 5-16).

On the other hand the data do not support the tested hypothesis, that response fidelity will decrease or remain the same with the inclusion of color, either. For example, the subjects viewing the color slides were much closer to the Control group in their inferences regarding maintenance and age characteristics than were the Black and White subjects (Figures 5-14 and 5-15). The same is true for economic inferences (Figure 5-13), and the accuracy of information as measured by the subjects maps (Figure 5-18).

The data reject both the hypothesis of interest and the tested hypothesis. The remaining alternate hypothesis is that there is no consistent relationship between the addition or deletion of color and cognitive response fidelity along all the dimensions used in this test. Perhaps a more detailed examination of the hypotheses is in order, and may reveal that for certain kinds of information color improves response veridicality while for others black and white performs more effectively.

Control	222
Color Slides	207
B & W Photos	220

FIGURE 5-10: NUMBER OF SOCIAL DIFFERENCES

	No. Of Correct Categories	No. Of Mentions	No. Of Incorrect Categories	No. Of Mentions
Control	30	721	0	0
Color Slides	18	443	4	16
B & W Photos	26	800	2	14

Significance .05

FIGURE 5-11: FUNCTIONAL CHARACTERISTICS

	No. Of References
Control	6.4
Color Slides	8.7
B & W Photos	16.

FIGURE 5-12: REFERENCES TO ECONOMIC CHARACTERISTICS

	Well Maint.	Poorly Maint.	N*	Mean Rating On Clean Dirty Scale
Control	60	40	56	3.37
Color Slides	37	63	29	3.65
B & W Photos	22	78	38	4.20

Significance .05

FIGURE 5-13: INFERENCES REGARDING MAINTENANCE CHARACTERISTICS

	New	Old	N*	
Control	23	77	31	5.15
Color Slides	20	80	26	5.34
B & W Photos	43	57	42	5.60

Significance .05

FIGURE 5-14: INFERENCES REGARDING AGE

	Highest (1-3)	Middle (4-7)	Lowest (8-10)	Mean Score	N
Control	22.7	54.5	22.7	5.43	22
Color Slides	17.4	34.8	47.8	6.47	23
B & W Photos	40.0	30.0	30.0	4.90	10

NSS

FIGURE 5-15: SUBJECT MAPS RANKED FOR INFORMATION CONTENT

	Highest (1-3)	Middle (4-7)	Lowest (8-10)
Control	22.7	50.0	27.3
Color Slides	17.4	34.8	47.8
B & W Photos	50.0	30.0	20.0

NSS

FIGURE 5-16: SUBJECT MAPS RANKED FOR ACCURACY OF CONTENT

	No. Of Incorrect Statements
Control	12
Color Slides	12
B & W Photo	10

FIGURE 5-17: FACTUALLY INCORRECT STATEMENTS

2. Affective Response Fidelity. It can be seen that there is very little difference between the affective responses of subjects to the black and white display and to the color display. In fact the affective response pattern of the subjects viewing the black and white photographs is slightly closer to that of the Control group than is that of the Color Slides subjects. This is true for all three of the affective response measures two of which are at high levels of significance.

As can be seen in Figures 5-20 through 5-22 both of the simulations have resulted in a significant negative bias in the response of subjects to the street; however, it is also evident that the color slides are slightly more severe in this than are the black and white photos. Thus the data clearly reject the hypothesis of interest, that response fidelity should be greater for simulations employing color in their display than for relying only on black and white displays.

	Positive	Neutral	Negative
Control	57.1	9.5	33.3
Color Slides	4.3	13.0	82.6
B & W Photos	10.0	20.0	70.0

Significance .001

FIGURE 5-18: AFFECTIVE TONE OF RESPONSE TO QUESTION 1

	Positive	Negative	N*
Control	55	45	240
Color Slides	23	77	220
B & W Photos	30	70	186

Significance .05

FIGURE 5-19: EVALUATIVE STATEMENTS (QUESTIONS 1-9)

	Sum	Mean
Control	81.79	3.89
Color Slides	101.47	4.84
B & W Photos	87.85	4.18

FIGURE 5-20: EVALUATIVE DIMENSIONS OF THE SEMANTIC DIFFERENTIAL

3. Behavioral Response. The data summarized in Figures 5-23 through 5-27 reject the hypothesis of interest, that a visual display which employs color will result in a response pattern closer to that of actual experience than will a display which is in black and white. For example, when asked for their attitude toward going for a walk or working in the Harvard Street area the subjects who viewed the black and white photographs responded more like the Control group than did the Color Slides subjects. In all the other behavioral questions, about shopping, living or going to a movie or restaurant in the environs of Harvard Street there was little or no difference between the response of the Color and Black and White subjects.

At the same time the findings do not support the tested hypothesis that the behavioral response fidelity of a black and white display will be the same or greater than that of a color display. For example, the Color Slides subjects responses were slightly closer to those of the Control group on the questions regarding living in or going to a restaurant or movie in the area, than were those of the black and white photos (Figures 5-25 and 5-27).

	Positive	Neutral	Negative	N
Control	72.8	9.1	18.2	22
Color Slides	26.0	13.0	60.8	23
B & W Photos	30.0	0.0	70.0	10

Significance .05

FIGURE 5-21: ATTITUDE TOWARD GOING FOR A WALK IN AREA

	Positive	Neutral	Negative	
Control	54.6	13.6	31.8	22
Color Slides	34.7	4.3	60.8	23
B & W Photos	20.0	20.0	60.0	10

Significance .05

FIGURE 5-22: ATTITUDE TOWARD GOING SHOPPING AREA

	Positive	Neutral	Negative	
Control	27.2	0	72.8	22
Color Slides	4.5	0	95.5	23
B & W Photos	0	20.0	80.0	10

Significance .05

FIGURE 5-23: ATTITUDE TOWARD LIVING IN THE AREA

	Positive	Neutral	Negative	
Control	45.4	27.3	27.2	22
Color Slides	21.7	13.0	65.2	23
B & W Photos	40.0	10.0	50.0	10

NSS

FIGURE 5-24: ATTITUDE TOWARD WORKING IN AREA

	Positive	Neutral	Negative
Control	63.7	4.5	31.8
Color Slides	59.1	9.1	31.8
B & W Photos	50.0	20.0	30.0
		NSS	

FIGURE 5-25: ATTITUDE TOWARD GOING TO A MOVIE OR RESTAURANT

In conclusion, the results of this experiment designed to test the hypothesis that the use of color slides to present an environment to subjects will result in cognitive, affective and behavioral responses which are more like those of subjects who directly experience the environment than those of subjects who experience the environment by means of black and white photographs lead us to reject that hypothesis. At the same time the data also reject the two alternate hypothesis: 1) that there is no difference and, 2) that the black and white photographs will result in greater response fidelity.

In short, the data reject both the hypotheses of interest 1a, 2a, and 3a and the tested hypotheses 1b, 2b, and 3b. The remaining alternative hypotheses is that there is no consistent relationship between the addition or deletion of color and response fidelity is supported by these findings.

III. The Effects Of Motion On Response

This third and last of the second phase experiments was designed to test the hypothesis that inclusion of movement or motion into a visual display would increase its response fidelity over that of a still display. More specifically this experiment was designed to assess the plausibility of the following hypotheses.

1. Cognitive Response Fidelity.

   a. Hypothesis of Interest.

      Cognitive response fidelity will be greater for a display which employs motion pictures than for a display of still photographs.

   b. Tested Hypothesis.

      Cognitive response fidelity will be the same or lower for cinematic presentations than for still presentations.

2. Affective Response Fidelity

   a. Hypothesis of Interest.

      Affective response fidelity should be higher for subjects viewing a moving picture of an area than for subjects viewing still photographs.

   b. Tested Hypothesis.

      The affective response fidelity of a still display will be similar to or will exceed that of a cinematic display.

3. Behavioral Response Fidelity.

   a. Hypothesis of Interest.

      Behavioral Response Fidelity will be greater for a photographic display which incorporates motion than for a display of still photographs.

   Tested Hypothesis.

   The behavioral response fidelity of a simulation which employs still photography will be similar to or greater than that of a simulation utilizing motion pictures to display an environment.

1. <u>Cognitive Response Fidelity</u>. The data summarized in Figures 5-28 through 5-35 are not consistent with the hypothesis that a simulation employing motion pictures to represent an environment will result in a cognitive response pattern which more closely approximates that of real experience than will a simulation which utilizes still photographs. For example, although both of the groups who viewed the simulations noted fewer different types of activities in the area than did the Control group, the subjects viewing the movie noted fewer than did the Color Slide group, 54 percent as many as the Control group compared to 65 percent (Figure 5-29). Similarly the response pattern of the Color Slide group more closely approximated that of the Control group in the number of social inferences (Figure 5-28), the number of economic inferences (Figure 5-30) and the pattern of inferences regarding maintenance characteristics (Figure 5-31), made by the respective subject groups in their descriptions of Harvard Street.

In those instances where the color slides did not achieve a higher level of response fidelity than did the color movie the differences were too small to be statistically significant. For example, in terms of the inferences regarding the relative age of the street (Figure 5-32), the amount and accuracy of information contained in their sketch maps (Figure 5-34) and the numbers of factually incorrect statements made in their description of the street (Figure 5-35) there were no statistically significant differences between the response pattern of the Color Movie and the Color Slide groups.

Finally, while the data clearly enable us to reject the hypothesis of interest they are also inconsistent with the tested hypothesis that the cognitive response fidelity of still displays either equals or exceeds that of motion picture displays.

Cognitive Response - Motion

	Number[1]
Control	222
Movie	196
Slides	207

FIGURE 5-26: NUMBER OF SOCIAL INFERENCES[2]

	No. Of Correct Categories	No. Of Mentions	No. Of Incorrect Categories	No. Of Mentions
Control	30	721	0	0
Movie	17	393	0	0
Slides	18	443	4	16

Significance .05

FIGURE 5-27: FUNCTIONAL CHARACTERISTICS[1]

Control	6.4
Movie	3.8
Slides	8.7

FIGURE 5-28: REFERENCES REGARDING ECONOMIC CHARACTERISTICS[1]

	Well Maint.	Poorly Maint.	N[1]	
Control	60	40	56	3.37
Movie	19	81	25	4.93
Slides	37	63	29	3.65

Significance .05

FIGURE 5-29: INFERENCES REGARDING MAINTENANCE CHARACTERISTICS[1]

	New	Old	N[1]	
Control	23	77	31	5.15
Movie	41	59	27	5.00
Slides	20	80	26	5.34

NSS

FIGURE 5-30: INFERENCES REGARDING AGE[1]

	Highest (1-3)	Middle (4-7)	Lowest (8-10)	
Control	22.7	54.5	22.7	5.43
Movie	33.3	33.3	33.3	5.76
Slides	17.4	34.8	47.8	6.57

NSS

FIGURE 5-31: MAPS RANKED FOR INFORMATION CONTENT[1]

	Highest (1-3)	Middle (4-7)	Lowest (8-10)
Control	22.7	50.0	27.3
Movie	28.6	33.3	38.1
Slides	17.4	34.8	47.8

NSS

FIGURE 5-32: MAPS SCORED FOR ACCURACY OF INFORMATION CONTENT

	Incorrect Statements*
Control	12
Movie	10
Slides	12

FIGURE 5-33: FACTUALLY INCORRECT STATEMENTS

2. Affective Response Fidelity. The data from two of the three measures of affective response used in this study offer no support for the hypothesis of interest, that affective response fidelity is greater for simulations employing motion pictures to represent environments than it is for those utilizing still photographs. For example, when the subject's free descriptions of Harvard Street were analyzed for affective responses I found that the Control group made more affective references and were more positive in their response to the street than were the Color Slides and Color Movie subjects. Of the two groups who experienced the simulations the color slides actually came closest to replicating the response pattern of the Control group in both the frequency and direction of their affective responses, although the directional difference was slight (Figure 5-36).

Examination of the evaluative dimensions of the Semantic Differential reveals that both simulations result in a more negative response to the environment, and that there is little difference between the two modes (Figure 5-37). This pattern is borne out in Figure 5-38, which summarizes the overall affective tone of the responses to Question 1 of the Data Collection Instrument, which asks for a free response to the street.

In summary, the data clearly reject the hypothesis of interest and are consistent with the tested hypothesis.

	Positive	Neutral	Negative	
Control	57.1	9.5	33.3	3.04
Movie	20.0	15.0	65.0	4.25
Slides	4.3	13.0	82.6	4.30

Significance .05

FIGURE 5-34: AFFECTIVE TONE OF RESPONSE TO QUESTION 1

	Positive	Negative	
Control	55	45	240
Movie	21	79	169
Slides	23	77	220

Significance .05

FIGURE 5-35: EVALUATIVE STATEMENTS FROM QUESTIONS 1-9

	Sum	Mean
Control	81.79	3.89
Movie	100.41	4.79
Slides	101.47	4.84

FIGURE 5-36: EVALUATIVE DIMENSIONS OF THE SEMANTIC DIFFERENTIAL

3. Behavioral Response. As was the case for cognitive and affective response the data from the five questions asking for the subjects willingness to carry out common everyday activities in the environs of Harvard Street are not consistent with the hypothesis of interest (Figures 5-39 through 5-41). Only in their willingness to go for a walk in the area was there a statistically significant difference and in this instance the response of the Color Slides group most closely approximated that of the Control group (Figure 5-39). Both simulations resulted in less willingness to engage in the everyday activities of going for a walk, going shopping, etc., in the Harvard Street area than did actual direct experience with the street.

In conclusion the data clearly reject the hypothesis that a motion picture presentation of an environment will result in a more veridical response than will a presentation of still photographs. The data are at the same time consistent with the alternate hypothesis that the still photographs are at least equal and in certain instances are superior in terms of their ability to replicate the behavioral response of direct experience.

In conclusion, the results of this experiment designed to test the hypothesis that the use of motion pictures to present an environment to subjects will result in cognitive, affective, and behavioral responses which are more veridical with direct experience than will a presentation of still photographs lead us to reject that hypothesis. The results are, in fact, consis-

	Positive	Neutral	Negative	N
Control	72.8	9.1	18.2	22
Movie	28.6	0	71.5	21
Slides	26.0	13.0	60.8	23

Significance .05

FIGURE 5-37: ATTITUDE TOWARD GOING FOR A WALK IN THE AREA

	Positive	Neutral	Negative	N
Control	54.6	13.6	31.8	22
Movie	47.6	0	52.4	21
Slides	34.7	4.3	60.8	23

NSS

FIGURE 5-38: ATTITUDE TOWARD GOING SHOPPING IN THE AREA

	Positive	Neutral	Negative	N
Control	27.2	0	72.8	22
Movie	4.8	4.8	90.5	21
Slides	4.5	0	95.5	23

NSS

FIGURE 5-39: ATTITUDE TOWARD LIVING IN THE AREA

	Positive	Neutral	Negative	N
Control	45.4	27.3	27.2	22
Movie	42.8	9.5	47.1	21
Slides	21.7	13.0	65.2	23

NSS

FIGURE 5-40: ATTITUDE TOWARD WORKING IN THE AREA

	Positive	Neutral	Negative	N
Control	63.7	4.5	31.8	22
Movie	52.4	9.5	38.1	21
Slides	59.1	9.1	31.8	23

NSS

FIGURE 5-41: ATTITUDE TOWARD GOING TO A MOVIE OR RESTAURANT

tent with the alternate hypothesis that the still presentation results in equal or superior response fidelity.

Conclusion

The findings from these three experiments have resulted in the rejection of two of the three hypotheses of interest selected for this second phase of study. Only the hypothesis that there is an inverse relationship between the degree of abstraction used in environmental displays and response fidelity was supported by the data. Both the hypotheses suggesting that inclusion of color and motion into a display would result in greater response veridicality were rejected unambiguously.

Recognizing the sample limitations involved, these findings suggest that the additional expense and difficulty involved in color and motion picture presentations are not warranted on the basis of increased response veridicality. In fact, there was some indication that both color and motion actually resulted in slight decreases in response fidelity; however, the differences were very slight.

On the other hand, the findings do suggest that additional attempts to increase the detail and realism in perspective drawings are likely to result in increased response fidelity. And further that in terms of cognitive measures it is possible to improve on reality by using realistic drawings. Finally, the data suggest that highly abstract computer graphics (as exemplified by the drawings used in the study) result in severe negative distortions of affective and behavioral response patterns and result in significant increase in inaccurate or factually incorrect conceptions about an environmental setting.

NOTES

1. Frequencies are adjusted to reflect different group sizes. They are adjusted to reflect a common treatment group of twenty subjects.

CHAPTER VI

CONCLUSIONS

The comparative study conclusively demonstrated that, for the samples tested, there are considerable differences between ones response to a simulated environment and his response to the real thing. It should be emphasized, however, that those differences are by no means all in the direction of a degradation of the experience. In a number of instances, where comparison with some objective reality was possible, certain of the simulations proved superior to reality.

Limitations Of The Findings

Before I proceed to summarize the results of the study let me re-emphasize some of the limitations of those generalizations.

The Sample. The general sample, being composed of married college students, is clearly not representative of the population at large. Certainly it remains to be investigated whether or not these findings will hold for other population groups. This same limitation holds for the sample of Architects and Planners which was composed of graduate students in those fields at one institution and as such they are not representative of the professions at large.

The Environment. The environment selected, an older city in-city, shopping street, is also not representative of "the environment" in general. And, it certainly is an open question as to whether the same pattern of results would occur with a new or a smaller scale or a different type of an environment.

The Use Of The Simulations. The limitations which were necessary to enable me to obtain some valid comparisons between media have clearly resulted in a different and more constrained use of the media than would normally occur in architectural or urban design practice. For example, in practice one would normally employ more than one media, and would supplement that with text and verbal descriptions. Observers would be able to ask questions, to look several times at displays, etc. Similarly the rigid standardization of station points, view angles, etc., are hardly typical of an Environmental Designers presentation to an audience of clients/users. On the other hand, the findings do reveal some of the relative strengths and weaknesses inherent in the media. And this knowledge should provide some basis upon which to select appropriate techniques for particular kinds of tasks. It should also assist in the selection of combinations of techniques such that the strengths of one might complement the weaknesses of the other.

The Relative Response Fidelity Of The Six Media

Because the findings are complex it is not possible to reach a definitive conclusion regarding which media is "best" in terms of its ability to replicate the response pattern of reality. However one media, the perspective drawings, did receive higher performance ratings somewhat more frequently than any other single simulation, this to my own surprise. The color movie and color slides performed consistently far worse than I had expected. The modelscope simulations, while ranked lowest in my expectations also performed even worse on the knowledge measures than I had expected, and resulted in far less extensive knowledge, and perhaps more importantly much more inaccurate knowledge than did direct experience.

All the simulations, with the exception of the drawings, consistently resulted in a more negative affective and behavioral response to the street than did direct experience, and in some instances rather severely so.

Cognitive Responses. The comparative study has demonstrated conclusively that there are considerable differences in the amount, type and accuracy of the information about an environment which one is able to gain from experiencing that environment directly versus by means of a simulation. However, those differences are by no means all in the direction of a degradation of knowledge on the part of those who view the simulations. As a means of conveying certain kinds of information about an environment simulations can be more effective than reality itself.

1. The Color Movie: On the environmental knowledge measures used in this study the subjects who viewed Harvard Street by means of the color movie consistently ranked about fourth relative to the other media tested. They did tend to

make somewhat fewer mistakes relatively and were ranked second as a group on the accuracy measures.

2. Color Slides: This media consistently resulted in similar but slightly greater knowledge on each of the dimensions than did the color movie usually achieving third place in the rankings. It did, however, result in somewhat more factual errors than did the movie and also resulted in a relatively poor overall orienting schema.

3. Black and White Photographs: The photographs were somewhat less consistent in their relative effectiveness at conveying information about the selected environment than were the other two photographic modes. It tended to rank second on most of the knowledge measures but in several instances deviated sharply from that pattern. For example, it did not appear to afford subjects adequate information on maintenance and they tended to make fewer aesthetic judgments relatively. Overall, however, the black and white photographs enabled viewers to construct an extensive and accurate image of Harvard Street.

4. The Perspective Drawings: This media performed surprisingly as well as a medium for communicating information about the environment. The Drawings group ranked first on a number of important knowledge dimensions. Subjects viewing this media reported more knowledge of the activity structure of the street than did the Control group. It ranked first of the media in knowledge of the social structure, on the recognition tests, and in knowledge of the relative level of maintenance of

the environment. On other knowledge measures it resulted in an almost identical response pattern to that of the Control group.

5. The Modelscope Movie: Subjects viewing this media tended to rank either fifth or sixth on almost all the knowledge measures used in the experiment. In some instances the Modelscope Movie subjects demonstrated very serious deficiencies in their knowledge of Harvard Street. For example, the subjects who viewed the Modelscope Movie noted only one-fourth as many functional elements as did the Control group and of those cited over half were in error! As might be expected, there was a tendency on the part of these subjects to conceive of the area as new and better maintained than it actually was. The groups responses to the semantic differential exhibited a total variance from that of the Control group three times that of the Drawings subjects. Subjects viewing the modelscope movie made over five times as many factual errors as did Control subjects, and noted only one-fifth as many elements.

6. Modelscope Slides: In general the memory reports both verbal and graphic of the Modelscope subjects were rated in the lowest two categories. For example, Modelscope Slides subjects noted only one-fourth as many activity types as did the Control group and more than one-half of those noted were erroneous! In all the Modelscope Slide subjects made more errors than any other group and made over five times as many as did the Control group. In the overall knowledge ratings the Modelscope Slides subjects were rated in the lowest two categories. There were exceptions to this pattern however. The

Modelscope Slides subjects rated high (in the first three categories) in terms of their comprehension of the purely physical form of the area. Their estimates of the relative maintenance was second closest to that of the Control group. In terms of total variance on the semantic differential scales the Modelscope Slides subjects were rated as fourth in their approximation of the Control group response. The total variance was over twice that of the Drawings subjects but was smaller than that of the Color Movie group.

Affective Response. With the exception of the perspective drawings all the simulations consistently resulted in a more negative affective response to the street than did direct experience, and in some instances rather severely so. This would seem to be less of a problem than would be a positive bias, at any rate less so for practitioners than for researchers. For instance, it would seem to follow that a positive response to a simulation of a proposed environmental intervention would certainly be indicative of a positive response to the real thing if it were actually constructed.

1. The Color Movie: It is in terms of affective responses to the environment that the movie tested resulted in its most serious distortion from the response pattern produced by the real environment. There was consistently, through all the affective measures utilized, a rather large deviation towards more negative evaluations. For example, in one summary measure 45 percent of the Control subjects reacted negatively to the street compared to over 80 percent

of the Movie subjects. In all only one other media resulted in a greater distortion of affective responses from those produced by the Control group.

2. The Color Slides: The color slides, as did the movie, resulted in a very serious negative bias in the subjects affective response to Harvard Street. In fact this media consistently resulted in the most severe variance from the Control group response, of any media tested, and the variance was consistently in the negative direction.

3. The Black and White Photographs: As did the other two photographic media, the Black and White Photographs resulted in a large and pervasive negative bias in the affective response of the subjects to the Harvard Street environment. The photographs ranked fifth of a field of six in terms of its relative response fidelity on this dimension. Approximately seventy percent of the subjects who experienced this medium responded negatively to the environment as opposed to 33 percent for the Control group.

4. The Perspective Drawings: The Drawings group came closest to replicating the affective response of the Control group to Harvard Street. This media resulted in an almost insignificant negative bias.

5. The Modelscope Movie: While the modelscope movie resulted in a very poor showing on the knowledge measures, the subjects affective response to the environment displayed was not so deviant as were the three descriptive simulations tested. The Modelscope Movie subjects were ranked third on

this dimension. This media, as did most of the simulations, resulted in significantly more negative affective response to the environment than that of the Control group.

6. The Modelscope Slides: The modelscope slides, as did most of the other simulations tested, resulted in a significantly higher frequency of negative affective responses than did the Control group. In fact only eighteen percent of Modelscope Slide subjects expressed a positive affective evaluation of the street versus almost 60 percent of the Control subjects. Overall this group was ranked fourth on its relative response fidelity on this dimension.

Behavioral Response. Similar to, and perhaps a result of the affective response patterns, I found that with the exception of the perspective drawings the simulations resulted in a distinct and negative bias in the attitudes of the subjects toward carrying out everyday activities like walking, shopping, etc., in the Harvard Street context. Again this would seem to pose less of a problem than would a positive bias in that if users expressed positive attitudes to the simulations they would in all likelihood be very positive indeed toward the reality. It should be noted that this negative bias in both affective and behavioral response refutes the conventional wisdom that an environment always looks better in "pictures" than it does in reality. It must be emphasized that a part of the meaning of that "conventional wisdom" had to do with the propagandistic use of the media to show the environment in its best light rather than as it actually is. In any case the data do show that given a serious intent to portray an environment "truthfully" the media result in a negative rather than a positive bias.

1. The Color Movie: The movie subjects tended to be much more negative in terms of their willingness to engage in those everyday behaviors suggested in the questionnaire, such as taking a walk, going shopping, etc., in the Harvard Street area than were the Control subjects. In general almost twice as many movie subjects responded negatively as did Control subjects. Compared to the other media, however, several others resulted in even greater deviations from the Control response, both were also in the negative direction.

2. The Color Slides: The Color Slides subjects also were significantly more negative than the Control group in terms of their willingness to carry out the suggested behaviors in the Harvard Street context. Almost twice as many Color Slides subjects responded negatively as did Control subjects.

3. The Black and White Photographs: Similarly this group of subjects responded in a far more negative fashion to the suggested behaviors than did the Control group, ranking fifth in terms of its relative response fidelity on this dimension.

4. The Perspective Drawings: On the behavioral dimension as well the Drawings group comes closest to the Control groups, overall there is a very slight difference between the two groups. The Drawings group proved to be slightly more positive toward shopping and living on Harvard Street than did

the Control group.

5. The Modelscope Movie: The Modelscope Movie subjects were, as a group, the most negative of those tested toward all the behaviors suggested in the questionnaire. They responded negatively almost three times as often as did the Control group on this dimension.

6. The Modelscope Slides: In addition those subjects who experienced the modelscope slides were significantly more negative about engaging in the suggested behaviors in the area, with one exception. Rather strangely forty-one percent of the Modelscope Slide subjects expressed a positive attitude about living in the area shown in the slides as opposed to only 27 percent for the Control group. This is surprising when only seventeen percent stated that they would be positive toward taking a walk in the area. Overall the Modelscope group was ranked third in terms of the degree to which it replicated the response pattern of the Control group on this dimension.

The Effects Of Population Variables

The Environmental Designers Versus The General Sample. The comparative study found that there were differences between the ED and GS subjects. The ED group obtained more information and made fewer errors in their descriptions than did the general sample. This pattern was consistent across all the experiential modes and was not confined to those media which the ED group have the advantage of long familiarity engendered by their use as a professional tool.

The ED group also responded differently than did the GS group in their affective evaluations of Harvard Street. The ED group were more positive in their affective reactions to the actual street than were the GS subjects but on the other hand they reacted more negatively to the simulations of the street.

All in all the ED subjects who viewed the simulations tended to respond more negatively to the idea of carrying out some common everyday activities in the Harvard Street setting than did their GS counterparts.

Thus the data from this experiment suggest caution in generalizing the response of professional environmental designers/planners to lay populations.

Sex. Aside from small and inconsistent differences in their affective evaluations and in their attitude toward taking a walk down Harvard Street, the sexes responded essentially the same to both reality and to the simulations.

Because of the small sample I was unable to make valid comparisons of response patterns for other population variables.

The Effects Of Abstraction, Color, And Motion On Response Fidelity

Abstraction. The data from the second phase experiment support the hypothesis that response fidelity varies inversely with the degree of abstraction (directly with realism) used in encoding the simulation content. The "Realistic" perspective drawings resulted in a response pattern which more closely approximated that of reality than did the "Abstract" drawing along cognitive, affective and behavioral dimensions. Recognizing the sample limitations these findings suggest that additional efforts to increase the detail and realism in environmental displays are likely to result in increased response veridicality. Further, the findings suggest that for cognitive responses it is possible to improve on reality by using realistic drawings.

The findings indicate that highly abstract drawings, such as are exemplified by computer graphics, result in severe negative distortions of affective and behavioral response patterns. Finally, the abstract drawings resulted in significant increases in inaccurate or factually incorrect conceptions about the environment.

Color. The study revealed that there was no consistent relationship between the use of color in a display and response fidelity. The data clearly rejected my initial hypothesis that inclusion of color into a display would result in increased response veridicality.

Motion. The findings of the second phase experiment lead me to reject the hypothesis that the addition of motion to a stimulus display will result in increased response fidelity. In fact, the data were consistent with the alternate hypothesis and revealed that a still presentation actually results in equal or superior response fidelity.

Again recognizing the sample limitations involved, the data suggest that the additional expense and difficulty involved in color and motion picture presentations are not warranted on the basis of increased response fidelity. In fact, there is some indication that color and motion actually resulted in decreases in response fidelity.

Finally, while the findings are not as clear cut and conclusive as I had hoped, they should provide the practicing designer and researcher with some important insights into the effectiveness of several of their most important tools. Using those insights they should be able to make more intelligent choices among media. The findings from the second phase experiments point out some directions for improving the performance of simulations.

APPENDIX A

SIMULATION

APPENDIX A

SIMULATION

This appendix attempts to draw together a number of theoretical perspectives and findings which have relevance to the aims of the study. Its purpose will be to suggest a view of the problem, to provide postulates and assumptions, and to identify the variables and relationships involved. This will be done in two parts. The first will examine the process of simulation itself, what it is, what its broader purposes are, and what the major factors to be considered in a study of simulation effectiveness might be. The second section examines the handful of research efforts to date which specifically address questions of simulation effectiveness.

Simulation: What Is It?

Some authors prefer to distinguish between representation and simulation. For example, Thiel (1971) makes the following distinctions: he defines representation "as that special human activity of abstracting attributes of a situation." He then goes on to note that:

> . . . usually this is followed by the disposition of these attributes into a model, and the manipulation of the model for a variety of human purposes. When this process is carried on internally the representations are called images, schemata, ideas, and concepts; and the process thinking. In order to externalize the process and communicate to others requires a second representation of the internal representation using symbols with shared meanings. These external representations may then be used for a number of purposes. However, when external

> representations are employed for speculative purposes in connection with planning and prediction and decision-making or choosing among alternative courses of action they are defined as simulations. (1971)

For my purposes, however, I will use the two words interchangeably. Simulations are reproductions or representations of actual or conceptual objects, states, processes, events, or of theoretical constructs (McCormick, 1964). They are less complicated than reality and hence easier to manipulate.

"To simulate is to attain the essence of without the reality" (Thomas, 1957). Complete realism is not necessary for successful simulation. The simplicity of simulations, compared with reality, lies in the fact that only the relevant properties of reality are represented. For example, in a road map, which is a simulation of a portion of the earth's surface, vegetation is not shown, since it is not relevant with respect to the use of the map. In a simulation of a portion of the solar system, the balls representing planets need not be made of the same material or have the same temperature as the planets themselves. The choice of the essential aspects of reality being modeled depends upon the purposes for which it is being constructed.

Simulations can be constructed in several media, and can be expressed in various languages: mathematical, verbal, visual, or physical. In many instances simulations will involve combinations of these several modes of representation.

Uses Of Simulation

Simulations are used to accumulate and relate the knowledge we have about different aspects of reality. They are used to reveal reality--and more than this--to serve as instruments for explaining the past and the present, and for predicting and controlling the future. What control science gives us over reality we normally obtain by means of simulations. They are our descriptions and explanations of reality (Ackoff, 1962).

Simulation is not a new device. It's use is as old as man himself. In a broad sense, man has been using simulation ever since he began to draw and carve representations of objects on cave walls and to participate in dramatic events. Some early practical uses of simulation were the construction of models or other representations of objects for testing and evaluation prior to their actual construction. This technique which employs the use of physical and symbolic models or representations has long been used by environmental designers. Leonardo da Vinci's models and drawings are early examples.

Indications are, however, that although they were available and in limited use, perspective drawings and three-dimensional models played a very limited role in the planning of buildings in architectural practice even as late as the Italian Renaissance (Thiel, 1971). It was not until the late nineteenth century that we saw the beginnings of the use of simulations to test designs, materials, etc. And it is not until very recently that we have begun to see extensive use of simulation in environmental design and research. Simulations can be used by environmental designers/researchers for a wide variety of purposes. These include research, design, training, and teaching.

As was noted, the oldest use of simulation in our field is as a design aid for the creation, evaluation, and selection of proposed environments.

> Whenever man conceives the possibility of alternative courses of action in any situation, he is faced with the necessity of making a choice among them. To facilitate this decision he logically makes an estimate of the probable consequences of following each of the alternatives, and then decides between them on an evaluative, trade-off basis. In effect, a model of the situation is constituted, and operated faster than real time, so that the probable consequences of a possible course of action may be discovered before that action is taken. Simulation thus is a three part decision rationalizing operation, involving representations of alternate possible realities followed by their controlled operation to evoke consequences, and then by a comparison of these consequences with a goal structure (Miller, 1960).

Thiel (1971) notes three basic uses of simulation in the process of design.

1. Organization: the creative evocation of latent, vague, nebulous, half-formed internal representations; and by externalization in a self simulative (and self-stimulating) iterative process, giving them their tentative initial tangible form. This is a mid-wifing process.

2. Development: follows from the above, and is a nurturing operation, providing the embryonic representations with a greater tangibility, explicitness, and clarity.

3. Testing: the moment of truth, when the representation of the ideas, images, concepts, forms, etc., are measured against the standards or criteria applicable at that point. One important aspect of this is communication to and

evaluation by affected users or clients.

In the past, simulation has most often been devoted to propagandistic purposes, as a means of "selling" the designer's preferred solutions or else it has been used internally by the designer as a design tool rather than as a means of involving the user or client in the process of search and selection. Some recent simulation systems, which were developed as design aids, "Discourse" (Porter, 1968) and "Urban 5" (Negroponte, 1969), rely extensively on the use of computers to store, retrieve and display information about environmental systems, and to perform various logical and mathematical operations on it. This serves as a means of enormously increasing the number of alternatives a designer can investigate, as well as improving the quality of that investigation.

Simulation is also useful in helping the environmental researcher build a body of knowledge concerning environment and behavior. One important object of that endeavor is to formulate theories that will enable us to predict the response of users to their physical environment. Simulations are obviously a useful device for exploring such theories and testing hypotheses. In fact, the experiment itself is a form of simulation. Simulation is especially useful to the designer or researcher faced with the following situations:

1. Investigating aspects of the "real world" which do not presently exist.

2. Investigating areas where it is forbidden on ethical or political grounds, to "tinker" with the "real world."

3. Investigating areas where the economic or social costs of experimentation on the real system are too great.

4. Investigating situations where events in the "real world" are uncontrollable for experimental purposes.

By successfully simulating the above situations it is possible to experiment with the simulated system.

Simulation is also a valuable teaching and training device. It is useful in teaching people about systems, events, objects, etc., and training them to fill various operating roles in the real world. Such techniques will undoubtedly prove of great use in participant planning and design.

Types Of Simulation

With the wide variety of simulations being developed and in use, it is helpful to be able to classify them. Two somewhat different ways of characterizing them are:

1. On the basis of the degree of abstraction involved in the transformation.

2. According to their purpose or use.

Harmon (1961) employs a continuum. At one end is "identity simulation," in which the real world is used as the model to obtain knowledge about itself. The complexity of the system being studied, however, usually makes the use of "identity simulations" impractical. At the other end of the simulation continuum is complete "analytical simulation." This type represents the highest degree of abstraction from the real world and is exemplified by the use of a mathematical model of the system. The existence of systems involving relatively unknown sets of variables makes complete "analytical simulation" difficult to attain. Between these two types of simulation are the "laboratory simulation." In "laboratory simulation," the replication of the salient aspects of the real world system is attempted within the laboratory.

In a similar vein Larsen (1965) classifies a simulation according to the degree to which it resembles reality. In "Isomorphic simulations," all the operational features of the real situation are included and thus, in theory, they could replace the real situation. This type of simulation is similar to Harmon's "laboratory simulation" (1961).

Both Larsen (1965) and Ackoff (1962) also classify simulations according to their structuring characteristics. They employ three different types: the iconic, the analogue, and the symbolic. "Iconic models" are large or small scale representations of states, objects, or events. Because they represent the relevant properties of the real thing by those properties themselves, with only a transformation in scale; iconic models look like what they represent. For example, road maps and aerial photographs represent distances between and relative positions of places and routes between them. With respect to those relevant properties such maps or photographs look like the real thing; they differ from it with respect to those properties only in scale. Thus, iconic models are characterized by the use of some metric transformation or scaling. They are of use primarily in the description of static things, or of dynamic things at a point in time.[1]

Analogue simulations are characterized by the use of a convenient transformation of one set of properties for another set of properties in accordance with specified rules. Thus, if one desires to show relief (i.e. the third dimension or elevation) on a map we do not necessarily have to produce a three-dimensional map; rather we can resort to contour lines which by their distance apart convey information about grades. Or if we want to show the kind of road, we use color or shading and provide an appropriate legend which explains the transformation of properties. Thus one property is used to represent another, and hence the necessity of a legend. This type of simulation may also be used to represent dynamic systems or processes. For example, an electrical system or a national economy may be represented by an hydraulic system. In such cases the flow of water may represent the flow of electrical current or resources. The slide rule is a familiar analogue in which quantities are represented by distances proportionate to their logarathim. Graphs in which such properties as costs, time, numbers of people, and percentages are plotted are also analogues.

Finally there are "symbolic simulations" in which the properties of the thing represented by means of symbols, both mathematical and logical. Thus a relationship shown in a graph (as an analogue) can also be shown in an equation. The equation can be a symbolic model. Models in which the symbols employed represent quantities are usually called mathematical models.

Iconic models are the most specific and concrete of the three types of model but are usually the most difficult to manipulate for purposes of determining the effects of changes on the real thing. In the analogue easier to manipulate properties are usually substituted for the real ones. As a consequence such models are more abstract and general. For example, if we examine a graph in which distance and time are plotted, it is not likely that we can identify the phenomena involved unless the graph is labeled appropriately. Symbolic models are the most abstract and general and are the easiest to manipulate. In general, the amount of analysis required to construct a model is inversely related to the ease of manipulating it once it has been constructed (Ackoff, 1962). Thiel (1971) has illustrated these categories in the table below:

	Increasing	Abstraction		Decreasing
Simulation Type	Analytical (symbolic)	Laboratory (homomorphic)		Identity (isomorphic)
		Analogic	Iconic	
Media Examples	Logical systems	Flow Charts	Scale models	The "real world" or the actual system itself.
	Mathematics	Topological Drawings	Pictorial Drawings	
	Verbal language	Process Diagrams	Photos	
	Notation systems	Maps	Films	

FIGURE A-1: A CLASSIFICATION OF SIMULATION SYSTEMS

This study will concentrate on determining the effectiveness of that class of simulations most used by designers and researchers in conjunction with lay audiences, iconic simulations.

Fidelity Of Simulation

A basic issue currently facing environmental designers and researchers in their use of simulation is that of "fidelity"; that is, the degree of similarity between the simulation and that which is being simulated. The question of fidelity, however, must be related to the intended use of the simulation. For example, in the case of a simulator used for training the primary concern is with respect to the transfer in training that would take place in the case of people who train on a simulator and then transfer to the real thing. In my own case, where I am interested in ascertaining the response of users/subjects to particular environmental attributes or qualities, the concern would be with the "fidelity" of response. It is important, therefore, to distinguish between object or event ("Objective") simulation and human response ("Behavioral") simulation. Fidelity of "objective" simulation refers to the degree of similarity of the objective or physical features of the simulation versus the reality. Fidelity of "behavioral" simulation refers to the degree to which the human behavior involved in the true-life situation is similar to that which is involved with the simulation. One of the primary objectives of this study will be to examine the relationship between objective fidelity and response fidelity.

<u>Review Of Related Research</u>

This review is confined to those studies known to the author which are specifically related to questions of the response fidelity of simulations. The many studies concerned with the development of the techniques themselves or with their objective fidelity are not included.[3]

Winkel and Sasanoff (1966) investigated the behavioral equivalence between a simulated environment and a real environment in their study, "An Approach to an Objective Analysis of Behavior in Architectural Space." They confined their measure of equivalence to that of movement patterns. In their study they reproduced the interior of an existing museum gallery by subdividing the entire floor area on a five-foot grid, and taking eight color slide photographs (each subtending an angle of 45°) at 45° increments around the compass at each grid intersection. Subsequent slide projection on three adjacent screens provided a 135° wide angle simulation of the view in any of the eight compass directions, at any of the grid points in the space, and by means of appropriate changes in the projected slides, sequential projection could simulate virtual rotations and translations in space. They then presented the slides to a group of subjects who were allowed to "move through" the simulated space by giving instructions as to a sequence of desired movements, i.e. straight ahead, to the right, etc. . . . The subjects' "movements" were then recorded and compared with a sample of subjects who were tracked through the actual museum. Their findings indicated only a "fair" degree of similarity between the movement patterns of the two groups. The main difference being that the groups who experienced the real environment tended to stick to a few clearly defined "paths" whereas those who experienced the simulations were more random in their movements. Some of the subjects experiencing the simulated environment evidenced disorientation during the experiment.

Bonsteel and Sasanoff (1967) conducted a sequel to the previous study employing a closed circuit television camera on a dolly system which was then moved through a three dimensional model of the museum space cited above. The procedures employed were essentially the same as in the previous study. One important difference being the angle of view. On the slide simulation the angle of view was 135° whereas in the television simulation the angle was reduced to 45°. The subject seated in front of the television monitor would instruct the operators as to his desired movements. One important aspect of this study was that it was a real-time study, in that there was no time lost in carrying out the desired movements as in the previous slide study. Further, the use of the television image of a scale model is useable for predictive simulations.

The sample in this study was smaller than that of the previous study but was of similar composition, i.e. college students between the ages of seventeen and twenty-one.

The findings again indicated only fair correspondence between movement patterns and a difference of only two minutes of average viewing time. Of more significance, however, were comments made by the subjects which indicated a fairly high degree of awareness of the irreality of the experience. The subjects were for the most part unable to reproduce their movement pattern on a map of the space and many expressed surprise at the shape of the room.

Both of these studies concentrated primarily on reproducing behavior and with the exception of two questions in the latter did not focus at all on cognitive or affective variables, nor on the subjects attitudes toward carrying out behaviors in the setting.

Howard, Myenarski and Sauer (1972) have done a comparative study of affective responses to real and represented environments.[4] They simulated four buildings using color slides and black and white slides. They then had three groups of about sixty subjects evaluate the four buildings on twenty-eight semantic differential scales. One group saw the actual buildings, the second saw color slides and the third black and white slides. Two of the buildings were public and were familiar to the subjects, and two of the buildings shown were unfamiliar and were privately owned. The semantic differential ratings were factor analyzed and they found:

1) That their subjects affective responses to slides were not the same as they were to the actual environments.

2) That the slides elicited less extreme responses and more negative affective evaluations than did the actual environments.

3) Subjects tend to be more neutral rather than nega-

tive when shown slides of familiar buildings, and more negative when shown slides of unfamiliar private ones than they are to the actual environments.

4) That there was little difference between responses to the black and white and color slide representations. The color slides produced slightly less distortions from the actual environments but the difference was very small and the pattern inconsistent.

5) That higher levels of the relative brightness of the slides tended to produce less regression toward neutral responses and less bias toward more negative responses as compared with the responses of subjects to the actual buildings.

Seaton and Collins (1972) also have compared the response of subjects to real and simulated environments.[4] As in the Howard, et al., experiment Collins and Seaton had their subjects rate four buildings on five semantic differential scales. However, they had two groups of subjects view the buildings from different vantage points. From each vantage point each of the four buildings was simulated by means of a three dimensional scale model, a color photograph, and a black and white photograph. As in the previous study, (and my own) the subjects were subdivided into eight groups. Each group viewed all four buildings from one of the vantage points either by means of one of the simulations or in reality.

The subject ratings were then factor analyzed. Their findings were somewhat inconclusive (or incoherently reported). In general the overall pattern of response to the simulations was fairly similar to that of the actual building. The black and white photos tended to produce somewhat more positive responses on the evaluative scales, but the differences were small and not very consistent.

In this appendix I have sought to define simulation and to describe the different types of simulation available to an environmental designer. I have described the different uses for simulations and have developed some insights into, and reviewed the existing research dealing with the fidelity of simulation. In the next appendix I will develop some further insights regarding simulation effectiveness from the theory of communication and perception-cognition.

NOTES

1. It should be noted that there is no reason in principle why Iconic models can't simulate motion and time. Especially with the use of computer graphics it is increasingly possible to use iconic simulations in a dynamic mode.

2. For excellent reviews of the literature concerned with the development of simulation techniques with special reference to environmental design, the reader is referred to the work of four authors.

    1) Donald Appleyard, et al., The View from the Road, Cambridge: MIT Press, 196.

    2) David Bonsteel, "Application of Computed Graphics to Sequential Experience," Unpublished manuscript, 1970.

    3) Kevin Lynch, "Site Planning," Second Edition, Cambridge: MIT Press, 1971.

    4) Phillip Thiel, "Towards an Envirotecture," Unpublished, manuscript, 1972.

3. It should be noted that both these studies were begun after my own.

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APPENDIX B

APPENDIX B

In this appendix I will examine the use of simulations as a process of communication between a designer/researcher and a client/user/subject audience. The purpose of the appendix is to draw together important insights into this process from the Theory of Communication and the Theory of Perceiving and Remembering.

First, I shall develop a model of the communication process itself, as a means of identifying elements and relationships. This section will be framed as a general discussion of the communication process with some specific references to the particular problem of simulation effectiveness. The object of the discussion will be to point out where and under what circumstances to control or to make observations of variables and to derive hypotheses regarding the effects of various types and dimensions of simulations on response veridicality.

There are several models of the communication process. A comparison, however, indicates that they are quite similar, differing only in the addition or subtraction of one or two elements, mainly as a result of the difference in point of view of the disciplines from which they emerged. The model outlined below is adapted from one developed by Westley and MacLean (1957) which seems most consistent with the configuration of this problem.

It is possible to distinguish two basically different communication situations, they are termed here as "direct" and "indirect." Most of the information regarding the objects and events in the environment comes to us directly through our sensory apparatus. Thus a person sees directly the traffic about him. He hears the noise of an engine, and other sounds. With other sensory organs he senses the air temperature, his body position and movement, odors in the air, etc. But it is not always possible to experience the environment directly.[1] Often the information a person receives about the environment comes to him indirectly in the form of symbolic (language) reports via the media, his parents or peers, or in the form of iconic or analogic representations such as pictures or maps.

First let us look at the simple or direct model. Let us assume that an X is any object (or event) that has characteristics capable of being transmitted in some abstracted form. What is transmitted is not the event but an abstraction from it converted in some way to transmissible form. Hochberg (1964) describes this in the following quote:

> What matters to us in the world is objects and their properties, but our major sensory systems are <u>not</u> directly in contact with these objects at all. Therefore psychologists call them distal stimuli, indicating that they only stimulate our nervous system indirectly, by reflecting light-energy, sound-energy, and so on, which may or may not even reach our sense organs. The energy patterns that do reach and affect our sense organs are called the proximal stimuli. We can only know about the distal physical world--the world of space and objects and motion--through these proximal stimulus distributions, acting on our sense organs. If this pattern of proximal stimulation is interferred with, no object will be observed; conversely, if the proper proximal stimulation can be presented the object will be observed even if it is really absent. (Hochberg, 1964)

Let us assume further that a Receiver (R) has a need for such information as a means of orienting itself in it's environment and as a means of obtaining problem solutions and need satisfactions. The significant thing is that X's have stimulus characteristics that can be responded to by R. From the standpoint of the receiver, the world consists of a confusion of "objects of orientation" (X's). The receiver has within his sensory field an infinity of potential X's. He has learned that in order to obtain satisfactions and solve security problems he must orient toward X's selectively.

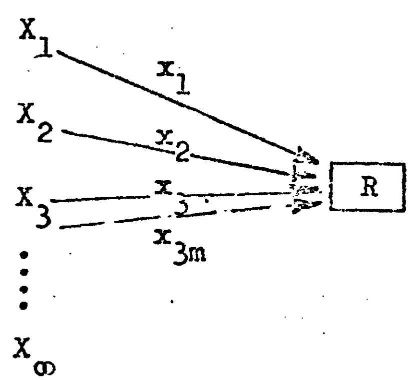

FIGURE B-1: DIRECT COMMUNICATION

Figure B-1 above illustrates the "direct process" wherein "objects of orientation" (X_1 ....X_0) in the sensory field of the receiver (R) are transmitted directly to him in abstracted form (x_1....x_0) after a process of selection from among all X's. Such selection being based at least in part on the needs and problems of R, his state of "perceptual readiness" in Bruner's (1957) terms. Some or all are transmitted in more than one sense (x_{3m} for example).

Now let us examine the second situation involving "indirect communication". The same set of X's are selected and abstracted by a communicator or sender (S) and transmitted as a message (X^*) to R, who may or may not have part or all of the X's in his sensory field (X_{1r}).

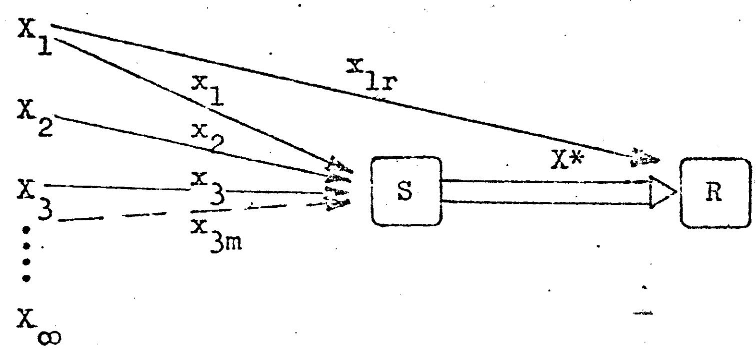

FIGURE B-2: INDIRECT COMMUNICATION

As Figure B-2 illustrates, the significant factor about indirect communication is that X's have stimulus characteristics X_{1r} which can be responded to in the absence of a sender (S). For instance if R looks out his window and sees flames in his neighbor's house, the event itself as surely transmits information to him as would the shouts of his neighbor about the fire.

Two basic distinctions between direct communication and indirect communication are:

1) Direct communication typically involves more sense modalities.

2) It also provides more immediate feedback.

In other words, more senses (and kinds of stimuli) can come into play in direct communication. Thus, the receiver has a "cross-modality" check. He can clear impressions he gets through one sense with those he gets through another. Indirect communications, then, differ from direct communications to the extent that:

1) the number of modalities tends to be minimized, and

2) "orientative feedback" is minimized or delayed.

We will return to these points later in this appendix. A somewhat more detailed examination of the indirect process reveals several additional elements. How do the X's (events, objects, etc.) get translated into a code, a language? This requires a third communication ingredient, an encoder (E). The communication encoder is responsible for transforming the abstractions of object X, selected by S, into some form of symbol containing meanings shared with R.

The fourth element is the medium (M), by means of which the message or symbols (X^*) are transmitted. It is correct to say that messages can exist only in some medium. The choice of media is often an important factor in the effectiveness of communication.

One additional element is necessary. Just as a sender needs an encoder to translate the events (X's) into a code, the receiver needs a decoder (D) to retranslate, to decode the message and put it into a form that the receiver can use. In our case a simulation technique and its related equipment are used to perform these functions. Finally, the receiver (R) responds to the message by altering or supporting his cognitive structure, affective state, or physical activities.

These, then, are the elements of the communication processes to be examined in our study.

1. The Environment (X's): The totality of objects and events "out there," in the sensory field of the observer.

2. The Communication Sender (S): A person or group engaged in selecting and transmitting messages purposively, in our case an environmental designer/researcher whose purpose is to assess responses of user/subjects to an environment through use of a simulation.

3. The Encoder (E): The process by which X's are transformed into X's,* in our case a simulation technique.

4. The Message (X^*): A set of x's abstracted from X, translated into a code, and structured into a transmission or message, i.e. an environmental display or simulation.

5. The medium (M): A particular medium capable of storing and transmitting symbols, such as movies, slide transparencies, or video displays.

6. The Decoder (D): The process whereby the message is retranslated into a form which the receiver can use, i.e. a display device.

7. The Communication Receiver (R): A person or group which requires and uses information about its environment for the satisfaction of its needs and the solution of its problems, i.e. an environmental user or research subject.

8. The Communication Effect (Y): The response of the receiver to the communication content.

Figure B-3 below compares the indirect and direct processes.

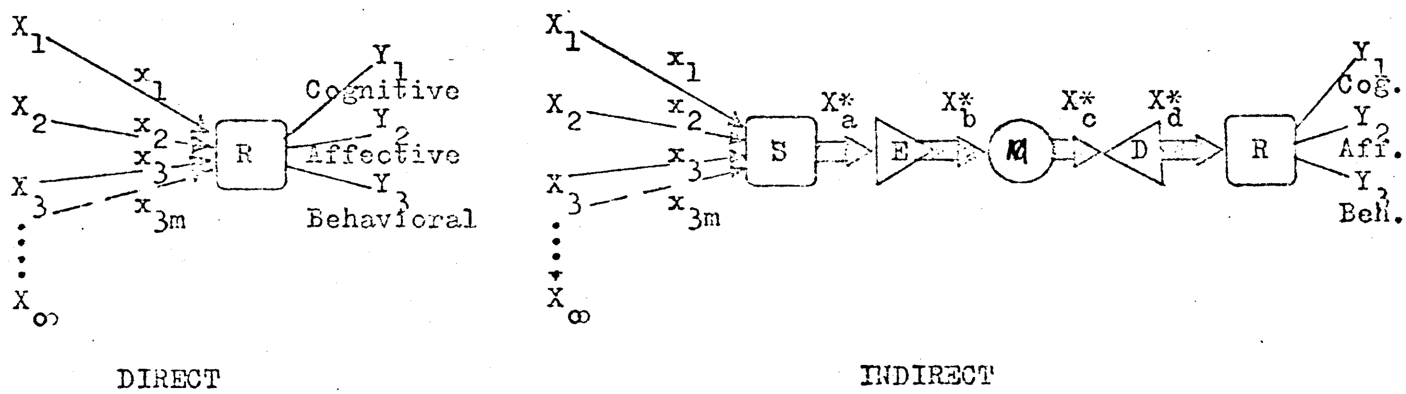

FIGURE B-3: DIRECT AND INDIRECT COMMUNICATION COMPARED

These elements should not be viewed as separate things or entities or people. They are the names of behaviors which have to be performed for communication to occur. More than one person may be involved in the same behavior-form (multiple senders, encoders, etc.) as in the case of a design team. One person may perform more than one set of behaviors, the same person may be both a sender and an encoder or receiver, as in the case of the designer using diagrams and drawings in a self communication process during the search phase of the design process.

One further factor which is important to note is that messages can be purposive or non-purposive. A purposive message is one that S originates for the purpose of modifying R's perception of an X. A non-purposive message is one which is transmitted to R directly or by means of a medium (M) and in the absence of any communicator's (S) intent to influence him (R). Ideally in the absence of a communicator's intent to influence (R) he (S) transforms his message X^* into an X.

Although the outwardly professed purpose of most environmental simulation has been non-purposive, in fact much of their usage has been purposive to the extent that it verges on being propagandistic. It is common practice to select that view of the environment which puts it in its best light. To eliminate undesired contextual content such as a buildings surroundings, by means of simple omission or by means of careful selection of view point such that unwanted elements are obscured by trees are commonly employed artistic devices.

The Fidelity Of Communication: Determinants Of Effect

Shannon (1948) has noted that communication can be viewed technically (emphasizing signal transmission), semantically (emphasizing problems of meaning), or in terms of effects (emphasizing behavioral consequences). The main emphasis of this study, as has been noted, is upon the later two views. Given a purpose for communicating, a response which is to be elicited, a communicator (S) hopes his communication will have high fidelity. By fidelity it is meant that the response which is congruent with the expectations and intentions of (S). In our case a set of responses to a simulated environment which are equivalent to those which would be obtained from its "real" counterpart. A high-fidelity encoder (E) is one that expresses the meaning of the sender (S) perfectly. A high-fidelity decoder (D) is one that translates a message for the receiver (R) with complete accuracy.

In analyzing simulation-communication, we are interested in determining what increases or decreases the fidelity of the process. Shannon and Weaver (1949) in talking about the fidelity of electronic communication, introduced the concept of noise. The usual way of thinking of noise is in terms of sound that is distracting--as messages that interfere with other messages. The Shannon-Weaver concept is similar to this common meaning. They defined noise as factors that distort the quality of a signal. We can broaden this meaning of noise to include factors in each of the ingredients that reduce effectiveness. Noise and fidelity are opposites. Eliminating noise increases fidelity; the production of noise decreases fidelity. Some of the literature in communication talks about noise, some about fidelity. The same problem is being discussed.

The basic concern related to noise and fidelity is the isolation of those factors within each of the ingredients of communication which determine the effectiveness of communication. When analyzing those ingredients, what factors must be taken into account? What determines the ways in which each of the ingredients works in a given situation?

An examination of the model communication process diagrammed in Figure B-3 enables us to predict how such a system will work. For one thing, such a system can be no stronger than its weakest link. There may be a filtering or distortion at any stage.

An example of this process might take the form of the color slides used in the experiment. The fidelity of the simulation depends on each link in the chain.

1. The sender: in taking the picture he must have sufficient knowledge of the subject matter to enable him to point the camera in the right direction, sufficient operating knowledge of the camera to enable him to focus, set the exposure, and otherwise operate the camera correctly.

2. The encoder: the quality of the image depends on the quality and characteristics of the camera, its lens, format size, etc.

3. The medium or channel: the quality of the image depends on the quality and characteristics of the film, i.e. is it color or black and white, how sharp an image will it produce?

4. The decoder: the quality of the image received depends on the quality and characteristics of the projector and screen. How bright is the bulb, how large an image will it produce, how good is the lens, etc.?

5. The receiver: is he interested, receptive, or hostile? What is his visual acuity, his state of perceptual readiness, etc.?

It is obvious that the quality of a simulation (its fidelity) depends on the weakest link in this chain, and that in order to improve a simulation the marginal benefits in one must be equal to the marginal benefits in all the other links or else the effort is wasted. For example, it does no good to use a Hasselblad camera and then to project the slide with a cheap plastic lensed projector.

It is possible, then, to identify those factors in the process which determine communication effectiveness, the fidelity of the process. The remaining sections of this appendix will deal with each of these factors in more detail.

The Environment (X's)

The world of experience of man is composed of a tremendous array of discriminably different objects, events, people, impressions,--the environment. There are estimated to more than seven million discriminable colors alone, and in the course of a week we come in contact with a fair proportion of them (Bruner, 1962). Thus, from the standpoint of an observer or receiver (R), the world consists of a confusion of "objects of orientation" (X's). He has within his sensory field an infinity of potential x's. As a consequence of this infinite quantity of information and our limited cognitive capacities we are by nature perceptually selective. What we need to know here is the relationship between the form qualities of the environment itself and these marvelously purposeful selective powers which enable us to select that information needed and ignore the rest.

Carr (1967) in his article "City of the Mind" provides us with an excellent description of this process which is summarized below. First of all the processes of perceiving and knowing are inseparably inter-twined. An observer takes in an enormous amount of information through his sensory apparatus, his eyes, ears, etc., most of which is not relevant to his purposes. In order to make effective use of this information, to make it meaningful, he must condense or simplify it and relate it to his other experience.

Humans operate on an apparently fundamental plan to seek out simple nameable features and objects whenever possible. They possess a number of mechanisms which operate in a more or less automatic manner to sort and discard information. As Lynch (1960) has noted, what is simple in our experience is both a product of our familiarity and of the sensory qualities of the environment itself. So it is by means of a kind of conventionality, by being most receptive to the recurrent regularities of his experience, that the observer is able to select from the enormous quantities of incoming sense data that which is most appropriate to his purposes. Obviously considerable detail is lost and considerable distortion is incurred in the process.

There are, however, some details which cannot afford to be lost. The observer strives to be ready to see those features of the environment which relate to his current purposes and needs, regardless of their unfamiliarity. So that even in a strange environment an observer must be able to find a place to eat when he is hungry. Further, he must at all times be ready to attend to at least certain kinds of novelty, because what is unfamiliar may also be dangerous, and he is programmed to be maximally attentive to such potential danger signs, as rapid movements, flashing lights, etc. In other situations, information comes in too fast, is confusing or incomplete, so that the observer has difficulty in forming an adequate hypothesis about what is really "out there." As a consequence our strategy for the organization of perceptual experience by means of such elements as simple forms and nameable objects is often frustrated, especially in a complicated, rapidly changing environment like a city. In this situation the observer finds himself confused and disoriented. He then seeks to narrow still further the messages from the environment to which he responds. This adaptation is fortunately possible although it results in a degradation of the full experience.

No matter what information he seeks, his ability to achieve it is affected by the form of the environment but again observers who possess differing familiarity with an environment and who are carrying out different plans will attend to different features of that environment. The form of the environment not only influences an observers ability to achieve new information but also how he organizes experience in his memory. The purpose of memory is to represent experience in a form which can be retained in the brain un-used for an indefinite period and then located at some future time. This requires an efficient filing system and humans have typical strategies for accomplishing this enormous task efficiently. An observer may retain literal images of a few significant events or places, but normally he uses a few key perceptual features to classify each unique experience under some simple, usually verbal category. By doing this the experience is not only simplified and condensed, but is related to other similar past experience. For example, while he may have a visual image of Coolidge Corner,[1] he is likely to represent it as an upper middle-class shopping area with a few named features such as the S. S. Pierce Store. This is the most effective way of relating this information to other knowledge of the city and consequently making the memory more accessible for future use.

There are some essential features of the urban environment, such as the visible form of the spatial pattern which are not easily translated into words, however. Carr notes that there are three basic types of structuring these features in memory, "in terms of familiar sequences of visual images, in the form of extended spatial images of important areas, or schematically as a simple, overall diagram, easily describable in words" (Carr 1967:209). There are several ways in which the form of the environment itself can affect (facilitate or frustrate) not only our ability to achieve information but also how we organize it to be retained in our memory representations, and finally how easy it is to re-represent it externally in order to communicate it to others.

Lynch (1960) identified the important form qualities as being:

A. Legibility or imageability

1. Singularity or figure-background clarity: sharpness of boundary, closure, contrast of surface, form, intensity, complexity, size, use, spatial location.

2. Form simplicity: clarity and simplicity of visible form in the geometrical sense, limitation of parts.

3. Continuity: continuance of edge and surface,

nearness of parts, repetition of rhythmic interval, similarity, analogy, or harmony of surface, form or use.

4. Dominance: dominance of one part over others by means of size, intensity, or interest, resulting in the reading of the whole as a principal feature with an associated cluster.

5. Clarity of joint: high visibility of joints and seams, clear relation and inter-connection.

6. Directional differentiation: asymmetries, fradients and radial references which differentiate one end from another or one compass direction from another.

7. Visual scope: qualities which increase the range and penetration of vision, either actually or symbolically.

8. Motion awareness: the qualities which make sensible to the observer both the visual and the kinesthetic senses his own actual or potential motion.

9. Time series: series which are sensed over time, including both simple and item by item linkages, where one element is simply knitted to the two elements before and behind it and also series which are truly structured in time and thus melodic in nature.

10. Names and meanings: non-physical characteristics which may enhance the imageability of an element.

Three other factors identified by Lynch (1960) and investigated by others[3] at MIT are of importance.

B. The relative social values which those elements, i.e. districts, streets, buildings, etc., symbolize (Gulich, 1963).

C. The exposure of those elements to the viewer's eye (Hassan, 1965).

D. The degree of congruence between A, B, and C (Steinitz, 1967).

Thus as we can see, the environment consists of an infinity of "objects of orientation" (distal stimuli) which are capable of being perceived directly or are capable of being transmitted and received in some abstracted form (proximal stimuli) as information. And as we have shown, the form of the environment itself has a significant effect on an observer's (S or R) ability to achieve information and to represent it in memory and finally to re-represent it externally so as to communicate it to another person.

The Sender (s)

A communication sender, after determining the way in which he desires to affect his receiver, selects abstractions of X which are to be encoded into a message intended to produce the desired response. We have already discussed certain aspects of the way he goes about this in the previous section on the environment. There are, however, at least four further kinds of inter-related factors within the sender which can also affect fidelity. They are his: a) communication skills, b) attitudes, c) knowledge level, d) socio-cultural position.

Communication Skills. A senders communication-skill level determines (or affects) communication fidelity in two ways. First, they affect his ability to analyze his purposes and intentions, and consequently what he wishes to communicate. Secondly, they affect his ability to select relevant abstractions of X to be encoded into a message which expresses his intentions. Thus, a persons communication-skill affects his perception and his thinking and as such limit his ability to express his purposes and limit the ideas available and the ability to manipulate those ideas--to think (Berlo, 1960).

Attitudes. A second factor is the sender's attitudes. The attitude of a communication sender affects the way he communicates. An attitude is a mental state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related (Allport, 1966). The sender's attitudes affect the process in three ways: 1) his attitude toward the subject matter, 2) his attitude toward himself, 3) his attitude toward the receiver.

Attitude Toward The Subject Matter. A sender's attitude toward an object influences his perception of that object and consequently his selection of those abstractions of X deemed relevant to his message intent. Thus, one's attitude toward a subject is by definition a pre-determinant in his perception of that subject. For example, in reading a book or an article you get an impression of the writer's attitude toward the subject merely from those aspects of the subject he chooses to deal with. Therefore the fidelity of the process will depend upon the degrees of congruency between the attitude of the sender and the receiver. This is a persistent problem between environmental designers and lay user groups. It is possible (to varying degrees) to minimize the effect of the sender's attitude toward a subject by consciously avoiding encoding those attitudes (by being "objective") this will be dealt with under the section on "treatment".

Attitude Toward Self. The whole complex of variables that go together to comprise the individual's "personality" are related to the concept of "self-attitude" in communication, and extensive evidence indicates that this affects an individuals ability to communicate.

Attitude Toward The Receiver. The third kind of attitude that affects the sender's communication behavior is his attitude toward the receiver. One's attitude toward another affects the message content and treatment, because of a recognition on the part of the sender, that if he wishes to affect the receiver, he must select abstractions of X that are relevant to the receiver's need-value system.

Knowledge Level. It is obvious that the amount of knowledge a sender has about his subject will affect his message. One cannot communicate what he doesn't know; one cannot communicate with maximum effectiveness content material which he does not understand. On the other hand, if the sender knows "too much," if he is overspecialized, he might err in that his communication skills are employed in so technical a manner that the receiver cannot understand him. Knowledge of the communication process itself affects sender behavior. What and how the sender communicates depends on his ability to conduct the kind of analysis we have been describing. In other words, his communication behavior is affected by how much he knows about his own attitudes, the characteristics of his receiver, the ways in which he can produce or treat messages, the kinds of choices he can make about communication channels, etc. Knowledge of communication affects communication behavior.

Position In A Socio-Cultural System. No sender communicates as a free agent, without being influenced by his position in a social-cultural system. We need, of course, to take into account the personal factors of the sender: his communication skills, his attitudes, his knowledge. But we need to know more than this. We need to know the kind of social system in which he is operating. We need to know where he fits in that social system, the roles he fulfills, the functions he is required to perform, the prestige that he and other people attach to his role and to him. We need to know the cultural context in which he communicates, the cultural beliefs and values that are dominant for him, the accepted forms of behavior that are acceptable or not acceptable, required or not required in his culture. We need to know about his own expectations and the expectations others have of him.

All groups to which a sender belongs, all the values and standards which he has learned, his own perceptions of his "place in the world," his position in his own social class, his rank--all these things will affect his communication behavior. People in different social classes communicate differently. People from different cultural backgrounds communicate differently. Social and cultural systems partly determine the symbol choices which people make, the purposes they have for communicating, the meanings they attach to certain symbols, their choice of receivers, the channels they use for this or that kind of message, etc.

In summary there are at least four kinds of factors that operate on a communication sender. Each affects his communication behavior, his purposes, his selection of content, his messages. Each affects the way in which the receiver will respond to his messages. Factors in the sender include: 1) Communication skills, 2) Attitudes, 3) Knowledge level, and 4) Position in Socio-Cultural System.

<u>The Encoding - Transmitting - Decoding Process: Simulation</u>

In terms of our model, this grouping of elements (shown in Figure B-4) performs the following functions; after the sender has selected the abstractions of object X appropriate to R's need satisfaction or problem solutions then: 1) the encoder transforms them (X's) into some form of symbol (X^*) containing meanings shared with the receiver (R), and 2) it transmits such symbols ($X's^*$) by means of some channel or medium (M) to R, and finally, 3) it retranslates or decodes the message into a form the receiver can use. These elements serve as a means of extending the environment of R. We have already discussed certain aspects of this process in Appendix A.

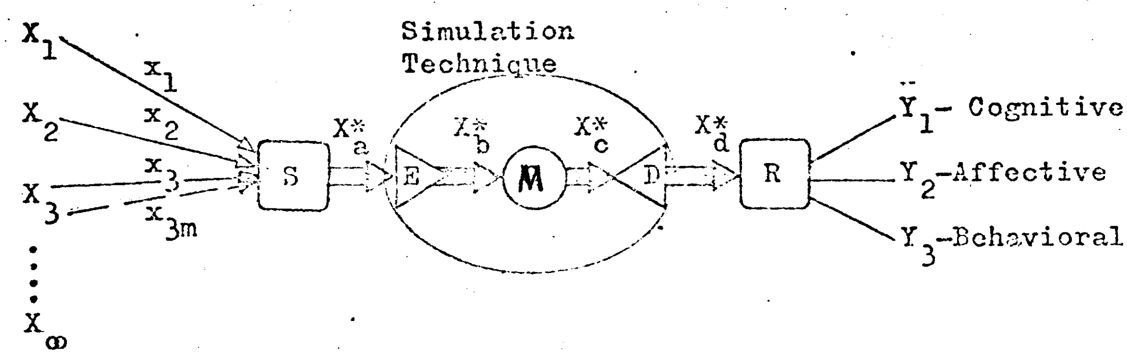

FIGURE B-4: SIMULATION TECHNIQUE

Encoding

At least three factors need to be taken into account in the encoding process: 1) the message code, 2) the message content, and 3) the message treatment. In discussing code, content, and treatment as message (X^*) factors we can talk about two things: a) the elements in each, and b) the way in which the elements are structured.

The Code. A code can be defined as any group of symbols that can be structured in a way that is meaningful to some person. While the messages (X's*) are transmitted in codes (symbol systems) they are by no means limited to the obvious ones--graphic and linguistic systems. In fact, the only crucial characteristic is the shared meaning associated with symbols. Such symbols can take virtually any form, so long as and to the extent that there exists shared meanings. Most symbols have both affective and cognitive elements. Thus, anything is a code which has a group of elements (a vocabulary) and a set of procedures for combining those elements meaningfully (a syntax). As yet there is relatively little systematic knowledge of the syntax and vocabulary of environmental design. Attempts have been made in this direction by Lynch and Appleyard (1964), Thiel (1961), and Rose (1968). However, it is more often the case that there is no recorded grammar for these codes, and therefore, the sender has difficulty in telling us what his structuring procedures are or even what his vocabulary is.

In summary, encoding a message requires certain decisions about the code. One must decide: a) which code, b) what elements of the code are to be selected, c) what method of structuring the code will be used. Thus, in analyzing communication effectiveness, we need to include the sender's decisions about the code in our analysis.

The Content. Content can be defined as that set of abstractions of object X which are selected by the sender to express his purpose. Content, like code, has both elements and structure. If you try to present three pieces of information, you have to present them in some order. One has to come first, one last, you must impose one or another order on them.

The Treatment. We have shown that the encoder (E) has choices available as to the code and the content of messages. In encoding a message, the sender can choose one or another code, he can choose one or another set of elements from within the code, he can choose one or another method of arranging the coded elements.

In presenting a message to express his purpose, the sender can select one or another piece of information, one or another set of images. He can arrange the content in one or another form. He can repeat some of it. He can summarize all of it at the end. He can leave some of it out. In the selection of elements and structure of both code and content, the sender has many decisions to make, many alternatives to choose from. In making these choices he utilizes a style of communicating--he treats his message in certain ways. In short, we can define treatment of a message as the decisions which the communication sender makes in selecting and arranging both code and content.

Some Dimensions Of Treatment

Fearing (1968) has suggested that it is possible to define a given message by its position on at least five dimensions.

1. Specificity of Intent. This dimension defines the definiteness with which the sender-encoder envisages the effects of the content he produces. This expresses itself in the degree to which the communication (X^*) is planned. Highly specific or "planned" communications are usually receiver (R)

centered. The senders are: a) explicit regarding the effects to be achieved on particular receivers, and b) consciously manipulating content in the light of those intentions. A propaganda campaign, for example, is directed toward particular "publics" who are assumed by the sender to have certain wants, and other characteristics, and whom he wishes to influence in a particular way.

Communications which are relatively unspecific, on the other hand, are to a greater degree object or event (X) oriented. That is, in general, the communicator (S) is more concerned with expressing the event, object, etc. (X), than with producing certain effects on the receiver (R).

2. Reality. This dimension refers to the degree to which a communication content (X^*) reflects or is identifiable with psychological or physical reality. Thus the degree of reality could be defined as a function of the manipulatory activities of the sender-encoder in producing content. These include selecting, abstracting, isolating, or otherwise ordering content and contextual variables (X's). The degree of freedom which the sender-encoder permits himself in arranging communication content determines the position of the content on a real-irreal dimension. A newsreel, a map, a roadsign occupy positions toward the "real" end of the continuum; that is, they are examples of content which has been subject to a minimal amount of arrangement or selection by an encoder.

3. Authenticity. This dimension refers to the degree which communications content (X^*) contains cues which the receiver (R) accepts as congruent with "reality" as he knows it. Such cues are in the content, or are provided by its context, and they are perceived by the receiver as an indication that the content has been manipulated by the sender-encoder. The objective reality of such manipulation is not involved. The newsreel, documentary, and fictional film are perceived by most receivers as differing with regard to authenticity.

The cues which carry the signification of authenticity for the interpreter are, at least in part, the result of cultural conditioning. The label "newsreel" is in itself such a cue--and is part of the context in the presentation of the film; the use of nonprofessional actors in a documentary, and the use of natural settings are cues of authenticity. These cues may be simulated with intent. An example of this, was the famous War of the Worlds broadcast, which had high irreality, but was authentic for many receivers. In this case the cues for authenticity were psychologically more potent than the specific indications of irreality.

4. Ambiguity. This dimension is concerned with properties of communications content which make it susceptible to variant conceptualizations by receivers. A content may be said to be relatively unambiguous when it is maximally resistant to such variant structurizations. In the limiting case it would be susceptible to only one structurization. All communications

content are in some degree ambiguous. This may be termed the principle of necessary ambiguity, and is basic to the understanding of all communications effects.

The important variables are in the content (including context). These include structural simplicity or complexity, amount of detail, etc. It is probable that content (X) which is structurally simple, for example a road sign, will be less ambiguous than content which is complex, for example an environmental display.

5. Congruency. This dimension refers to the degree to which the presented content (X^*) is relevant to the need-value-demand system of the receiver. The relevant variables are those in his (R's) need-value structure and symbol manipulating habits, conceived as acting on content of specific structure. For example, receivers with specific and persisting goal integrations, strong value orientations and stereotypes, specific prior experience or involvement with particular content, or any other persistent set will either reject or markedly modify presented content in the direction of greater congruity with those predispositions. Their perceptions of specific content will be deviant as compared with the perceptions of receivers whose need-value system is less rigid, or to a greater degree congruent with the presented content. In other situations the intensity and specificity of need for a structured field--that is, need for information, guidance, direction, or "meaning"--will determine the degree of congruence of presented content. The familiarity with the symbols used in particular content and

the degree to which they have significations for sender-encoders and receivers are, of course, fundamentally important variables.

In summary, I have listed three factors that are pertinent to the message produced by the sender-encoder: 1) the code, 2) the content, and 3) the treatment.

The Medium

In communicating, a sender has to choose a medium, some vehicle in which to carry his message. These could be viewed as light waves, sound waves, etc., but this is outside our particular interest; it is the concern of communication engineers, utilizing principles of light-sound theory, to communicate messages. We are concerned here with media in the sense of photographs, drawings, movies, video displays, etc.

It is clear that each medium has inherent within it certain limitations and certain possibilities. For example, if we choose to use photographs as the medium, then the qualities and limitations of the film will be important; can it encode color? What are its tonal ranges? etc.

The Decoder (D): The Display Device

Just as a sender needs an encoder to translate the objects, events (X's), into a code or message (X^*), the receiver needs a decoder to retranslate, to decode the message and put it into a form the receiver can use. In this the encoder would correspond to a display device. For example, in a computer simulation the encoding would correspond to the programming, the decoding to the display of information on the video-scope. This latter view will constitute the meaning of decoder (D) for this investigation.

Thiel (1971) has indicated some of the choices available to a designer/researcher between encoder, medium and decoder which together constitute a simulation technique.

Source of Optical Data (The Environment)	Representation Process (Encoder)	Storage Format (Medium)	Display Format (Decoder)
The real world		Drawings	Drawing display
Free hand or mechanical drawings	Hand prep. Hand animate Machine animate	Photos Slides	Photo display Slide projection
Digitalized Data sets	Still photo Movie photo	Holograms Films Tapes	T.V. display T.V. projection C.R.T. display
Scale Models	C.C. T.V.	Models	Model display
Full-size mock-ups	Computer & data plot Computer & C.R.T. Holigram	Mock-ups Real world	(Nat. Obs.) Hologram display Model Display (periscope) Natural obs. C.C. T.V. Display C.C. T.V. projection Film projection

FIGURE B-5: ELEMENTS OF A SIMULATION PROCESS

<u>The Receiver (R)</u>

One point should be emphasized about the importance of the receiver in communication. If we limit the discussion to effective communication, the receiver is the most important link in the communication process. If the sender (S) does not reach the receiver (R) with his message, he might as well not have bothered at all. One of the most important emphases of communication theory is a concern with the fellow at the far end of the communication chain--the receiver (R).

We have already described, at some length, the receiver, when we described the sender. The person at one end of the process and the person at the other end are quite similar. Therefore while it is useful to talk about senders (S's) and receivers (R's) separately, for analytic purposes, it is not meaningful to assume that these are always independent functions, or independent kinds of behavior.

With this point of view in mind we can talk about the receiver in terms of his attitudes. How he decodes a message is in part determined by his attitudes toward himself, toward the sender, toward the content of the message. All the things mentioned about the content of the sender apply to the receiver as well. Imagine, for example, a hostile audience at the presentation of a freeway proposal destined to destroy their homes and disrupt their neighborhood.

We are dealing with simulations which consist of the presentation of cues that merely suggest a real world, from which the observer must then create a reality from his own experience as represented in his mental image of the world. Of utmost importance to this illusion of reality is a "suspension of disbelief" on the part of the observer. This suspension of disbelief arises from a willingness on the part of the observer to participate in the surrogate experience. While this is a common part of everyday life for most people, for example, when we watch a T.V. drama, etc., it is not to be taken for granted. This suggests that presentations must be made in a code and format which is based on a viewer's particular experience. Thus for use in the design process, presentations can be made at a level of abstraction recognizable perhaps only to those accustomed to working with simulations. For the layman, however, a more elaborate or "real" presentation may be necessary (Bonsteel, 1971). Further it suggests that presentation must be made in a context which encourages participation and response.

Man's Capability For Information Sensing. It is a widely held notion that man has but five senses, when in truth he has many more. Mowbray and Gebhard (1958) have made a general survey of the senses, wherein they identify ten and compare: 1) the limits, 2) the relative stimulus magnitudes that may be tolerated, and 3) the sensitivities of these various senses. In addition, they have identified some of the interactions among simultaneously stimulated sensory channels. Some of the senses respond differently to frequency changes as well as to intensity changes.

Thus man gathers information through his senses: he sees, hears, tastes, and feels pressure or pain. Human senses are stimulated by physical energy. For example, in the visual sense mode, color hue varies with the frequencies of the light waves striking the retina of man's eyes; brightness is a function of the energy level of the light waves; saturation corresponds to the homogeneity of the wave lengths (Sinaiko, 1957). Human sensory abilities are very complicated. There are definite known limitations, both minimum and maximum, on how much energy is required to produce a sensation. Some sounds are at too low an energy level to be audible while others are too high and may produce injury. Sometimes the senses are unable to distinguish between slightly different energy sources. Even people with normal color vision cannot always discriminate between two very similar colors. Still another aspect of the human senses is that they are limited in terms of speed and capacity (Sinaiko, 1957). Human senses tend to be inconsistent. Such things as a man's general health, or fatigue, affect his sensory ability. Background conditions--noise of all types--influence and may adversely affect the senses. Man's ability to gather information about the environment is affected if two or more of his sense channels are stimulated at the same time. The cab driver who is following a World Series game on the radio and, at the same time, trying to respond to traffic lights or other visual signals is experiencing simultaneous sensory stimulation. Further, the interaction between the driver's two senses has an adverse effect on his over-all performance. On the other hand, in some cases, sensory interaction may boost performance as, for example, when one who receives the same message simultaneously through visual and auditory means (Sinaiko, 1961). Further along this line, we know that, although stimulus properties themselves to a large degree determine what a person sees, they by no means specify what will be perceived and remembered. Perception is influenced, even determined, by what Bruner (1957) calls the "state of perceptual readiness" of the receiver (R). He argues that perception:

> . . . depends upon the construction of a set of organized categories in terms of which stimulus inputs may be sorted, given identity, and given more elaborated connotative meaning. Veridical perception . . . depends upon the construction of such category systems, categories built upon the inference of identity from cues and signs. Identity in fine, represents the range of inferences about properties, uses, and consequences that can be predicted from the presence of certain interest cues (1957-146).[3]

According to Bruner, the individual (R) in the course of his interaction with the environment then organizes the accessibility of his perceptual categories to match his estimate of the probability of the occurrence in the environment of events or stimulus inputs, and to match his purposes for that interaction. This estimate of the probability of occurrence of events is developed in the course of the personal daily interaction with the environment and is a product of two regularities:

1) the recurrent regularities, or redundancies of events in the environment and the correlation of some events with others to produce recurrent event sequences.

2) the regularity of everyday activities which are a result of many people carrying out shared plans in a common environmental context.

Accordingly, for a trip down a shopping street the person would have some expectations regarding the likely occurrence of events and what he will see in that trip. His expectations in turn "program" his attention so as to focus it on those events and objects that are congruent with his expectancies or his mental model[12] of that environment, and as a result they also strongly influence what the person remembers in his revised model. If the persons expectations are congruent with the form of the environment, then obviously there will be little revision of the mental representation. But often this is not the case and either the expectations are incorrect or else the categories are inappropriate in the particular context. When this occurs, there are two possible solutions:

1) either the perceptual selectivity allows the person to seek out only those attributes which are congruent with his expectations and to ignore or alter those which are not, or

2) he must alter his categories and his model to fit the new environment.

The outcome is both a product of the persons "cognitive style" (rigidness versus flexibility) and of the strength of the inconsistencies. This ability to perceive the world in terms of a context often gets man into trouble by causing him to ignore important things, but it also enables him to make order out of chaos.

Another aspect of man as a data sensor is his capacity for getting information out of an incomplete or sparse stimulus. The telegram, "C-m- at ---- F-th-r dy-ng" can be interpreted with little ambiguity, although it occurs in a piecemeal fashion. This ability to interpret partial information, or "to go beyond the information given" (Bartlett, 1932), can also enable him to base interpretations on the wrong facts. Optical illusions are examples of a wrong pattern being imposed on partial information (Siniako, 1957). Appleyard (1971) has noted that three types of perception seem to predominate in man's interaction with his urban world. He has termed them operational, responsive and inferential.

Our operational role or operating plan "determine" our perception of particular elements in the city by programming our "state of perceptual readiness." As one uses the city, performing various tasks, he selects and attends to those particular features of the environment which relate to the carrying out of those tasks. Thus the details of intersections, traffic signs, etc., are often far more dominant in our mental image than their simple perceptual dominance would suggest. Lynch (1960) noted the use of small insignificant details as landmarks or orienting elements at key decision points in an otherwise featureless environment. Because of the need to clearly anchor and to identify these points, the most salient characteristics, however, small or otherwise insignificant is sought out and remembered.

For other more general operating plans and in less demanding circumstances perception is much more responsive to and determined by the configuration or form of the physical environment itself (Carr, 1969). What is out there to be seen largely determine what is seen under these highly general operating plans such as "look around for something interesting."

In these circumstances form characteristics such as intensity, singularity or individualization from background, time in view, and brightness are sought out or catch ones eye by intruding into our normal operational search patterns. Under this highly general operating plan perception is at its most passive state and as such is largely confined to two classes of environmental elements. First, attention is devoted to those features which were identified by Lynch (1960) as the "imageable" elements of the environment and secondly, by those features which are new or changing (Carr, 1967).

Thirdly, perception is inferential and probabilistic in nature (Appleyard, 1971). Our "state of perceptual readiness" is lastly determined by our image or knowledge of the world. We develop a general system of categories, concepts, and relationships, our "City of the Mind" (Carr, 1967) through our direct experience with an urban world, from our exchanges with our peers and parents, and from various indirect and symbolic sources. The process of perceiving is thus one of matching each new experience against our expectations derived from experience. When we interact with a new environment, we begin a process of matching each new event against our expectations. Because the environment is a "bigger book than we can read" we must simplify it. This is accomplished by means of attending to those features, which are significant in terms of our expectancies and our current operating plan, by screening out those which are not, and by normalizing those which are ambiguous. Often we must "go beyond the information given" and on the basis of a very few cues, attempt to place the object or event into a particular class or category of events. We infer that an area belongs in that class of objects, shopping center, or slum. From this we are able to infer social and functional as well as a host of other meanings and values associated with that particular concept which we use to guide our behavior.

Perception of this sort is a process of forming and testing hypotheses about what is "out there," of adjusting category accessibilities, of fitting events to categories, of predicting probabilities of events and of deciding. Each new event is added to our image of the world, and the more extensive our experience the more extensive our knowledge. Thus wider knowledge results in an increased likelihood that our hypotheses regarding what's out there are correct ones thus increasing our ease in gaining new knowledge. Because our expectations determine our category accessibilities, those features of the environment which are most common to our experience are most accessible in our reference system. Further, those aspects of the environment which most conform to stereotype or norm stand the highest probability of being attended to and identified and are most likely to be identified faster (Potter, 1966). Because of its inferential nature, however, this mode can be a source of error. When an event or situation is "new" to us or when the perceptual attributes available to us are ambiguous or incongrous we often make incorrect inferences.

In our interaction with the environment in the course of carrying out everyday or unique once in a lifetime plans we continually shift from one mode of perception to another. This shift of perceptual mode is a result in part of; the perceptual qualities of the environment itself; our current operating plan or task; our environmental experience and hence expectations; our familiarity with the plan and the place; and our mood and conflicting plans and motivations.

Because we experience our world through these varying perceptual modes, our knowledge of that world consists of a "complex collection of varyingly perceived items, qualities, and events" (Carr, 1967). Further, because our mental capacities are limited, we must still further simplify that experience as we store it in memory. Carr (1967) and Appleyard (1971) following Bruner's (1962) lead have hypothesized that there are three basic forms of representing our urban experience in memory, the enactive (experience stored and recalled as actions), the iconic (experiences stored and recalled in terms of their formal physical or perceptual properties), and the symbolic (experience stored and recalled as concepts, associations, etc.). These three modes of representation correspond to three successive stages in intellectual development, a series of "technological advances" in terms of their ability to store information and transfer experience to new situations. There are probably consistencies between the perceptual mode by means of which experience is gained and the type of imagery or model used to store that experience in memory.

Much of the experience gained in our interaction with the environment is stored and recalled in the form of actions or action sequences, enactive imagery in Bruners (1962) terms.

> Enactive representation is how we retain the involuntary and relatively inflexible motor routines which we normally refer to as habits or skills. The way we play tennis, dance, or operate a complex machine seems almost to be represented in the muscles. These skills are so well learned that they pass from consciousness altogether, and it is only when we try to instruct someone else on how to hit a proper forehand that we realize the dependence on enactive representation in the form of an 'action schema'. After one or two fumbling attempts to describe how it is done we will inevitably end up by acting it out (Carr, 1964).

Because this form of representation has a number of limitations, it's non-communicability, it's non-reversibility, it is almost always combined with and supplemented by the other forms of representation.

In the iconic mode of representation, the environment is represented by its perceptual qualities, physical size, color, shape, etc., the image elements noted by Lynch (1960). Iconic representations also have limitations arising from the fact that they are so closely bound to the accidents of perceptual experience and often loaded with irrelevant detail, are inflexible and tend to be dominated by the surface qualities of things such that they often inhibit grasping relations based on other than perceptual attributes.

Symbolic representation facilitates both economy and the construction of relationships and frees us from perceptual dominance by means of its lack of sensory isomorphism between words and things. Usually symbolic representation is used as a supplement to images. For example, although we may retain literal (iconic) images of some significant events or places, we normally use a few key perceptual features to classify each unique experience under some simple usually verbal category. Thus while we may also have a visual image of it, we are likely to represent a street in memory as a high class shopping street with certain named stores since that is our most effective way of relating it to our other knowledge of the city and thereby make our memory of it more accessible for future use (Carr, 1964).

Obviously, no simulation can accurately reproduce the stimulus-response requirements of a complex man-environment system in its entirety. Yet, some simulations approximate it to a far greater degree than do others. Thus, the designer/researcher is always faced with the persistent issue of "how much and what to simulate." Most simulations, of necessity (and by design), omit several entire stimulus classes from the stimulus-response relationship. Further, unlike single purpose "flight simulators," it seems unlikely that simulation of broad multi-purpose man-environment systems will ever extensively utilize more than the two main senses of vision and hearing. In all probability they will continue to be limited to vision alone. Therefore, a basic question inherent in the study of simulation is that of the detriment to experience produced by limiting stimulation to the primary sensory channels of vision and hearing.

The discussion up to now has only partially dealt with the issue of the relationship between "objective" fidelity and "response" fidelity in simulation, i.e. how accurately any particular simulated element, interaction or situation, should reproduce that of the actual system in order to obtain a veridical response. For example, how closely should the detail of an architectural model replicate that of the actual building in order to obtain an equivalent response. The question of how much characteristics can be simplified or altered in simulation is a difficult one. Each class of stimuli, as well as the principal interactions, must be experimentally studied to determine the extent to which it can be degraded and still obtain an equivalent response. Experiments by Adams, Garrett, and Robinson (1955), in the use of flight simulators showed that the visual sense was the most susceptible to reduction in objective fidelity. Therefore, it seems likely that where precise response measures are demanded, that great care should be exercised in accurately simulating relevant variables. However, this question requires investigation. At least three basic alternative research approaches are possible:

1. The stimulus channels utilized may be varied. For example, one might experiment with simulating environments by employing only visual variables and only sound variables (Southworth, 1969). However, given the relative primacy of the visual channel in spatial perception, it seems unlikely that it would be fruitful to consider such exclusive alternatives. Which leads us to 2 below.

2. Multiple sensory inputs may be utilized. If one

accepts vision as man's basic input channel and systemmatically varies other inputs, such as aural or olfactory stimuli, it would be possible to determine whether such stimuli reinforce, confuse, or have no effect on the response.

3. Variation of the fidelity or reality of the individual classes of stimuli. One useful example would involve systemmatic variation of the detail of a visual display of an environment or the use of color versus black and white displays.

The Effects On The Receiver (Y's): Responses

S. S. Stevens (1950) defined communication as: "the discriminatory response of an organism to a stimulus." This definition says that communication occurs when some environmental disturbance (the stimulus) impinges on an organism and the organism does something about it (makes a discriminatory response). If the stimulus is ignored, there has been no communication. The test is a differential reaction of some sort. The message that gets no response is not a communication. The word "stimulus" in the definition sometimes carries the implication that meaning is to be found in the message or object rather than in the interpreter of it. Signs, trees, and houses do not contain meanings, or they would evoke identical reactions from everyone. Instead a stimulus or cue only places constraints upon the actions of those who perceive it, those constraints deriving from standards of adequacy or appropriateness through experience with others.

The word "response" suggests to some that man is an involuntary or passive reactor to external signs rather than an active creator of meanings. While cues have a "response potential," it is the perceiver who decides upon the specific values they will have for him. It is he who constructs his world and decides how he is going to use it. The potency of any cue is found in our capacity to use it in altering or supporting cognitive structures, affective states, or physical activities.

Communication response involves three classes of phenomena. One of these is cognitive in nature and refers to an individuals (R's) information regarding an event or object (X). Another is behavioral, referring to the acts which an individual performs, advocates, or facilitates with regard to an X. The third phenomenon is affective, referring to the individuals valuations concerning the X.

In this appendix I have developed a model of an indirect communication process which employs a simulation technique to encode, transmit and display information about an environment and compared that with a process direct experience. I have shown how each element in the indirect process can affect the response fidelity of that process. The purpose of this appendix has been to point out the key elements and relationships involved in such a process as a basis for selection and design of a research approach which was discussed in Chapter I.

NOTES

1. As in the case of environments which do not yet exist.
2. It is interesting to note that this process of representing the world in our memory is a form of simulation. According to Thiel (1971), "when this process is carried on internally we call it image, schemata, ideas, concepts, and the process thinking. To externalize this process and communicate it to others requires a second representation of the internal representation by means of a conventionalized system of physical signs; patterns of gestures, sounds, or two or three dimensional artifacts. Such a re-representation depends upon a commonality, from person to person in the attachment of the external man-made signs to the internal representations."
3. I took this reference from Steven Carr, "The City of the Mind," in Ewald, Environment for Man, Indiana University Press, 1967.

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APPENDIX C

REALISTIC PERSPECTIVE DRAWINGS

PLEASE DO NOT OPEN UNTIL DIRECTED

1. What did you think of the street (and its surroundings) generally?

2. Please describe what you remember of the street and surrounding areas that were shown in the pictures you just saw. Tell us that which first comes to your mind - those things which stand out most clearly. We don't expect you to remember every detail - but try and write down as much as you can remember in the space below.

3. On the next page would you draw a quick, rough map of the street and surrounding area that you have just seen in the pictures, showing its main features. You can use labels if that helps. We are not interested in your ability to draw. We are only concerned that you represent, as best you can, a map of the street and its surroundings as you remember it.

4. Many areas in our cities can be divided up into parts or divisions or groupings - would you describe any such divisions or parts you noticed in the street and its surroundings.

5. Now, on your map on page 3, would you draw a line around those different areas or parts which you just mentioned in question 4 above.

6. Think of that particular part or section of the street which you liked best and describe its appearance.

7. What kinds of activities (for example shopping, residential, etc.) go on in that area you liked best?

8. Think of that particular area or part of the street and its surroundings which you <u>liked least</u> and describe its appearance.

9. What kinds of activities go on in that area or part of the street you <u>liked least</u>?

10. Now, thinking about the street as a whole, how would you feel about taking a walk through this area?

11. Why is that?

12. How would you feel about shopping there?

13. Why?

14. What would you think of living there?

15. Why?

16. What about working there?

17. Why is that?

18. How about going to a movie or restaurant there?

19. Why is that?

20. What were some of the things about the street and its surroundings which you liked?

21. What were some of the things about the street and its surroundings which you disliked?

22. Would you estimate, approximately, the length of the street as being about:

____ 0 - 5 Blocks (0 - 1/4 Mile)
____ 6 -10 Blocks (1/4 - 1/2 Mile)
____ 11-15 Blocks (1/2 - 3/4 Mile)
____ 16-20 Blocks (3/4 - 1 Mile)
____ 21-25 Blocks (1 - 1 1/4 Miles)
____ 26-30 Blocks (1 1/4 - 1 1/2 Miles)
____ 31-35 Blocks (1 1/2 - 1 3/4 Miles)
____ 36-40 Blocks (1 3/4 - 2 Miles)

23. We would like to measure the way people feel about the area shown in the pictures. We would like you to judge the area against a series of descriptive adjectives. In filling out this part of the questionnaire please make your judgements on the basis of how you feel about the street as a whole.

Here is how the scales work: if you feel strongly that one of the adjectives appropriately describes the area, then you would mark that end of the scale nearest the appropriate adjective. For example:

Light :_✓_:____:____:____:____:____:____: Dark

Or,

Light :____:____:____:____:____:____:_✓_: Dark

If on the other hand you feel that the area seems neutral with respect to the adjectives, then you would mark the middle or neutral space. For example:

Strong :____:____:____:_✓_:____:____:____: Weak

The other two spaces are on a scale from neutral to strong associations.

Now, would you judge the area against the descriptive adjectives on the following page.

24.	SAFE	:____:____:____:____:____:____:____:	DANGEROUS
25.	TASTELESS	:____:____:____:____:____:____:____:	TASTEFUL
26.	EXCITING	:____:____:____:____:____:____:____:	BORING
27.	CONFUSING	:____:____:____:____:____:____:____:	CLEAR
28.	CLEAN	:____:____:____:____:____:____:____:	DIRTY
29.	NOISY	:____:____:____:____:____:____:____:	QUIET
30.	SPACIOUS	:____:____:____:____:____:____:____:	CRAMPED
31.	OLD	:____:____:____:____:____:____:____:	NEW
32.	WIDE	:____:____:____:____:____:____:____:	NARROW
33.	GLOOMY	:____:____:____:____:____:____:____:	PLEASANT
34.	ORDERLY	:____:____:____:____:____:____:____:	DISORDERLY
35.	INCONVENIENT	:____:____:____:____:____:____:____:	CONVENIENT
36.	ALIVE	:____:____:____:____:____:____:____:	DEAD
37.	UNCOMFORTABLE	:____:____:____:____:____:____:____:	COMFORTABLE
38.	COLORFUL	:____:____:____:____:____:____:____:	DRAB
39.	CHANGING	:____:____:____:____:____:____:____:	LASTING
40.	RICH	:____:____:____:____:____:____:____:	POOR
41.	UNIFORM	:____:____:____:____:____:____:____:	DIVERSE
42.	LOW	:____:____:____:____:____:____:____:	HIGH
43.	FORMAL	:____:____:____:____:____:____:____:	INFORMAL
44.	INCOMPLETE	:____:____:____:____:____:____:____:	COMPLETE
45.	PRIVATE	:____:____:____:____:____:____:____:	PUBLIC
46.	NATURAL	:____:____:____:____:____:____:____:	UNNATURAL
47.	DESERTED	:____:____:____:____:____:____:____:	OCCUPIED
48.	FRIENDLY	:____:____:____:____:____:____:____:	UNFRIENDLY
49.	STATIC	:____:____:____:____:____:____:____:	DYNAMIC
50.	BEAUTIFUL	:____:____:____:____:____:____:____:	UGLY
51.	IMPERSONAL	:____:____:____:____:____:____:____:	PERSONAL
52.	UNCLUTTERED	:____:____:____:____:____:____:____:	CLUTTERED

53. Did the street scene shown in the pictures seem real to you?

____ Yes (SKIP TO QUESTION 55)

____ No

54. Why not?

55. Are you familiar with the area shown in the pictures?

____ Yes

____ No

____ Not Sure

56. Have you ever been there?

____ Yes

____ No (SKIP TO QUESTION 59)

____ Not Sure (SKIP TO QUESTION 59)

57. How many times, approximately, have you visited the area?

58. When were you last there?

59. Did the street scene you saw in the pictures remind you of any other area you have known?

____ Yes

____ No (SKIP TO QUESTION 61)

60. How do you feel about that other area? Describe briefly your memories and feelings regarding it in the space below.

61. If you had the opportunity to change the street shown in the pictures, what would you do to improve it?

62. What do you think the area was like in the past?

63. What do you think it will be like in the future?

64. What kind of people would you say live in the area now?

65. Now, thinking about the pictures themselves, did they give you a clear impression of what the street is like in reality?

66. Can you think of any ways in which the pictures, or presentation, might have been improved so as to enable you to better understand what the street is really like?

PART II

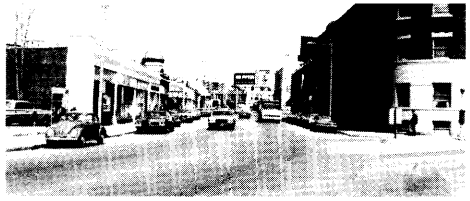
Please complete Part One before you begin this section, and do not go back to Part One after beginning Part Two.

On the following four pages are some pictures arranged in groups of four. In each group there is <u>one</u> picture taken from the street which you just saw. The other three are pictures chosen at random from other areas. We would like you to look at each group and pick the one which represents a scene you remember from the street. Indicate your choice by marking the appropriate blank as shown below. Please choose one (and only one) even if you have to guess.

Picture 1 ✓	Picture 2 ____	Picture 3 ____	Picture 4 ____

After you have marked your choice we would like you to indicate how certain you were of that choice on a scale from "absolutely sure" to "just guessing".

1. Picture 1____



Picture 2____

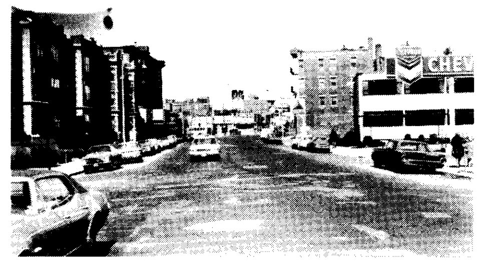
Picture 3____

Picture 4____

2. How certain are you of your choice?
____Absolutely Sure
____Very Sure
____Fairly Sure
____Not Very Sure
____Just Guessing

3. Picture 1____

Picture 2____



Picture 3____

Picture 4____

4. How certain are you of your choice?
____Absolutely Sure
____Very Sure
____Fairly Sure
____Not Very Sure
____Just Guessing

5. Picture 1____

Picture 2____

Picture 3____

Picture 4____

6. How certain are you of your choice?
____Absolutely Sure
____Very Sure
____Fairly Sure
____Not Very Sure
Just Guessing

7. Picture 1____

Picture 2____

Picture 3____

Picture 4____

8. How certain are you of your choice?

____Absolutely Sure
____Very Sure
____Fairly Sure
____Not Very Sure
____Just Guessing

9. Picture 1____

Picture 2____

Picture 3____

Picture 4____

10. How certain are you of your choice?

____Absolutely Sure
____Very Sure
____Fairly Sure
____Not Very Sure
____Just Guessing

11. Picture 1____

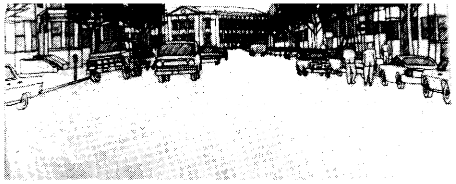
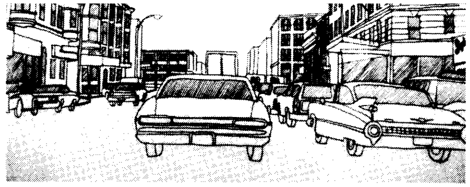
Picture 2____

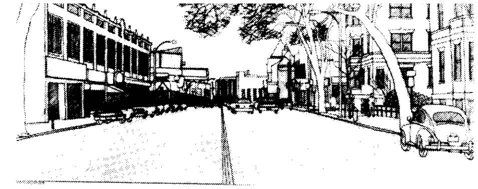
Picture 3____

Picture 4____

12. How certain are you of your choice?

____Absolutely Sure
____Very Sure
____Fairly Sure
____Not Very Sure
____Just Guessing

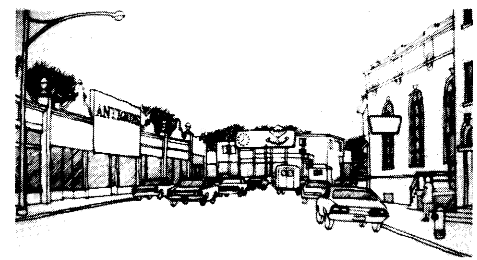





13. Picture 1____ Picture 2____ Picture 3____ Picture 4____

14. How certain are you of your choice?
____Absolutely Sure
____Very Sure
____Fairly Sure
____Not Very Sure
____Just Guessing

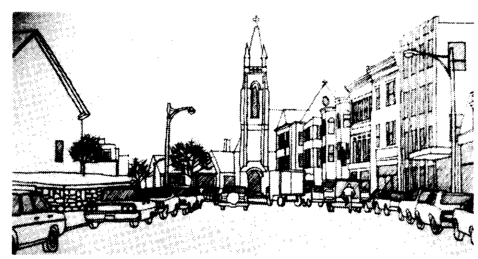




15. Picture 1____ Picture 2____ Picture 3____ Picture 4____

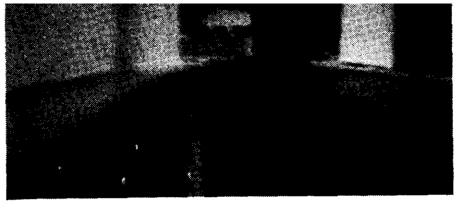
16. How certain are you of your choice?
____Absolutely Sure
____Very Sure
____Fairly Sure
____Not Very Sure
____Just Guessing

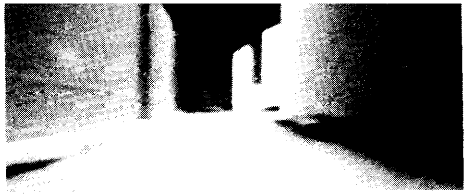


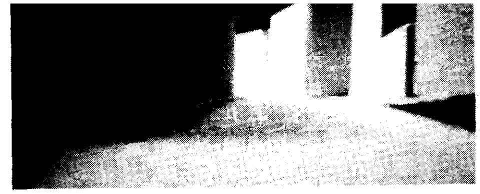



17. Picture 1____ Picture 2____ Picture 3____ Picture 4____

18. How certain are you of your choice?
____Absolutely Sure
____Very Sure
____Fairly Sure
____Not Very Sure
____Just Guessing

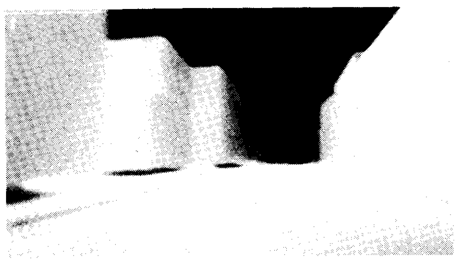


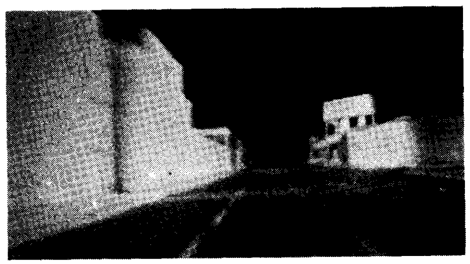


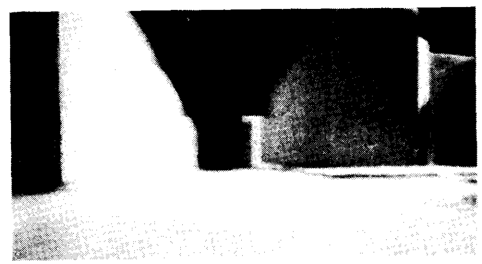


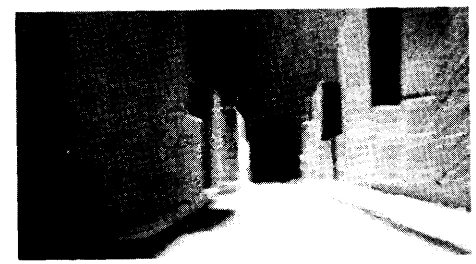
19. Picture 1____ Picture 2____ Picture 3____ Picture 4____

20. How certain are you of your choice?
____Absolutely Sure
____Very Sure
____Fairly Sure
____Not Very Sure
____Just Guessing



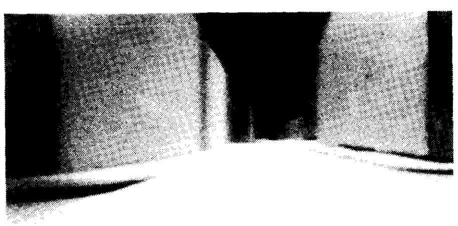


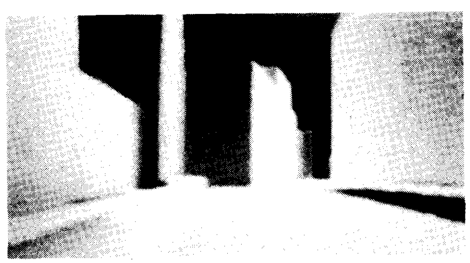


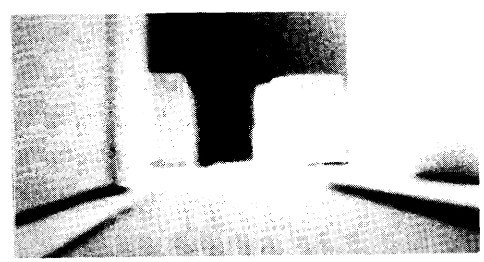


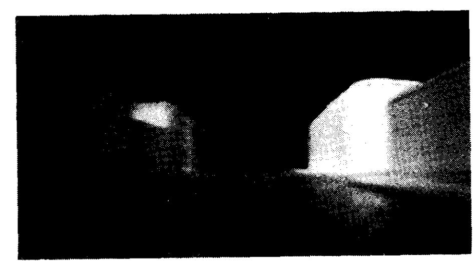
21. Picture 1____ Picture 2____ Picture 3____ Picture 4____

22. How certain are you of your choice?
____Absolutely Sure
____Very Sure
____Fairly Sure
____Not Very Sure
____Just Guessing









23. Picture 1____ Picture 2____ Picture 3____ Picture 4____

24. How certain are you of your choice?
____Absolutely Sure
____Very Sure
____Fairly Sure
____Not Very Sure
Just Guessing

25. In what year were you born?

19 ____

26. What is your sex?

____ Female

____ Male

27. What is your nationality?

____ U.S.A.

____ Canadian

____ Other (Please Specify) ______________________ (SKIP TO QUESTION 29)

28. Both Americans and Canadians have diverse national backgrounds. Which nationality do you think of yourself as?

29. What is your religious preference?

____ Catholic

____ Protestant

____ Jewish

____ Other (Please Specify) ______________________

____ None

30. Are you a student now, or will you be a student in the fall semester?

____ Yes

____ No (SKIP TO QUESTION 34)

31. What is your major subject or field of interest?

32. What is your present status?

____ Undergraduate (Circle Year) 1, 2, 3, 4, 5,

____ Graduate (Circle Year) 1, 2, 3, 4,

33. What is your intended occupation or profession - what kind of work will you do after you finish school? (SKIP TO QUESTION 41)

34. How many grades of school did you finish?

____ None

____ 1 - 6

____ 7 - 9

____ 10-12

35. Have you had any other schooling?

____ Yes

____ No (SKIP TO QUESTION 40)

36. What was that?

____ College

____ Other (Please Specify) ____

37. What was your major subject or field?

38. Do you have a college degree?

____ Yes

____ No (SKIP TO QUESTION 40)

39. What was the highest degree you earned?

40. What is your usual or intended occupation?

41. How long have you been living in the Greater Boston Area?

______ Years, ________ Months

42. How long have you lived at Westgate?

_______ Years, ________ Months.

43. Have you ever had occasion to look extensively at, or work with three-dimensional models or drawings, such as those made by architects, engineers, and city planners?

____ Yes

____ No

44. Do you have the use of an automobile?

____ Yes

____ No.

45. We would like you to indicate the size of the area (in terms of population) in which you lived for each 5-year period of your life to the present by matching these periods against the letter used in the column headed city size.

AGE		CITY SIZE
0 – 5	________	A. under 1000 (or rural area)
6 –10	________	B. 1,000 to 5,000
11–15	________	C. 5,001 to 10,000
16–20	________	D. 10,001 to 20,000
21–25	________	E. 20,001 to 50,000
26–30	________	F. 50,001 to 100,000
31–35	________	G. 100,001 to 200,000
36–40	________	H. 200,001 to 500,000
41–45	________	I. 500,001 to 1,000,000
46–50	________	J. over 1,000,000
51–55	________	
56–60	________	
60 +	________	

46. In what size city (in terms of population) would you prefer to live? (use the letters from #45 above) ____________________

That concludes the questions. Please do not discuss the study or questions with your neighbors or spouse if they have not yet participated in the study. Thank you very much for your cooperation.

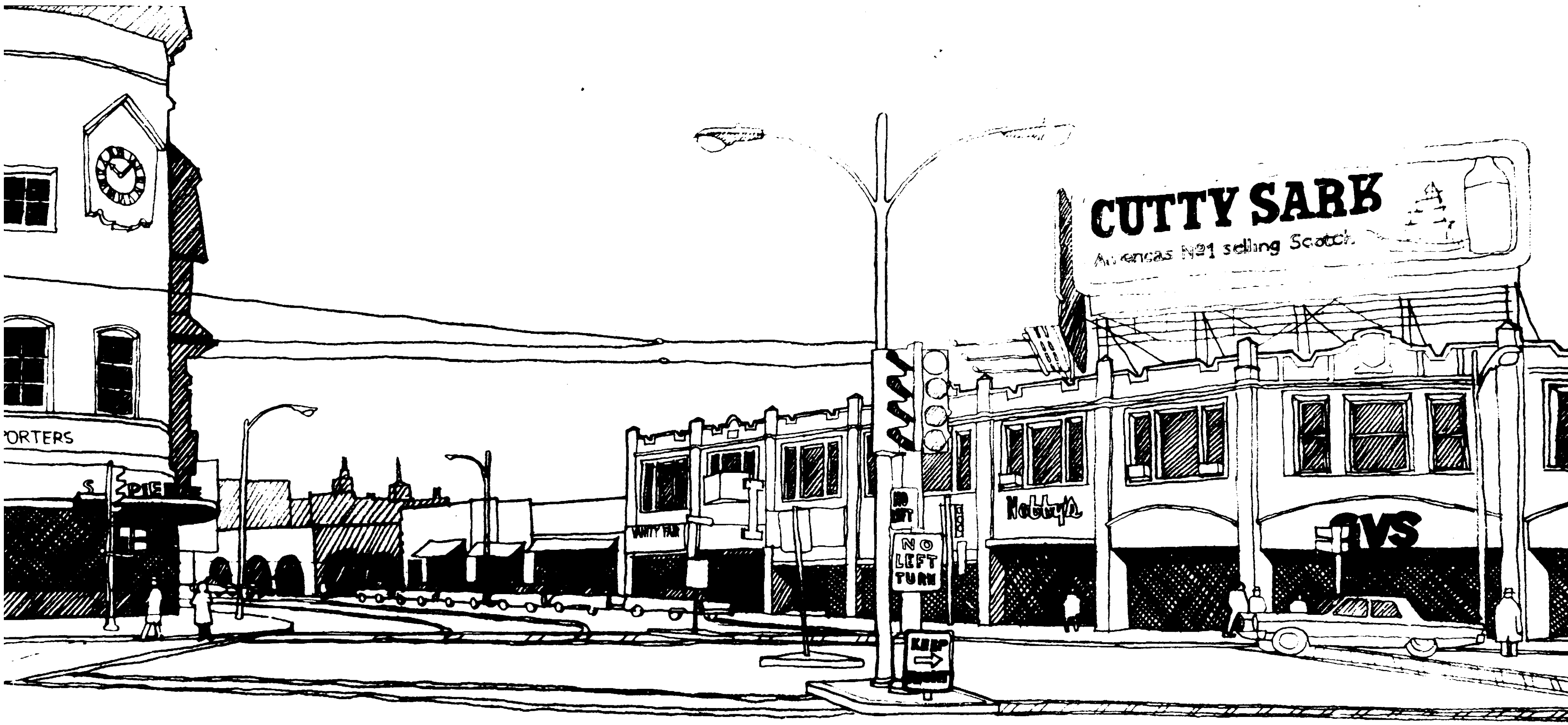
APPENDIX D

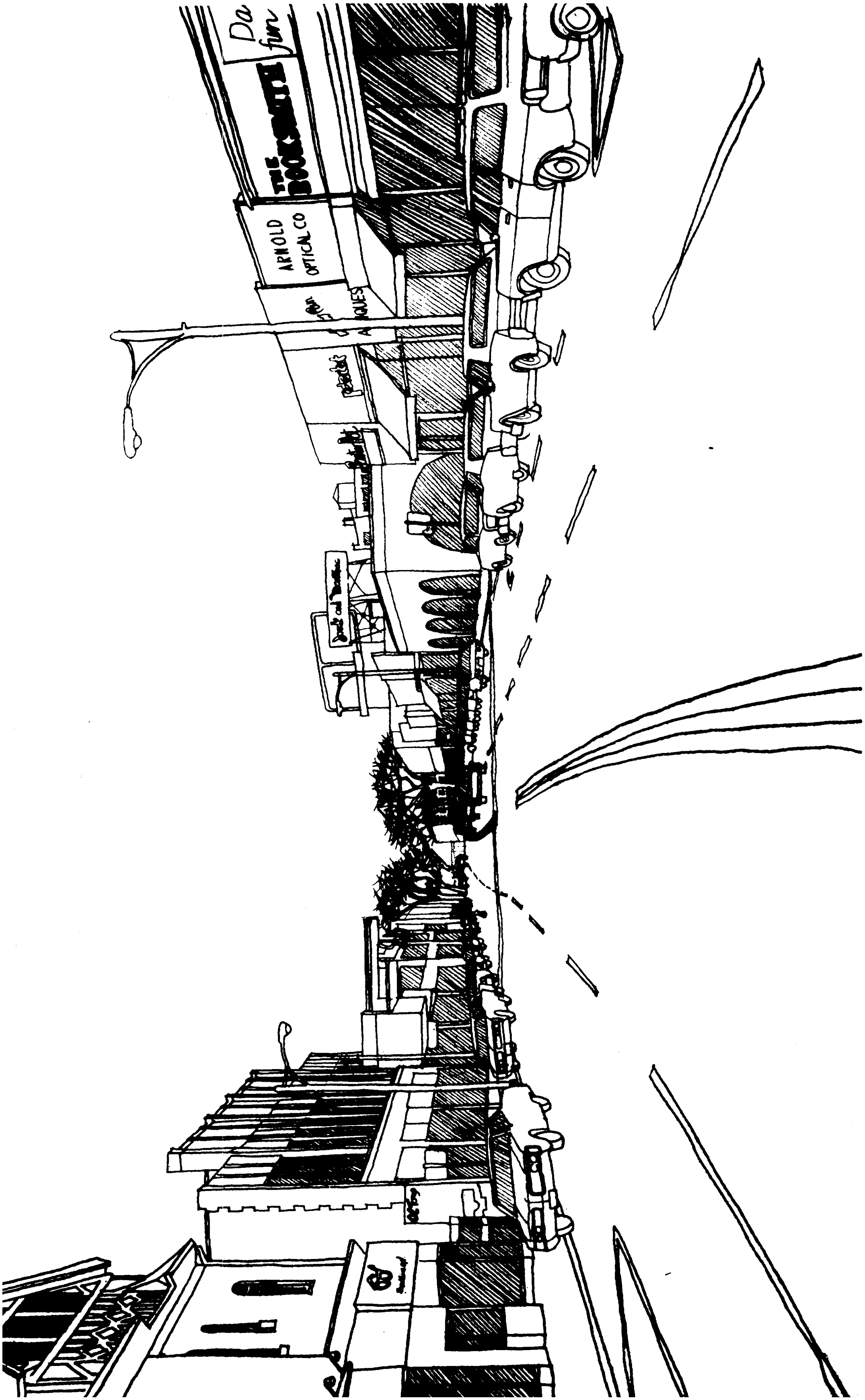
ABSTRACT PERSPECTIVE DRAWINGS

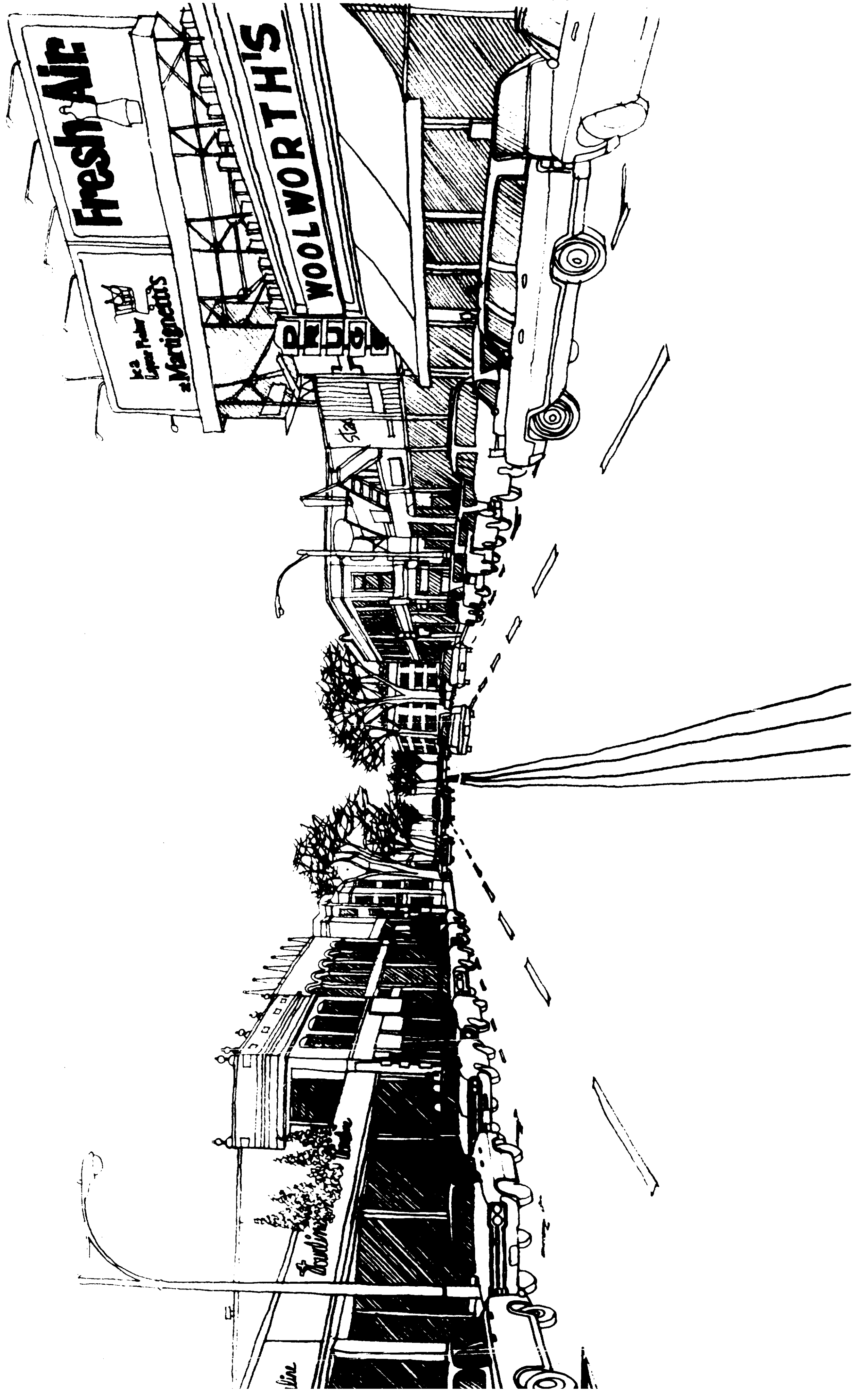
Print of a frame from the color movie

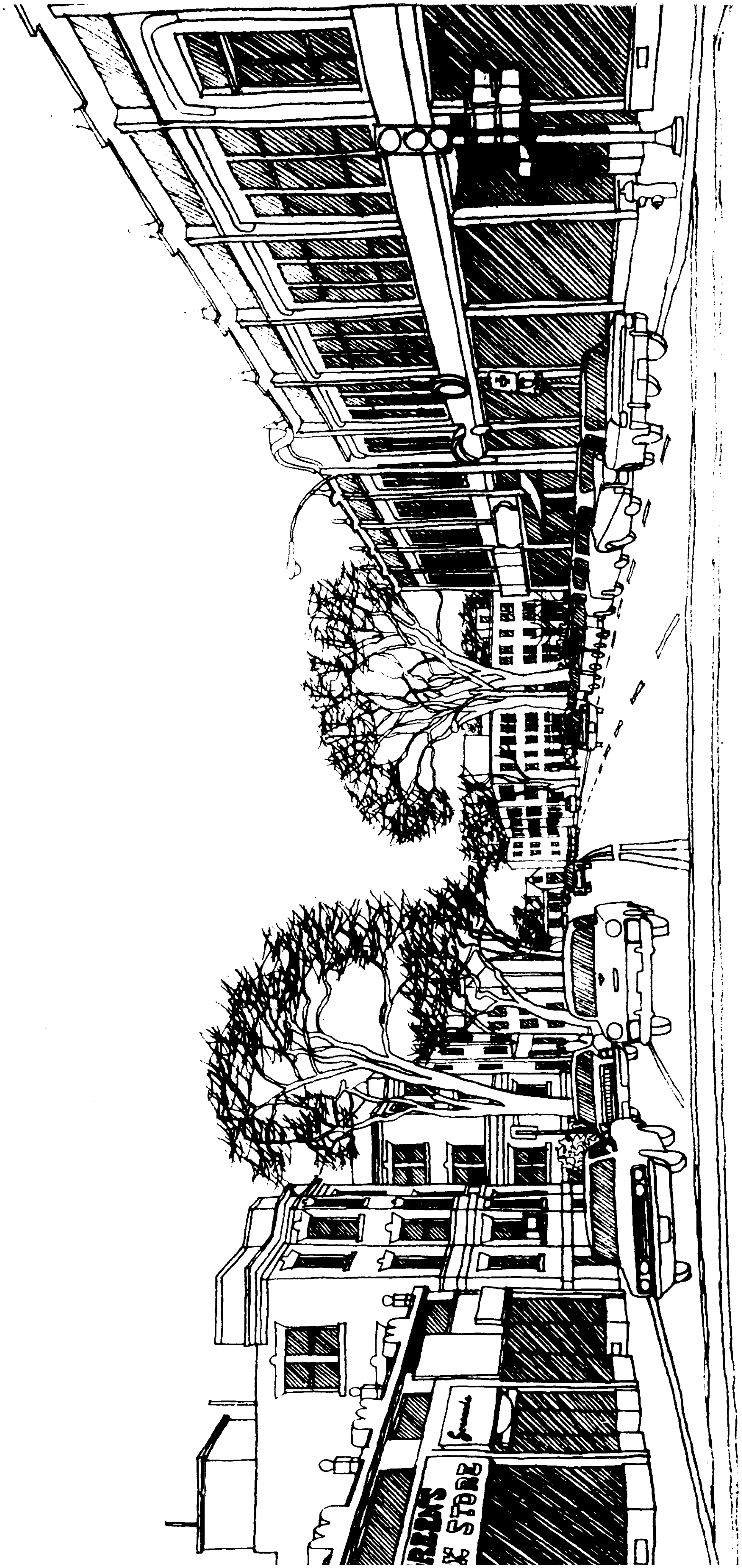
Print of a frame from the model movie

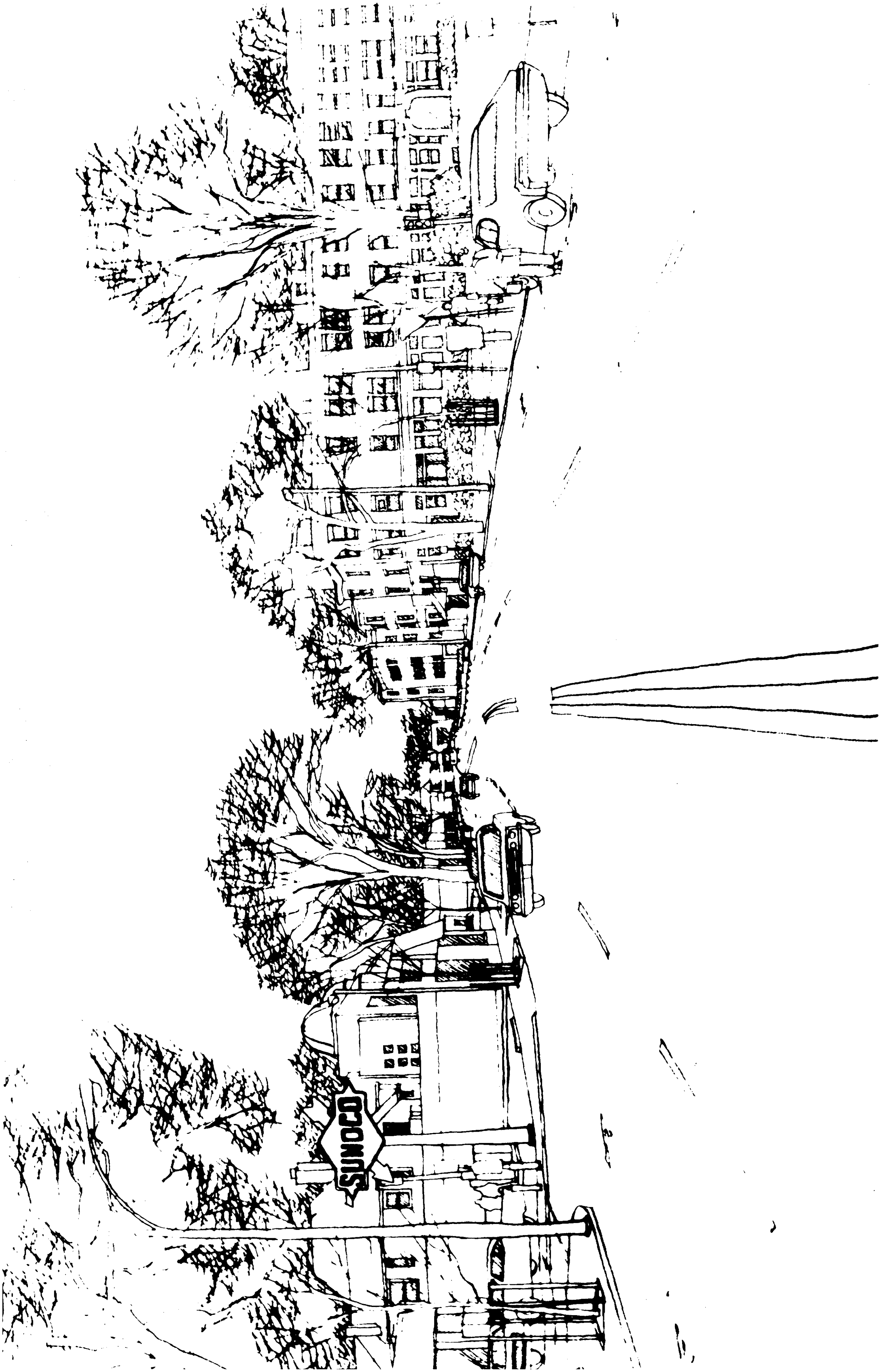
Print of a photograph of the perspective drawings

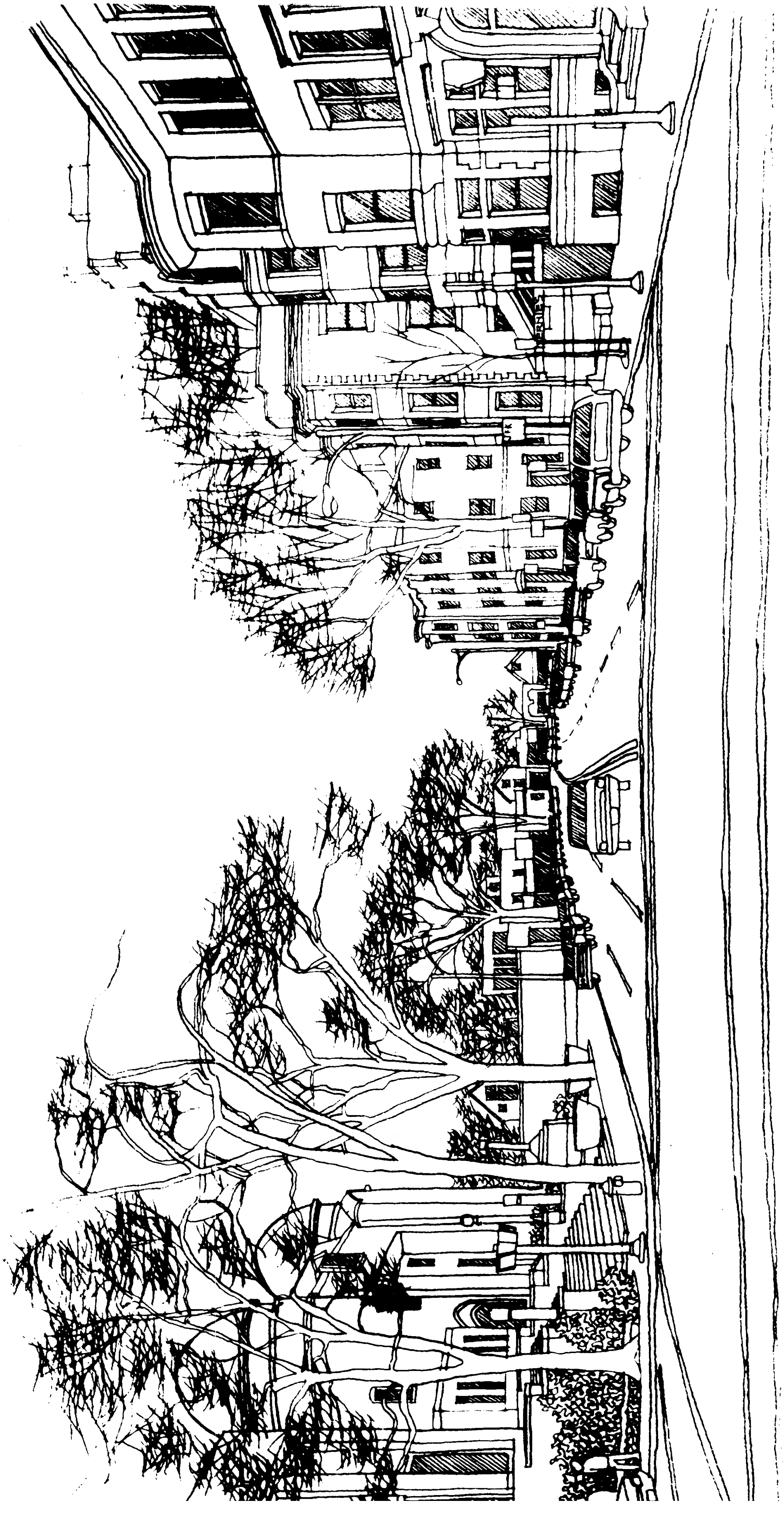

CUTTY SARK
NO
LEFT
TURN

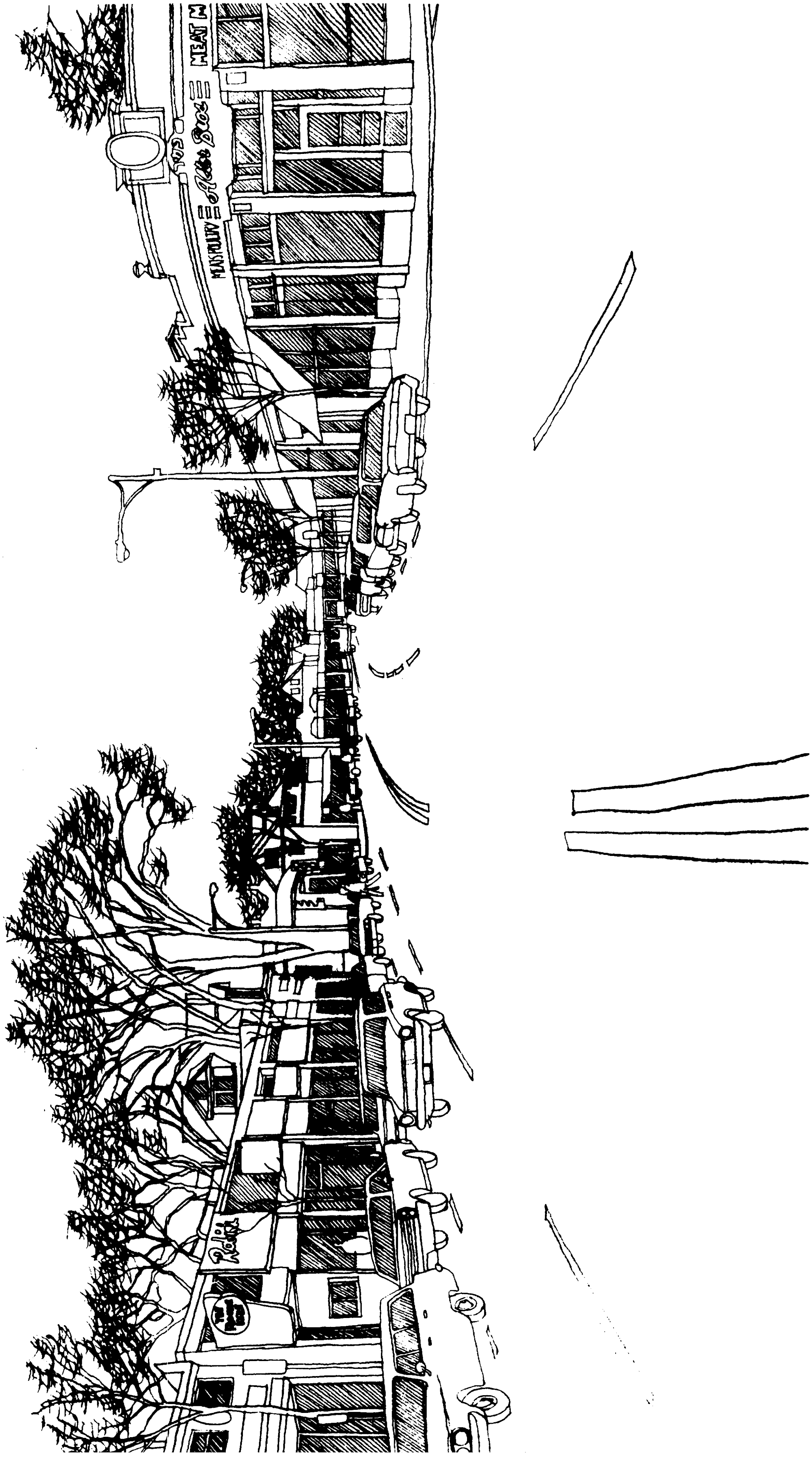

THE BOOKSMITH
ARNOLD OPTICAL CO

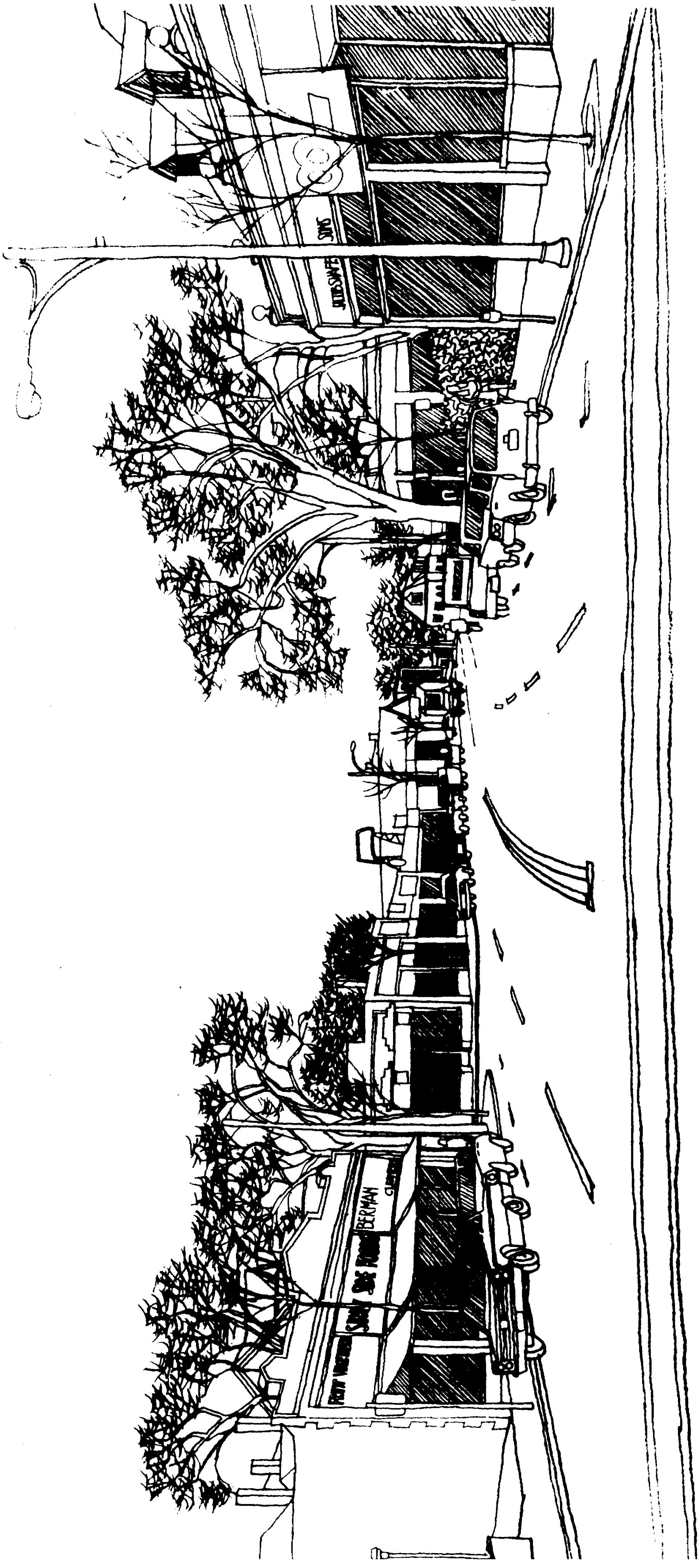

Fresh Air
WOOLWORTH'S

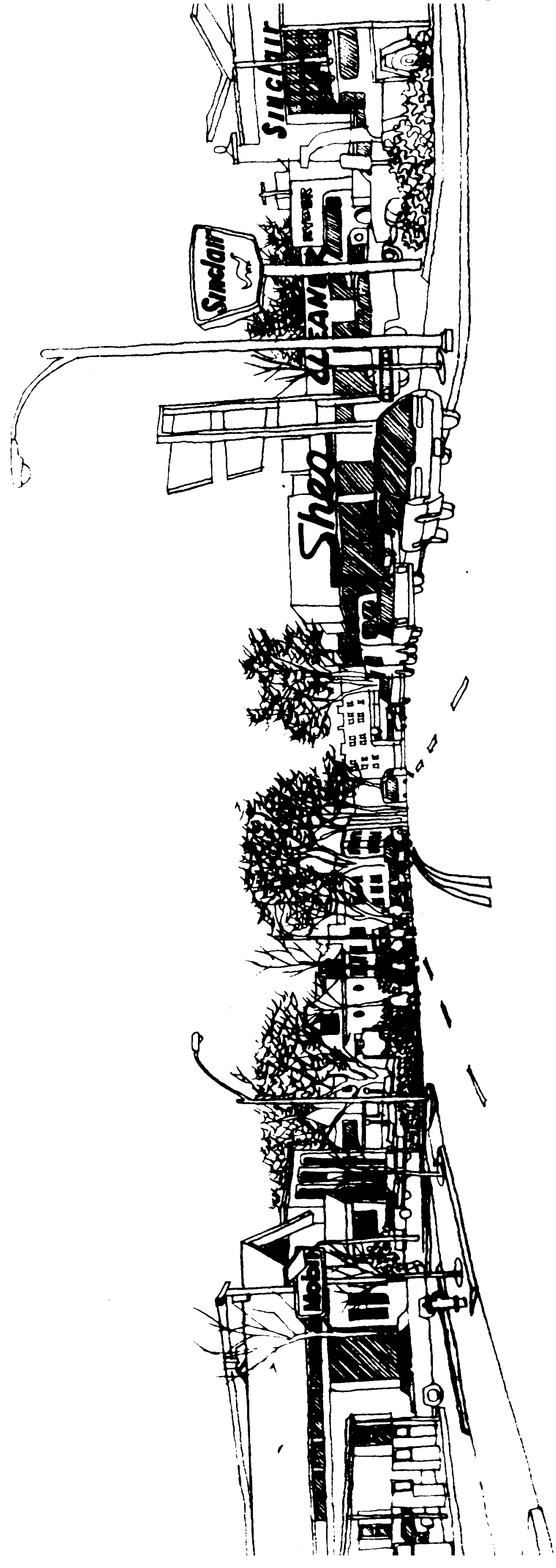


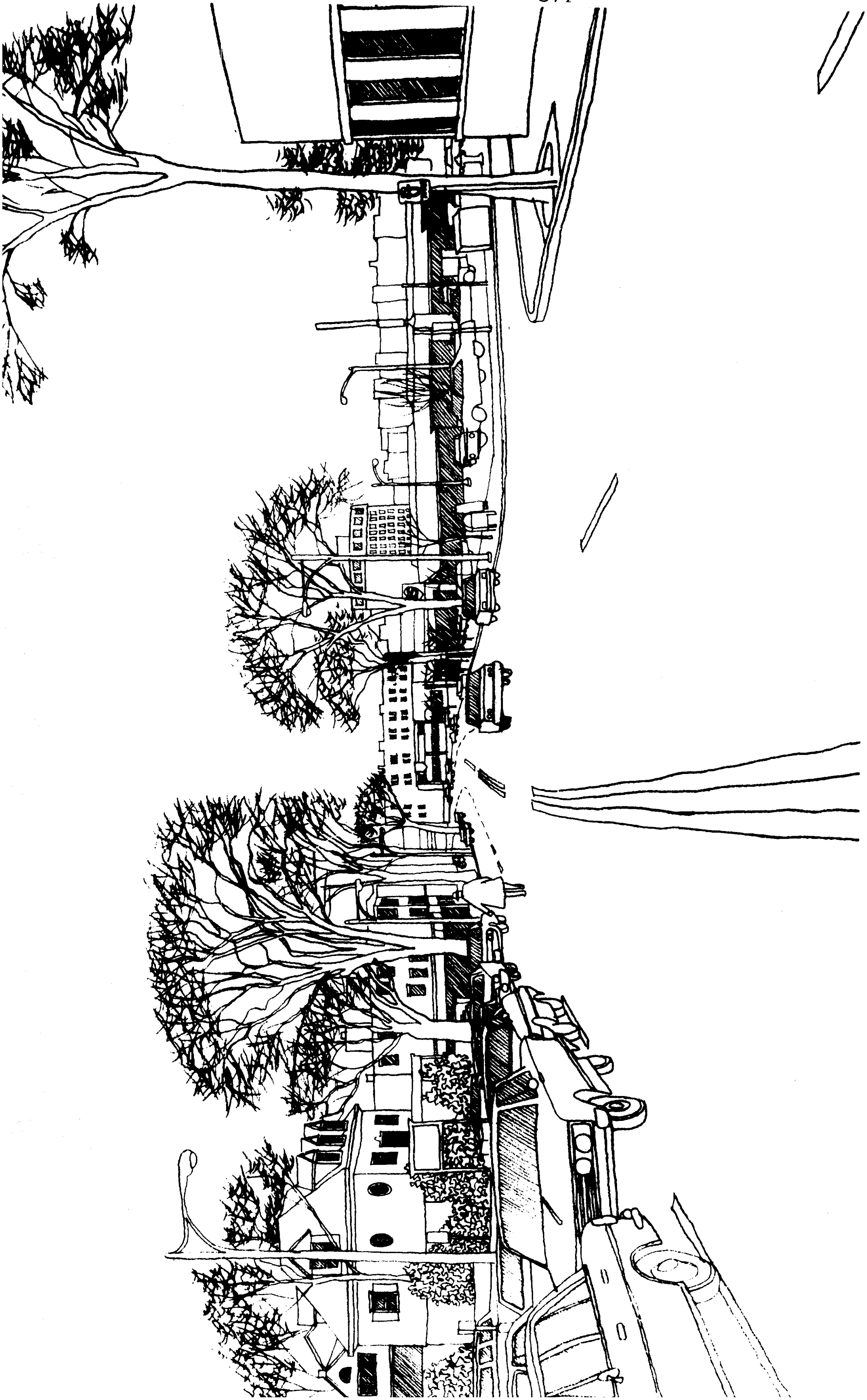

SUNOCO

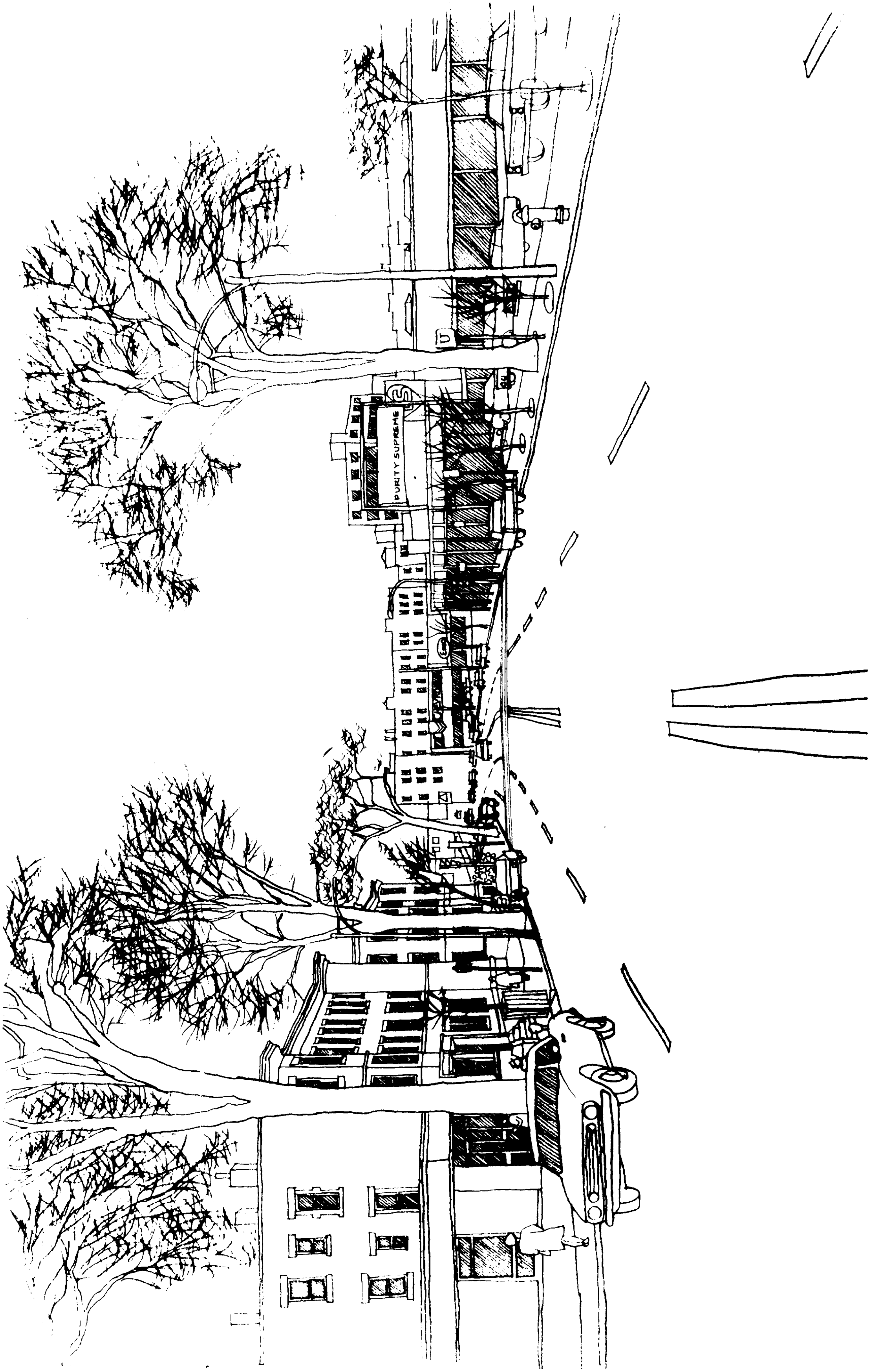


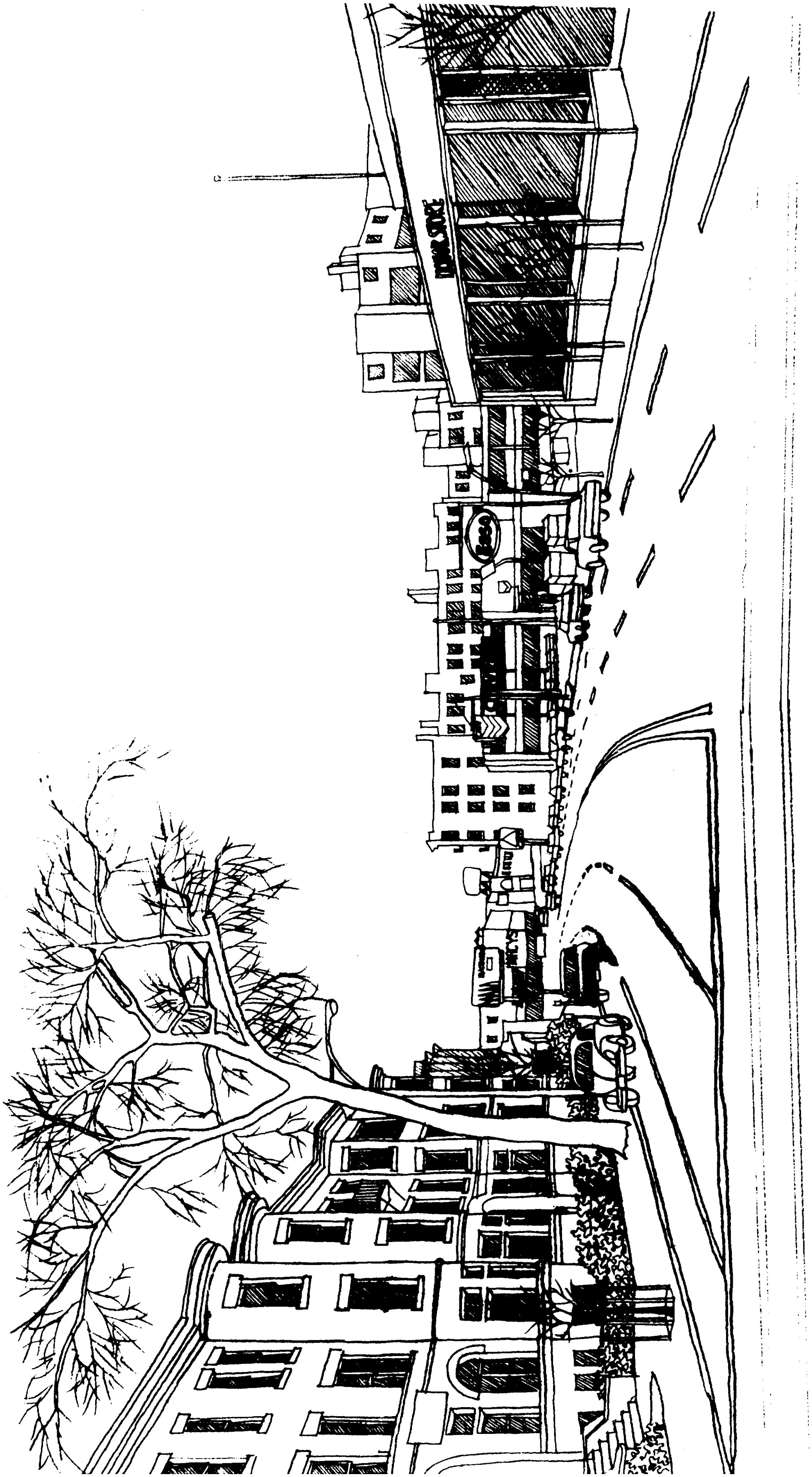

MEAT M

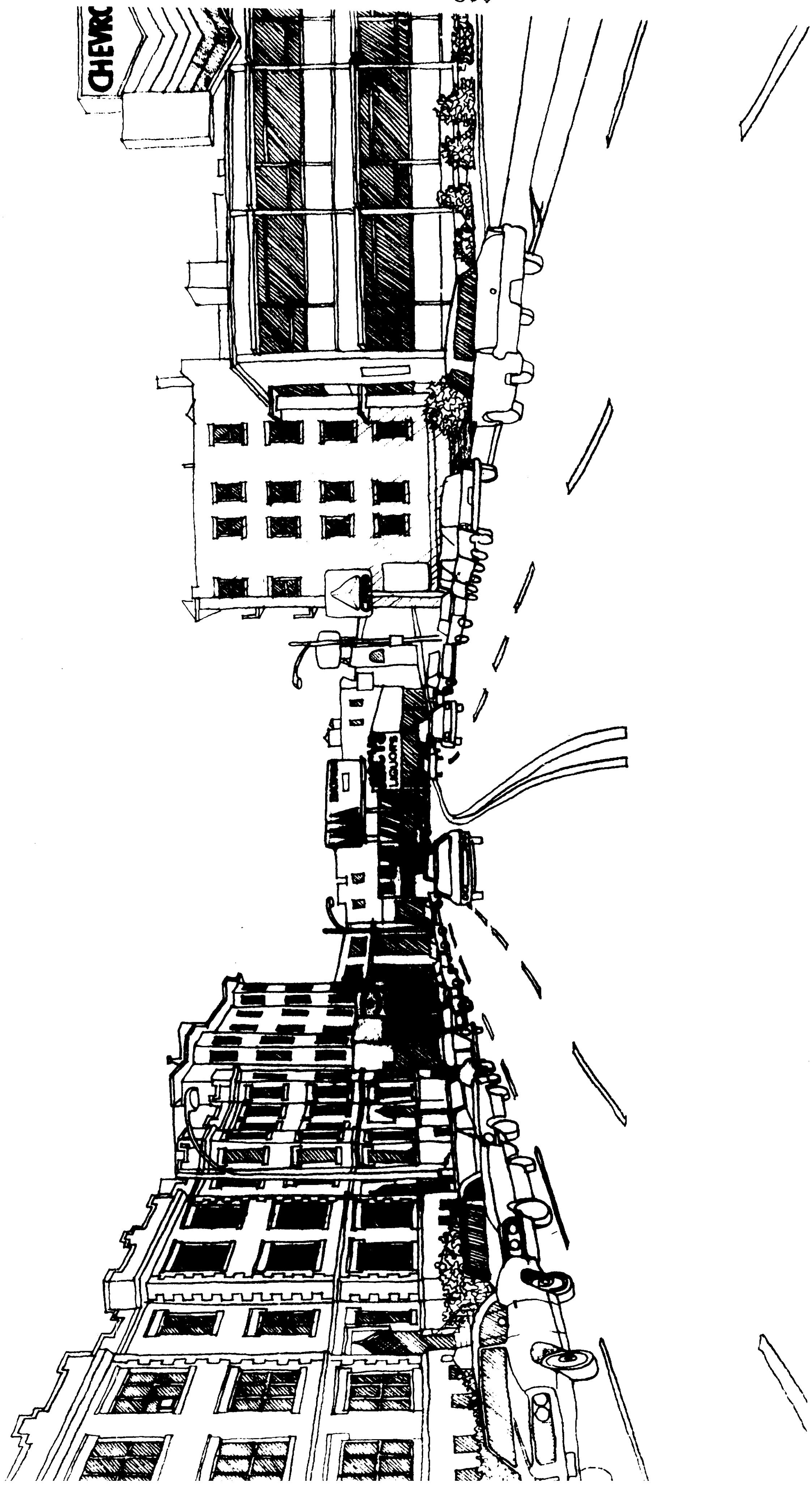

BERMAN

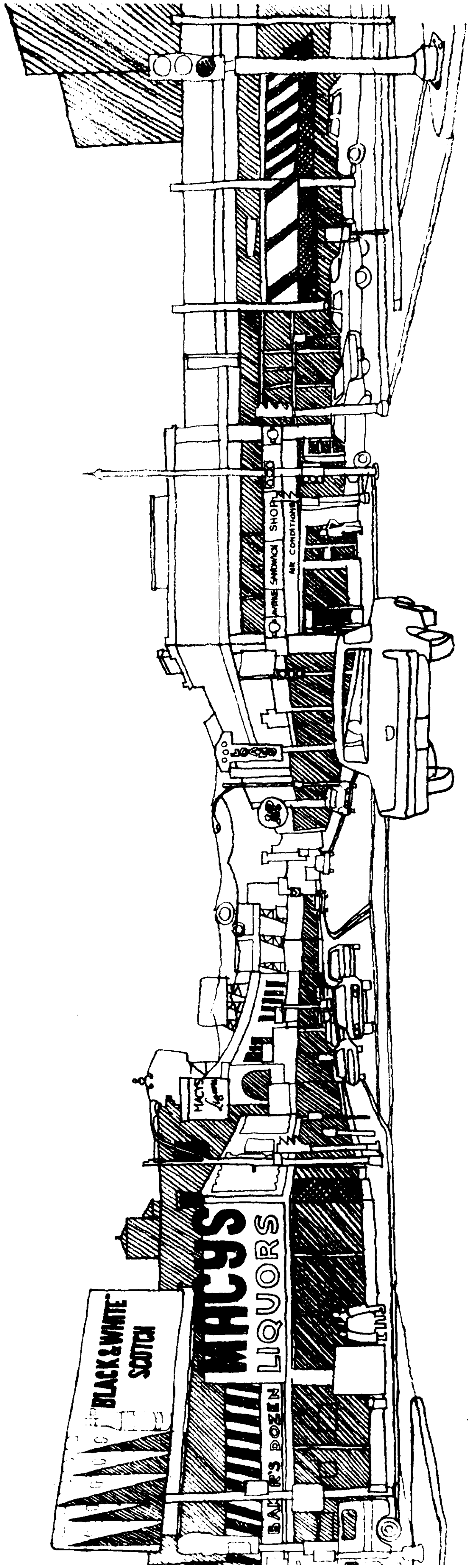

Sinclair
Shea
Mobil




PURITY SUPREME


DRUG STORE
Esso



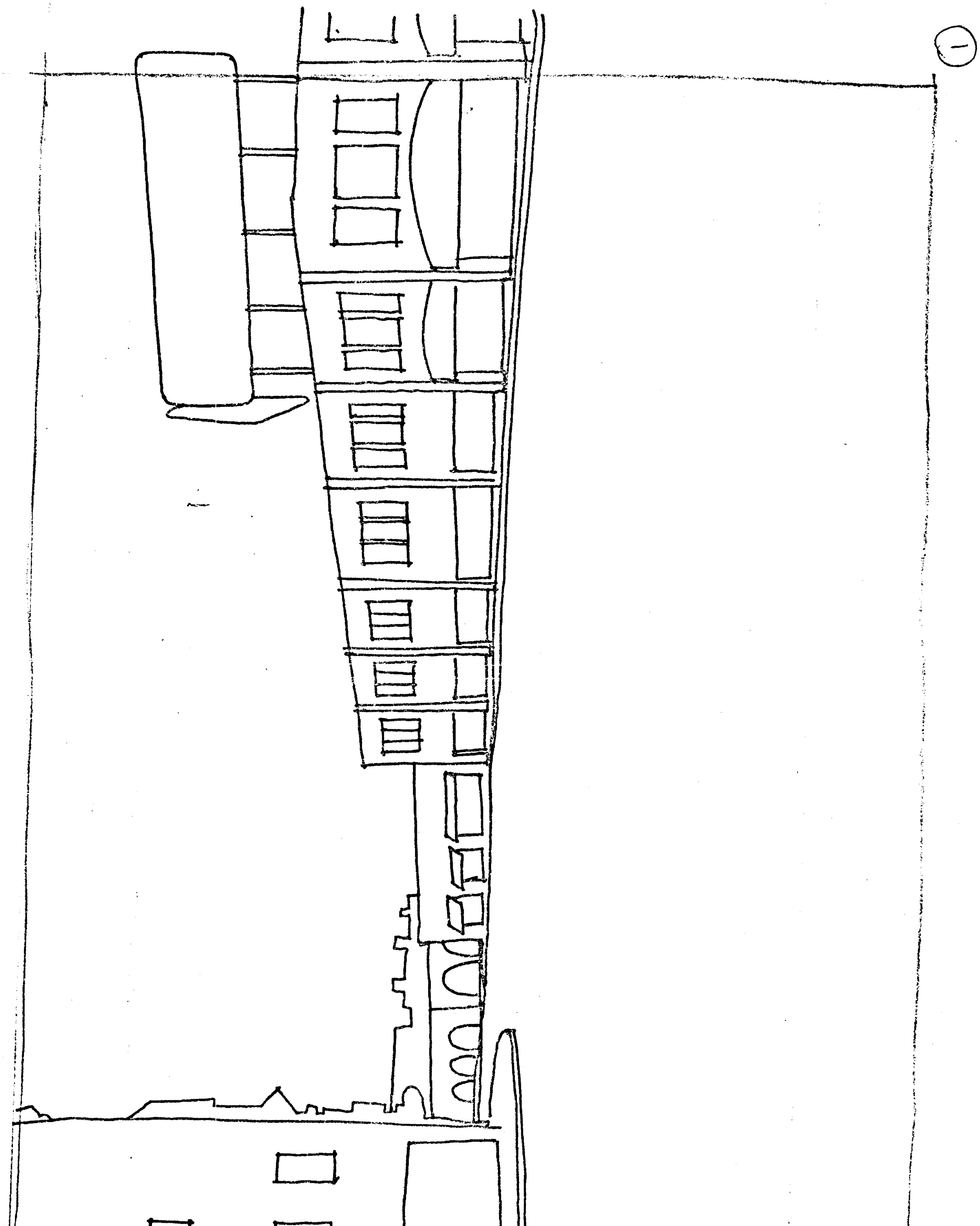

BLACK & WHITE
SCOTCH
MACYS
LIQUORS
SANDWICH SHOP

APPENDIX E

ABSTRACT PERSPECTIVE DRAWINGS

APPENDIX D

ABSTRACT PERSPECTIVE DRAWINGS



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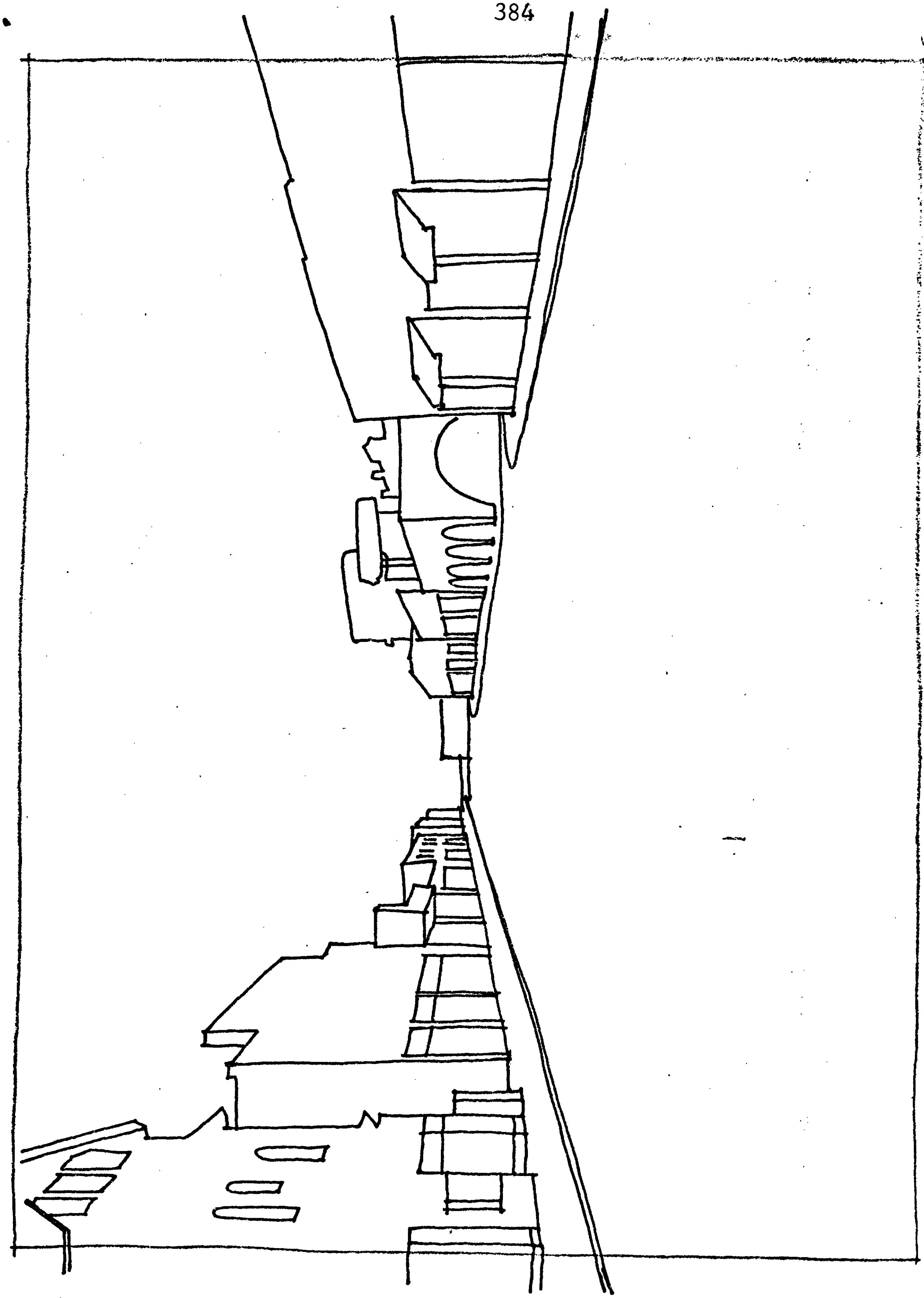

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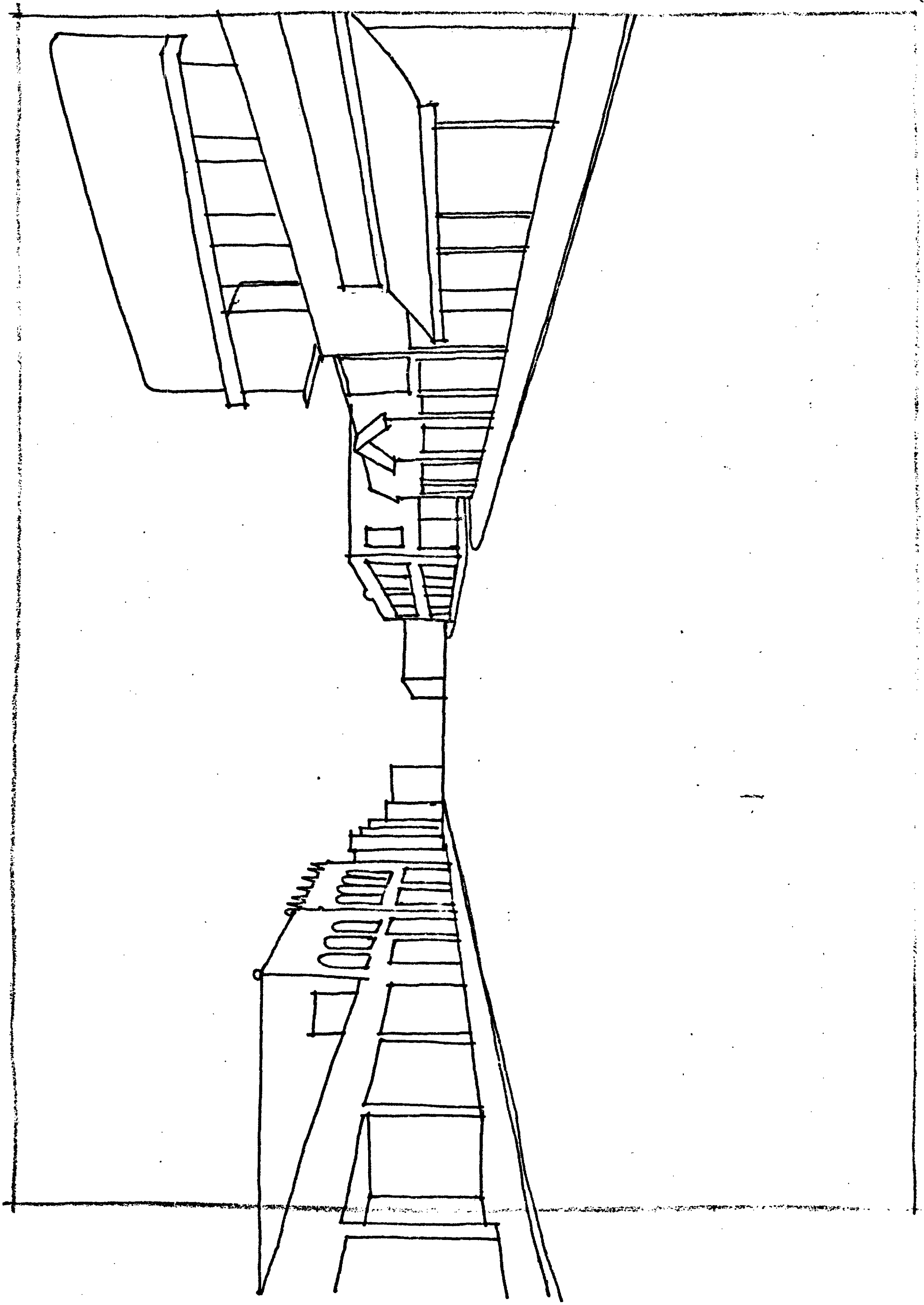

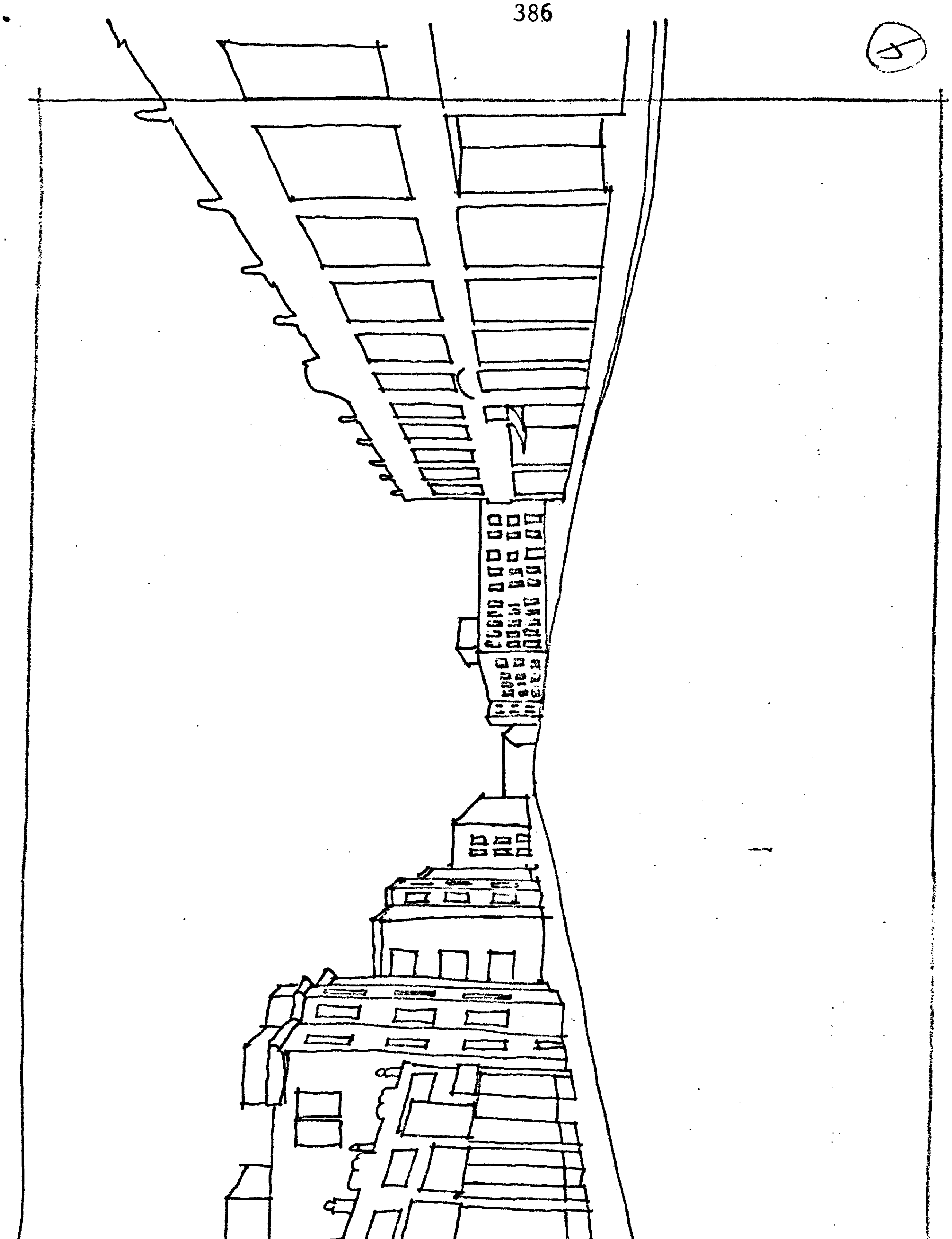

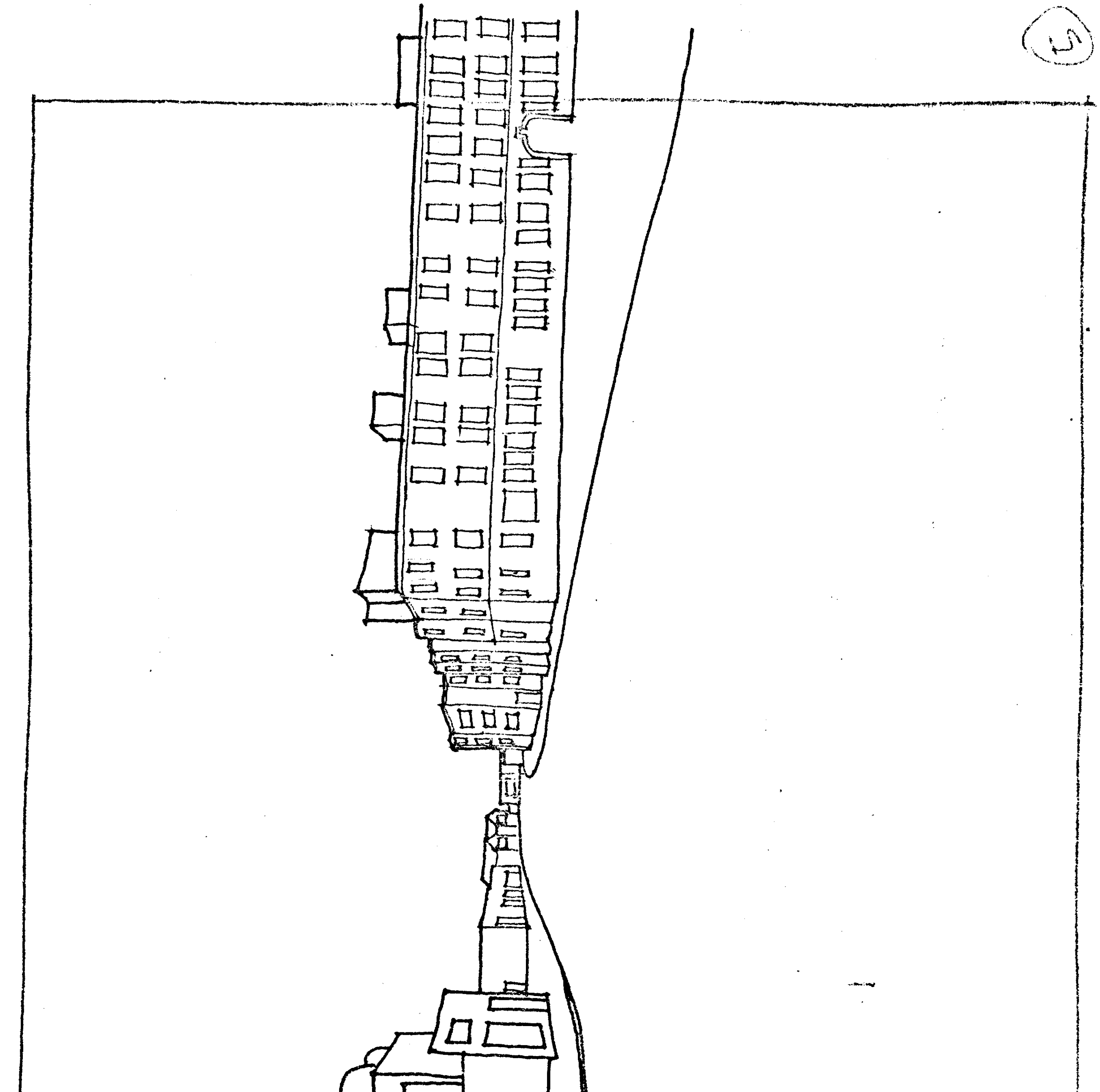

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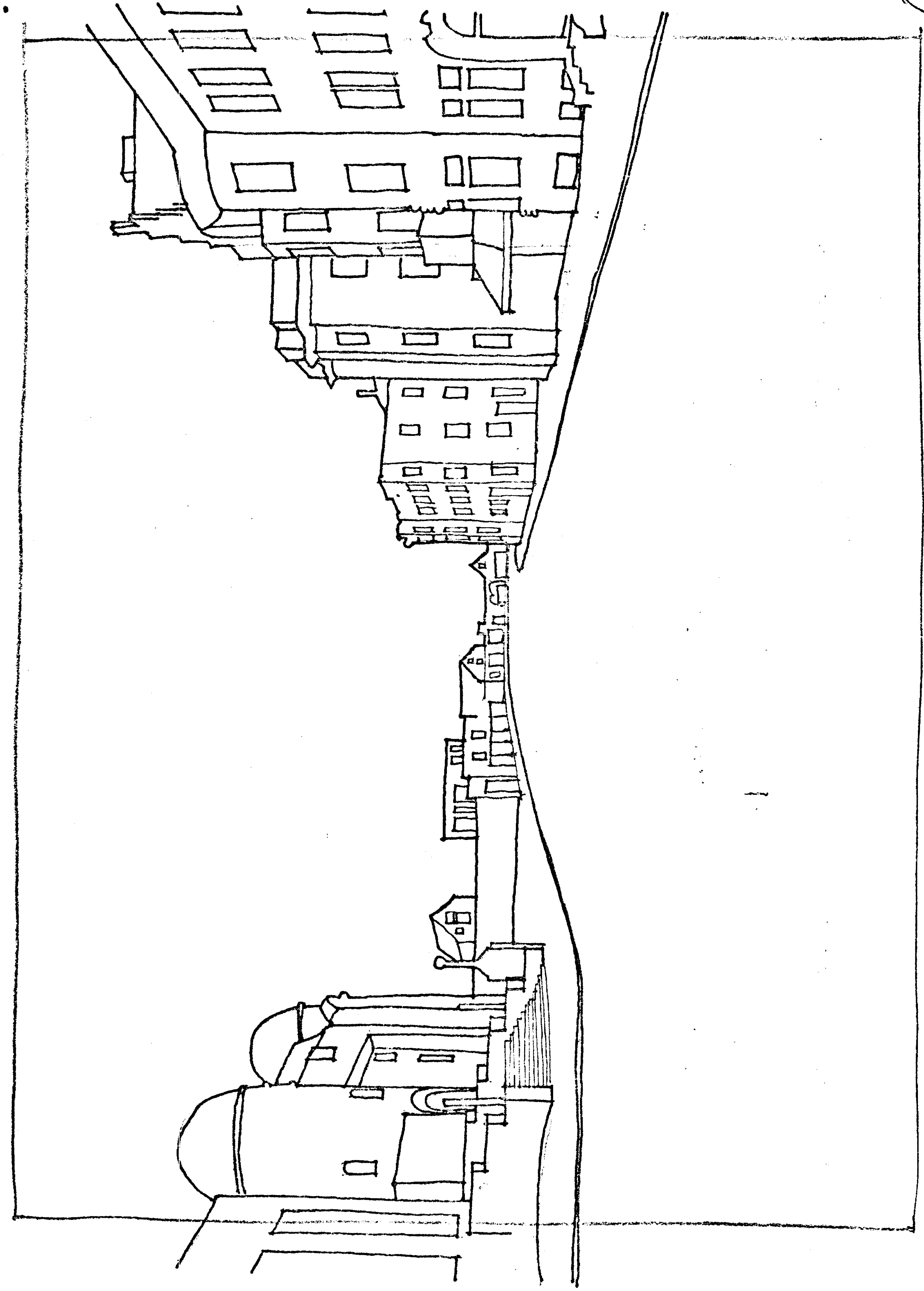

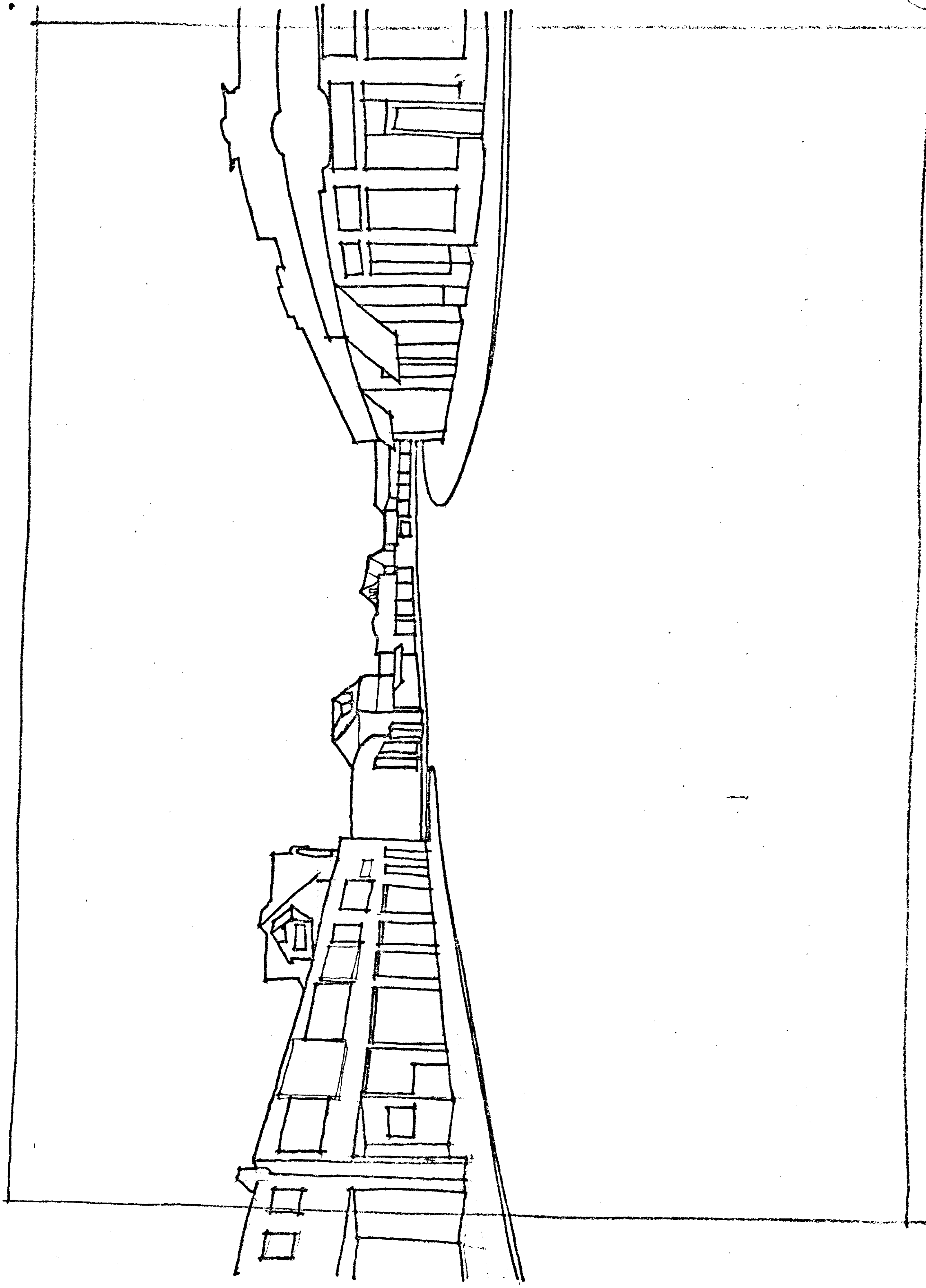

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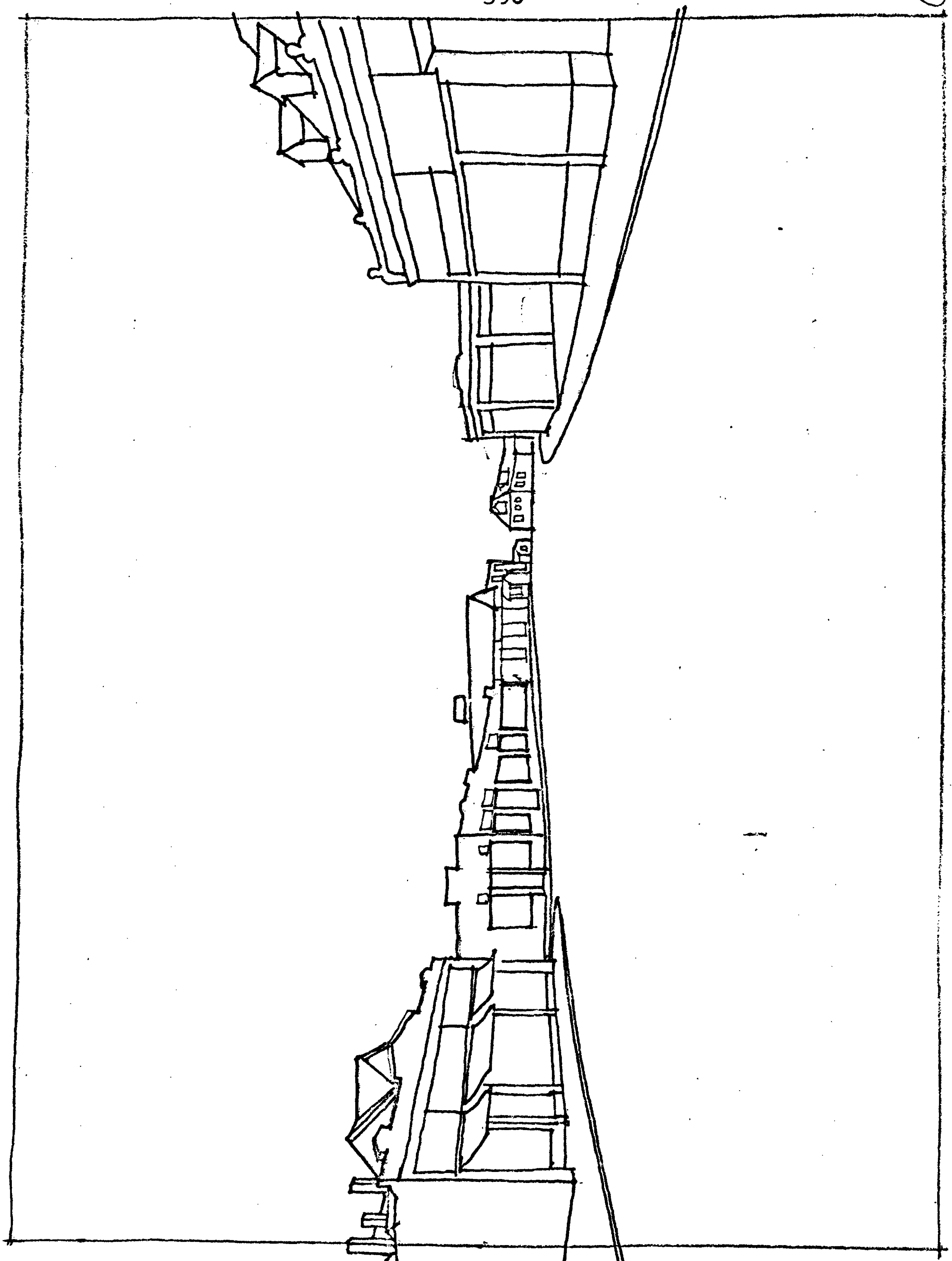
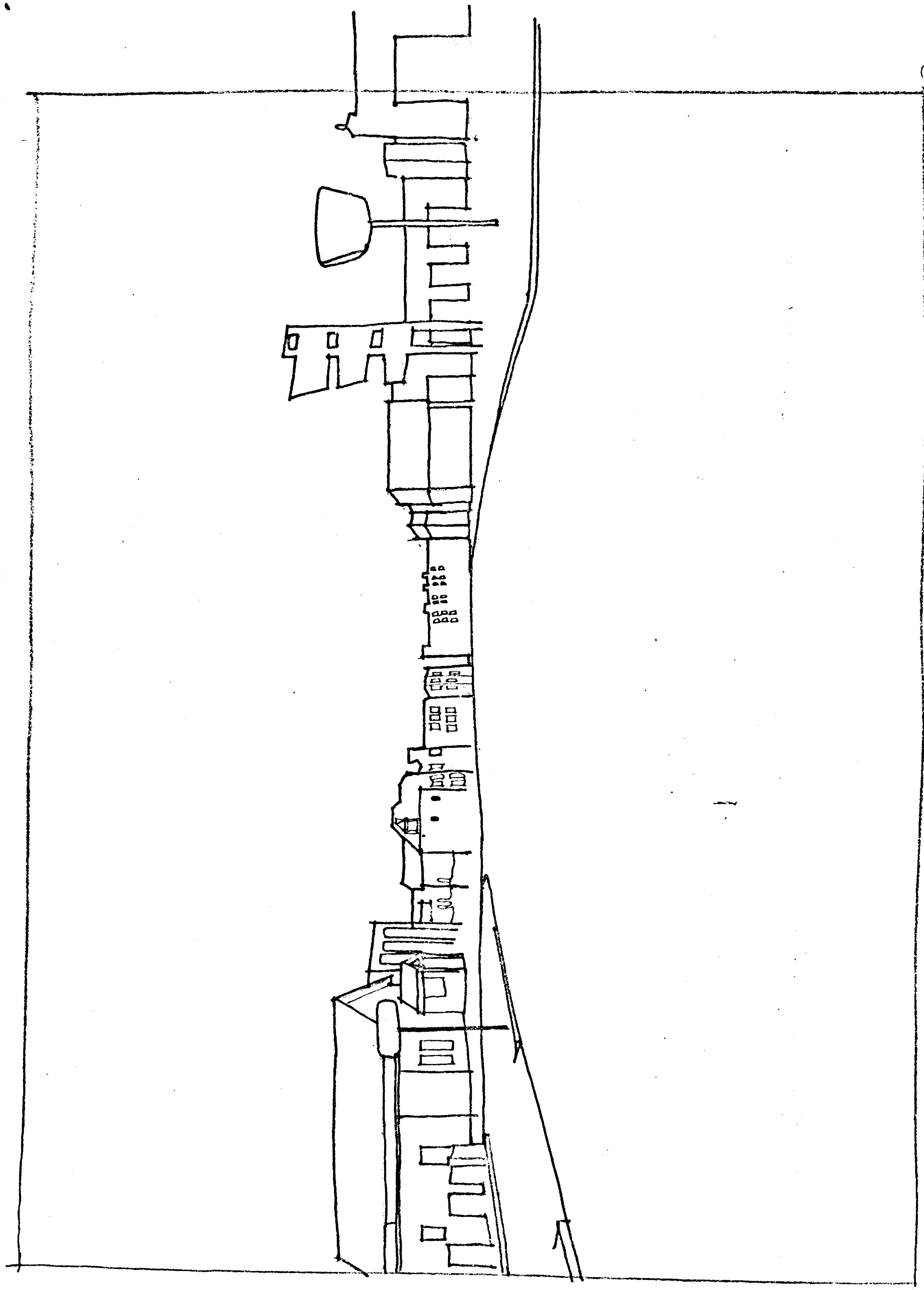


1



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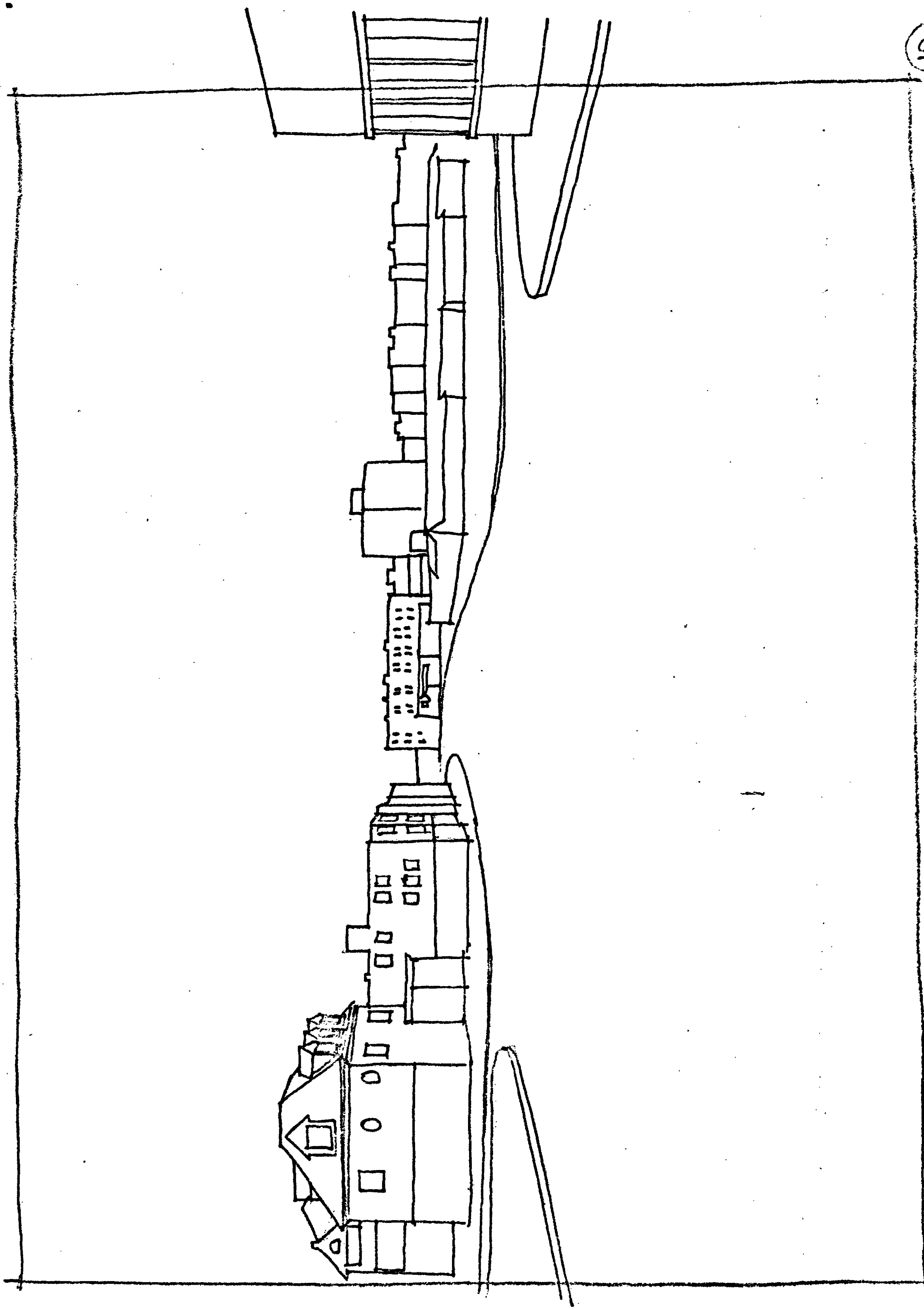

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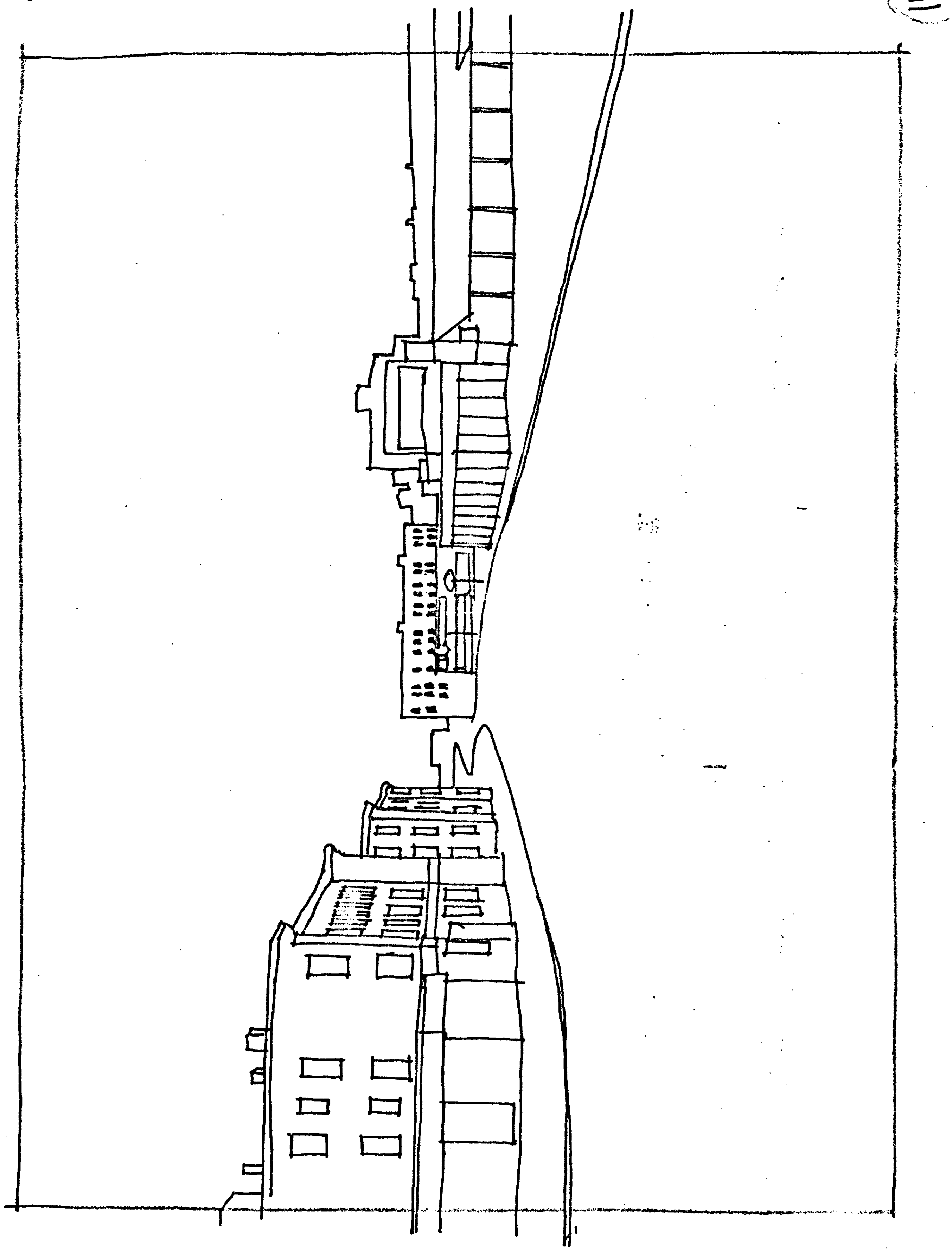
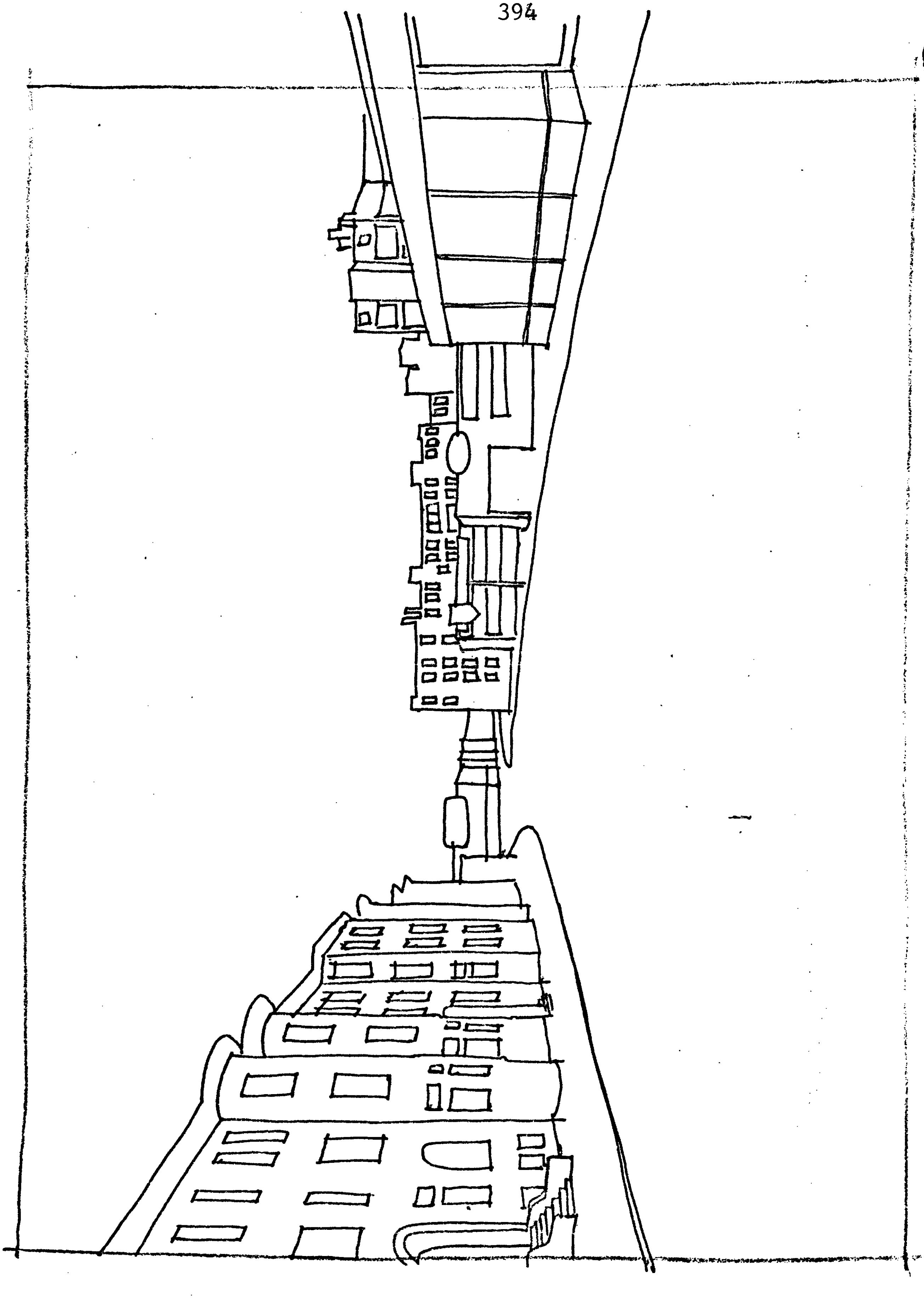
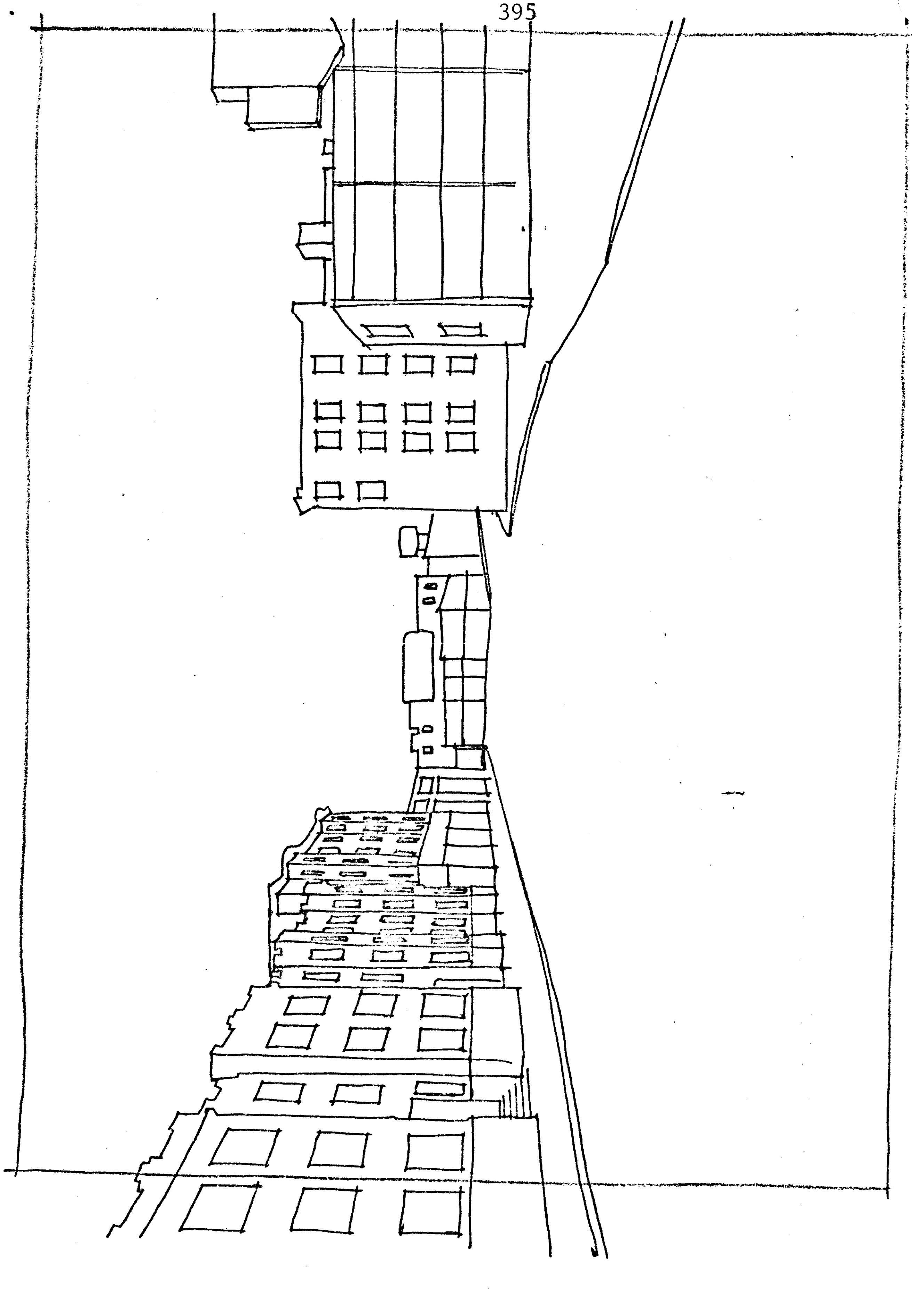
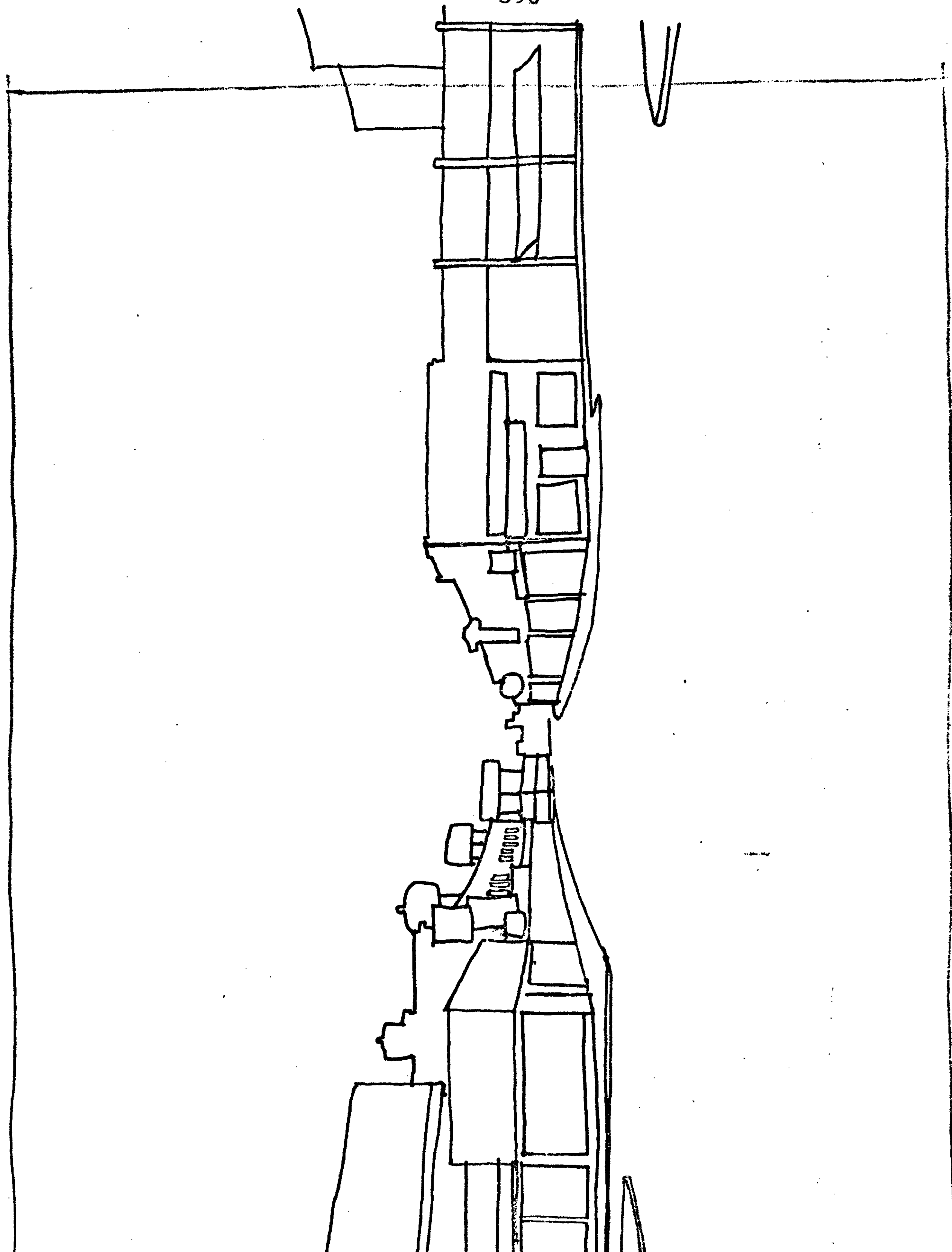








(14)

APPENDIX E

CODE

APPENDIX E

Column Number	Variable Name	Code
1	Media	1. Direct experience. 2. Movie of real thing. 3. Slides of real thing. 4. Drawings. 5. Movie of model. 6. Slides of model. 7. Black and white photos (timed). 8. Times drawings. 9. Realistic drawings. 10. Abstract drawings.
2, 3	Interview Number	(Code questionnaire number.)
4	Card number (Code 1)	
5	WORDSA	Question 1. What did you think of this street generally? (Count words.) 1 1-20 2 21-40 3 41-60 4 61-80 5 81-100 6 101-120 7 121-140 8 141-160 9 161+ 0 NA
6	ELEMENTA	Question 1. What did you think of this street generally? (Count elements.) 1 1-5 2 4-6 3 7-9 4 10-12 5 13-15 6 16-18 7 19-21 8 22-24 9 25+ 0 NA

Column Number	Variable Name	Code
7	PHYSA	Question 1. What did you think of this street generally? (Count physical elements mentioned.) 1 1-2 2 3-4 3 5-6 4 7-8 5 9-10 6 11-12 7 13-14 8 5-12 9 17+ 0 None
8	SOCIALA	Question 1. (Count social elements mentioned.) 1 1-2 2 3-4 3 5-6 4 7-8 5 9-10 6 12-12 7 13-14 8 15-16 9 17+ 0 None
9	ECON A	Question 1. (Count economic and functional elements mentioned.) 1 1-2 2 3-4 3 5-6 4 7-8 5 9-10 6 11-12 7 13-14 8 15-16 9 17+ 0 None

Column Number	Variable Name	Code
10	AFFECTA	Question 1. (Count number of Affective Responses.) (Not tone but definite like-dislike statements.) 1 2 3 4 5 6 7 8 9 0 None
11	BEHAVA	Question 1. (Count number of behavioral responses.) 1 2 3 4 5 6 7 8 9 0 None
12	INCORA	Question 1. (Count number of factually incorrect statements.) 1 2 3 4 5 6 7 8 9 0
13	TONE	Question 1. (General affective tones.) 1 Very favorable. 2 Generally favorable (mildly). 3 Neutral. 4 Generally unfavorable (mildly). 5 Very Unfavorable 9 NA

Column Number	Variable Name	Code
14	WORDS B	Question 2. Tell what you remember of the street? (Count words.)
		1 1-20
		2 21-40
		3 41-60
		4 61-80
		5 81-100
		6 101-120
		7 121-140
		8 141-160
		9 161+
		0 NA
15	ELEMENTSB	Question 2. Tell what you remember of the street? (Count elements.)
		1 1-3
		2 4-6
		3 7-9
		4 10-12
		5 13-15
		6 16-18
		7 19-21
		8 22-24
		9 25+
		0 NA
16	PHYSB	Question 2. Count physical elements. (Analyse for corrections of locational features.)
		1 1-2
		2 3-4
		3 5-6
		4 7-8
		5 9-10
		6 11-12
		7 13-14
		8 15-16
		9 17+
		0 None

Column Number	Variable Name	Code
17	SOCIALB	Question 2. Count Social Elements. 1- 1-2 2- 3 3- 5-6 4- 7-8 5- 9-10 6- 13-4 8- 15-16 9- 17+ 0- None
18	ECONB	Question 2. Count Economic and functional elements. 1- 1-2 2- 3-4 3- 5-6 4- 7-8 5- 9-10 7- 13-14 8- 15-16 9+ 17+ 0 None
19	INCORB	Question 2. Count factually incorrect statements. 1- 2- 3- 4- 5- 6- 7- 8- 9- + 0- None

Column Number	Variable Name	Code
20	MAPCOR	Question 3. Map rank for correctness of locational features. (Construct 10 equal sized stacks based on 1 = highest and 10 = lowest. Then reorder each stack internally then compare the ends with their adjacent categories.) 1. Highest 2. 3. 4. 5. 6. 7. 8. 9. 0. Lowest
21	MAPINFO	Question 3. Map rank for amount of information, detail, etc. 1- Highest 2- 3- (Same as above.) 4- 5- 6- 7- 8- 9- 0- Lowest
22, 23	SUBAREAS	Question 4. Did you notice any divisions or parts in the street? (Sum all categories mentioned.) 01- Land uses, i.e. shopping, residential, etc. V1 02- Pedestrian or traffic activity. 04- Building types or density - i.e. high, low, big, small, etc., etc. 08- Landscaping-presence absence of trees, open space, etc. 16- Space dimensions-open, closed, wide, narrow- 32- Age - new, old, etc...... 00- NA - None -

Column Number	Variable Name	Code
24	LOCATE	Question 5. Locate those areas on yon map. 1) Generally correct location. 2) Partially correct-about half right half wrong. 3) Generally incorrect location. 9) N.A.
25	AREA LIKE	Question 6. Which section liked best. 1) Coolidge Corner, shopping, commercial area at first. 2) Institutional area, park like area, campus, etc. 3) Small shops and residences mixed. 4) Residential area, with funeral homes. 5) Shopping center, gas stations, etc. 6) Apartment house area. 7) Commonwealth shopping area. 8) Other 9) N.A. (Liked all or didn't like any.) 0) Liked a specific place but NA which.
26, 27, 28	APPEARA	Question 6. Describe Appearance (Code first three mentions.) 001. Trees, landscaped, etc. 002. Clean, well kept, well maintained, etc. 004. Character, interest, diversity. 008. Uniform, consistent, planned. 016. Age-old or new. 032. Openness, less dense, spacious, uncrowded. 064 Lack of traffic congestion, parking, probe, problems, etc. 128 Other (Card). 256 No activity. 000 NA

Column Number	Variable Name	Code
29	ACTIVA	Question 7. What kinds of activities go on in that area you liked best. (Code first mention.) 1. Shopping, commerical, office, etc., i.e. Business. 2. Auto oriented business. 3. Residential 4. Recreation, parks, playgrounds. 5. Institutional, church, schools, etc. 6. Industrial. 7. 8. 9. N.A., don't know, didn't notice any.
30	AREA DIS	Question 8. Which area did you like least. 1. Coolidge Corner - Shopping, commercial area, etc. 2. Institutional area. Park like area, etc. 3. Small shops and restaurants. 4. Residential area, funeral homes area. 5. Shopping center, gas stations area. 6. Apartment house area. 7. Commonwealth shopping area. 8. Other - (card). 9. N.A. - disliked at all. 0. Disliked a specific area-but but N.A. which.
31, 32, 33	APPEARB	Question 8. Describe the appearance of the area you liked least (code first three mentions.) 001. Lack of trees, landscaping, etc. 002. Dirty, poorly kept, poorly maintained, etc. 004. No character, monotonous, bleak, etc. 008. Haphazard, unplanned, cluttered, etc., gaudy V3 016. Age-too new, old, etc. 032. Too crowded, dense, built up, etc. 064. Too much traffic, congestion, etc.

Column Number	Variable Name	Code
		128. Other card. 000. N.A. liked it all, etc.
34	ACTIVB	Question 9. What activities go on in the area you liked least? (Code first mention.) 1. Shopping, commercial, office, etc. 2. Auto oriented business, i.e. gas stations, etc. 3. Residential. 4. Recreational, parks, play-grounds, etc. 5. Institutional, churches, schools, etc. 6. Industry, warehousing, etc. 8. Other 9. N.A.
35	WALK	Question 10. How about taking a walk there? 1. Very positive. 2. Mildly positive. 3. Neutral. 4. Mildly negative. 5. Very negative. 6. Very positive with specific reservations. 7. Mildly positive with specifc 8. Neutral with specific reserva-tion. 9. N.A.
36, 37, 38	WHYW	Question 11. Why? (Code first three mentions.) 001. Safety reasons. 002. Cleanliness, maintenance reasons. 004. Character, interest reasons. 008. Density, openess reasons. 016. Landscaping, greenery reasons. 032. Traffic, parking, congestion. 064. Convenience. 128. Use oriented reasons. 256. People oriented reasons. 512. Other. 000. N.A.

Column Number	Variable Name	Code
39	SHOP	Question 12. How about shopping there. 1. Very positive. 2. Mildly positive. 3. Neutral. 4. Mildly negative. 5. Very negative. 6. Very positive with specific reservations. 7. Mildly positive of specific reservations. 8. Neutral with specific reservations. 9. N.A.
40, 41, 42	WHYS	Question 13. Why (Code first three mentions). 001. Safety reasons. 002. Cleanliness, maintenance reasons. 004. Character, interest, reasons. 008. Density, openness reasons. 016. Landscaping, greenery reasons. 032. Traffic, parking congestion. 064. Convenience. 128. Use oriented reasons. 256. People oriented reasons. 512. Other. 000. N.A.
43	LIVE	Question 14. What would you think of living there? 1. Very positive. 2. Mildly positive. 3. Neutral. 4. Mildly negative. 5. Very negative. 6. Very positive with specific reservation. 7. Mildly positive with specific reservations. 8. Neutral with specific reservations. 9. NA.

Column Number	Variable Name	Code
44, 45, 46	WHYL	Question 15. Why? 001. Safety. 002. Cleanliness, maintenance. 004. Character, interest. 008. Density, openness. 016. Landscaping. 032. Traffic parking, congestion, noise, pollution related reason. 064. Convenience. 128. Use oriented reasons. 256. People oriented reasons. 512. Other (card). 000. NA.
47	WORK	Question 16. What about working there? 1- Very positive 2- Mildly positive 3- Neutral 4 Mildly negative. 5- Very negative. 6- Very positive with specific reservations. 7- Mildly positive with specific reservations. 8- Neutral of specific reservations. 9- NA.
48, 49, 50	WHYT	001. Safety. 002. Cleanliness, maintenance. 004. Character, interest. 008. Density openness. 016. Landscaping, greenery. 032. Traffic, parking, congestion, noise, pollution, etc. 064. Convenience. 128. Use oriented reasons. 256. People oriented reasons. 512. Other - card (No suitable job for me). 000. NA.

Column Number	Variable Name	Code
51	MOVIE	Question 18. How about going to a movie or restaurant? 1- Very Positive. 2- Mildly positive. 3- Neutral. 4- Mildly negative. 5- Very negative. 6- Very positive with specific reservations. 7- Mildly positive with specific reservations. 8- Neutral with specific reservations. 9- NA
52, 53, 54	WHYM	Question 19. Why? 001. Safety. 002. Cleanliness, maintenance. 004. Character, interest. 008. Density, openess. 016. Landscaping, greenery. 032. Traffic, parking, congestion. 064. Convenience. 128. Use oriented reasons. 256. People oriented reasons. 512. Other cards (if a good movie or a good restaurant, would go then). 000. NA.
55, 56, 57	LIKED	Question 20. What were some of the things you liked? (Code first, three mentions.) 001- Planned, uncluttered appearance. 002- Cleanliness, maintenance, reasons. 004- Character, interest reasons. 008- Density, openness. 016- Landscaping, greenery. 032- Traffic, parking, congestion. 064- Convenience. 128- Use oriented reasons. 256- People oriented reasons. 512- Other - card. 000- NA.

Column Number	Variable Name	Code
58, 59 60	DISLIKED	Question 21. What did you dislike about the street? (Code first three mentions.) 001- Haphazard, unplanned, garnish, quality. 002- Cleanliness maint. 004- Character interest. 008- Density, openness. 016- Landscaping, greenery. 032- Traffic, parking, auto oriented reasons. 064- Convenience. 128- Use oriented reasons. 256- People oriented reasons. 512- Other- (card). 000- NA.
61	HOWLONG	Question 22. How long was the street? 1. 0-5 blocks. 2. 6-10 blocks. 3. 11-15 blocks. 4. 16-20 blocks. 5. 21-25 blocks. 6. 26-30 blocks. 7. 31-35 blocks. 8. 36-40 blocks. 9. NA.
62	SAFE	Question 24. Safe - Dangerous
63	TASTEFUL	Question 25. Tasteful - Tasteless
64	EXCITING	Question 26. Exciting - Boring
65	CLEAR	Question 27. Clear - Confusing
66	CLEAN	Question 28. Clean - Dirty
67	QUIET	Question 29. Quiet - Noisy
68	SPACIOUS	Question 30. Spacious - Cramped
69	NEW	Question 31. New - Old
70	WIDE	Question 32. Wide - Narrow
71	PLEASANT	Question 33. Pleasant - Gloomy

Column Number	Variable Name		Code
72	ORDERLY	Question 34.	Orderly - Disorderly
73	CONVEN	Question 35.	Convenient - inconvenient
74	ALIVE	Question 36.	Alive - Dead
75	COMFORT	Question 37.	Comfortable - Uncomfortable
76	COLORFUL	Question 38.	Colorful - Drab
77	LASTING	Question 39.	Lasting - Changing
78	RICH	Question 40.	Rich - Poor
79	UNIFORM	Question 41.	Uniform - Diverse
80	LOW	Question 42.	Low - High
1	MEDIA	1. Trip 2. Movie 3. Slides 4. Drawings 5. Movie of model 6. Slides of model 7. Black and white photos 8. Drawings - (timed)	
2, 3	INTERVIEW NUMBER (Code interview number)		
4	CARD NUMBER (Code 2)		
5	INFORMAL	Question 43.	Informal - Formal
6	COMPLETE	Question 44.	Complete - Incomplete
7	PRIVATE	Question 45.	Private - Public
8	NATURAL	Question 46.	Natural - Unnatural
9	OCCUPIED	Question 47.	Occupied - Deserted
10	FRIENDLY	Question 48.	Friendly - Unfriendly
11	DYNAMIC	Question 49.	Dynamic - Static
12	BEAUTIFUL	Question 50.	Beautiful - Ugly
13	PERSONAL	Question 51.	Personal - Impersonal

Column Number	Variable Name	Code
14	UNCLUTRD	Question 52. Uncluttered - Cluttered.
15	REALITY	Question 53. Did street seem real to you? (Code 0 in Col. 16, 17, 18.) 1. Yes 2. Sort of. 3. No. 9- NA. 0- INAP (Trip)
16, 17, 18	WHYRA	Question 54. Why not? 001 Not enough emphasis on sides of street. of street 002 Need more sensory modes, i.e. color, sound, etc. modes, i.e. Color, Sound etc. 004 Another showing or more time 008 Technical use of medium 006 More detail - i.e. cars, people 032 Not a very representative time -i.e., no people, cars, etc. 064 Other points of view than diversion 128 More pictures - closer together. 256- 999 NA 1 in Column 15. in Col 15. 600 INAP. (Coded 512- Trees or other distractions in background.
19	FAMILIAR	<u>Familiarity With Street</u> (Look at Questions 55, 56, 57). 1. No 2. Not sure 3. Visited one to three times. 4. Visited (three to ten times). 5. Visited 11 plus. 9. NA

Column Number	Variable Name	Code
20	ASSOCIAT	Question 59. Does street remind you of another area? 1- Yes. - with specific association-i.e., reminds me of a specific place. 2- Yes - general stereotype response. 3- No - (Code 0 in Column 21). 9- NA.
21	ATTITUD	Question 60. What were your feelings about the other area? Code underlining feeling. 1- Very favorable. 2- Mildly favorable. 3- Neutral. 4- Mildly negative. 5- Very negative. 6- 7- 8- 9- N.A. 0- INAP (Coded 3 in Column 9.)
22, 23, 24	CHANGE	Question 61. How would you change the street? (Code 3 mention.) 001- Landscaping, more trees, greenery, etc. 002- Clean up, improve maintenance. 004- Provide more character, diversity, interest. 008- Make more uniform, planned, consistent. 016- More new buildings, modernize. 032- Decrease density, provide more open areas, etc. 064- Decrease traffic, parking problems. 128- Change uses - i.e., eliminate stores, etc. 256- Other (card). 512- Everything. 000- NA

Column Number	Variable Name	Code
25	PASTDIR	Question 62. What like in pool? (Code direction of change.) 1- Generally better. 2- About the same. 3- Generally worse. 0- NA.
26	PASTKIND	Question 62. What like in past? (Code kind of change.) (Sum all categories meant.) 1. Use - functional. 2. People. 4. Physical. 9. NA 0. INAP
27	FUTURDIR	Question 63. What like in future? (Direction of change.) 1. Generally better. 2. About the same. 3. Generally worse. 0. N.A.
28	FUTURKIN	Question 63. What like in future (kind of change). 1- Use 2- People 4- Physical 9- NA 0- INAP.
29, 30	CLASS	Question 64. What kind of people live in area (code class). 01- Upper class. 02- Upper middle. 04- Middle 08- Lower middle 16- Lower 00 NA
31	OLD	064. What kind of people live in area. Code. Age. (Sum all categories.) 1- Elderly 2- Middle aged. 4- Young 0- NA.

Column Number	Variable Name	Code
32, 33	ETHNIC	Question 64. What kind of people live in area. Code ethnicity plus life style (three mentions). 01- Wasp 02- Jews 04- Irish and Italian Catholics and European minorities, i.e. Pole, etc. 08- Blacks. 16- Students, transients, etc. 32- Social stereotypes. 00- NA
32	REALITYB	Question 65. Did pictures give clear impression. 1- Definitely 2- Fairly clear. 3- Not too good. 4- Not at all. 9- N.A. 0- INAP (for trip). (Code 0 in 35, 6, 7, 8, 9, 0.)
35, 36, 37	WHYRB	Question 65. Pictures give clear impression. List first three mentions. 001- More emphasis on sides of street, a wider angle of view. 002- No sound, color, etc. 004- More time or more showings. technical use of medium → 008- Technical use of medium. 016 Show more detail - i.e. people 032- Show a representative time. 064 Show from other points of view - tends to 128 Show more pictures - i.e. closer together - 256 Need another media in conjunction with this one. with this one 512- Movement 999- NA 000- INAP

Column Number	Variable Name	Code
38, 39, 40	IMPROVE	Question 66. Ways to improve presentation (three mentions).

1. 001. More emphasis on sides of street.
2. 002- More modes - i.e. sound, color, etc.
3. 004- Second run - or slower run
4. 008. Better technical use of medium - i.e. correct exposure.
5. 016. More detail - i.e. case, people.
6. 032. Show a more representative time or other times.
7. 064. Aerial view or other points of view than drivers.
8. 123- More pictures closer together.
9. 251- Verbal description, or map or some other media on conjunction
10. 999- NA NO
0 000- INAP- (For trip).
11. 512- Movement.

Report For All Recognition Photos

Column Number	Variable Name	Code
41-52	PICOL-12	Question 1. Recognition Photos Code Actual Choice

1. Picture 1
2. Picture 2
3. Picture 3
4. Picture 4
9. N.A.

Column Number	Variable Name	Code
53-64	RECOGD-12	Question 1. Recognition

CORRECT			#1-4
1. Absolutely sure	(+5)	10	3-3
2. Very sure	(+4)	09	5-1
3. Fairly sure	(+3)	08	7-4
4. Not very sure	(+2)	07	9-2
5. Just guessing	(+1)	16	11-2

Column Number	Variable Name	Code
		INCORRECT 6. Absolutely sure (-5) 01 15-3 7. Very sure (-4) 02 17-2 8. Fairly sure (-3) 03 19-1 9. Not very sure (-2) 04 21-2 0. Just guessing (-1) 05 23-4 * NA = No punch on card.
65, 66	WHYFIC	Model Scope Photos 01- Width of street. 02- Height of buildings. 04- Signs 08- Dark surface 16. Lines 32. Did notice lines for dark surface but did <u>not</u> use. 00. INAP.
67	AGE	Question 25. In what year were you born? 1- 1950 + (20 years or less) 2- 1948-9 (21-22) 3- 1946-7 (23-24) 4- 1944-5 (25-26) 5- 1942-3 (27-28) 6- 1940-1 (29-30) 7- 1930-1959 (31-40) 8- -- 1929 (41+) 9. N.A.
68	SEX	Question 26. What is your sex? 1. Female 2. Male 9. NA.
69	NATIONAL	Question 27. What is your nationality? 1. U.S.A. 2. Canadian 3. Latin American (Code 0 in 4. Oriental Column 7 0) 5. Indian Pakistani Iranian 6. European 7. African 8. Other 9. N.A.

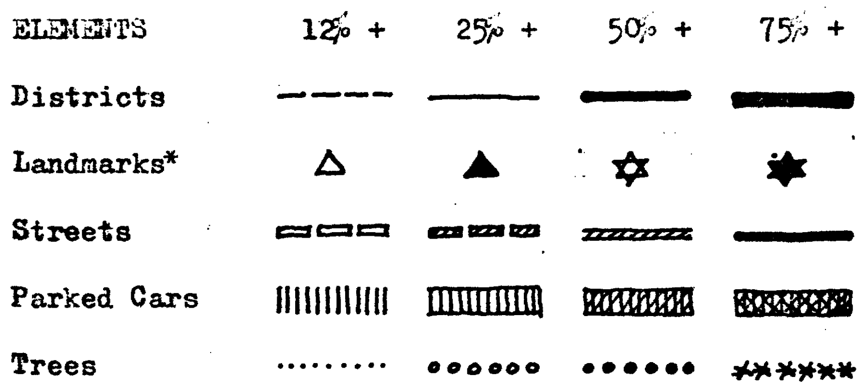
Column Number	Variable Name	Code
70	ETHNBACK	Question 28. American and Canadian National Background. 1. Wasp. 2. Jewish. 3. Catholic-Irish. 4. Italian-Catholic. 5. Black. 6. Other 7. None 9. NA 0. INAP (Coded 3-9 in Column 70).
71	RELIGION	Question 29. Religion. 1. Catholic. 2. Protestant. 3. Jewish. 4. Buddhist. 5. Moslem. 6. Hindu. 7. None. 9. NA
72	EDUC	Education (Highest. Look at Questions 32, 34, 35, 36, 37, 38, 39 1. 1-6 years. 2. 6-12 years. 3. Undergrad 1 and 2. 4. Undergrad 3, 4, 5 plus. 5. Grad 1 and 2. 6. Grad 3 plus. 7. Technical school or secretarial school, etc. 8. Other. 9. N.A.
73	MAJOR	Major Subject. Look at Questions 31, 36, 37. 1. Urban studies - No Architecture. 2. Urban studies - Architecture. 3. Engineering. 4. Natural sciences. 5. Education. 6. Social sciences. 7. Secretary, etc. 8. 9. NA. 0. INAP

Column Number	Variable Name	Code
74	OCCUP	Question 40. Usual or intended occupation? Look at Questions 31, 33, 37, 40. 1. Planner-urban studies. No Architectural background. 2. Architect-Planner 3. Engineer. 4. Sciences-natural. Chemistry, Physics, Mathematics, etc. 5. Social Sciences 6. Housewife-with educational or professional background. 7. Housewife-no education or professional background. 8. Secretary. 9. Other 0. NA.
75	HOWLONG	Question 41. How long in Boston area? 1. 1 year or less. 2. 2-5 years. 3. 6-10 years. 4. 10 plus years. 9. NA Question 42 Omit.
76	MEDIAEXP	Question 43. Experience with models, drawings, etc. 1. Yes. 2. No 3. NA.
77	AUTO	Question 44. Do you have the use of an automobile? 1. Yes. 2. No. 3. N.A.

Column Number	Variable Name	Code
78	URBANEXP	Question 45. Urban Experience. 1. 5 years or less in J or I. I 2. 10 years or less in J or I. I 3. 15 years or less in J or I. I 4. More than 15 years in J or II. 9. NA.
79	CITYSIZE	Question 46. Preferred city size. 1. A, B, C, D, E 2. F, G 3. H 4. I 5. J 9. N.A.

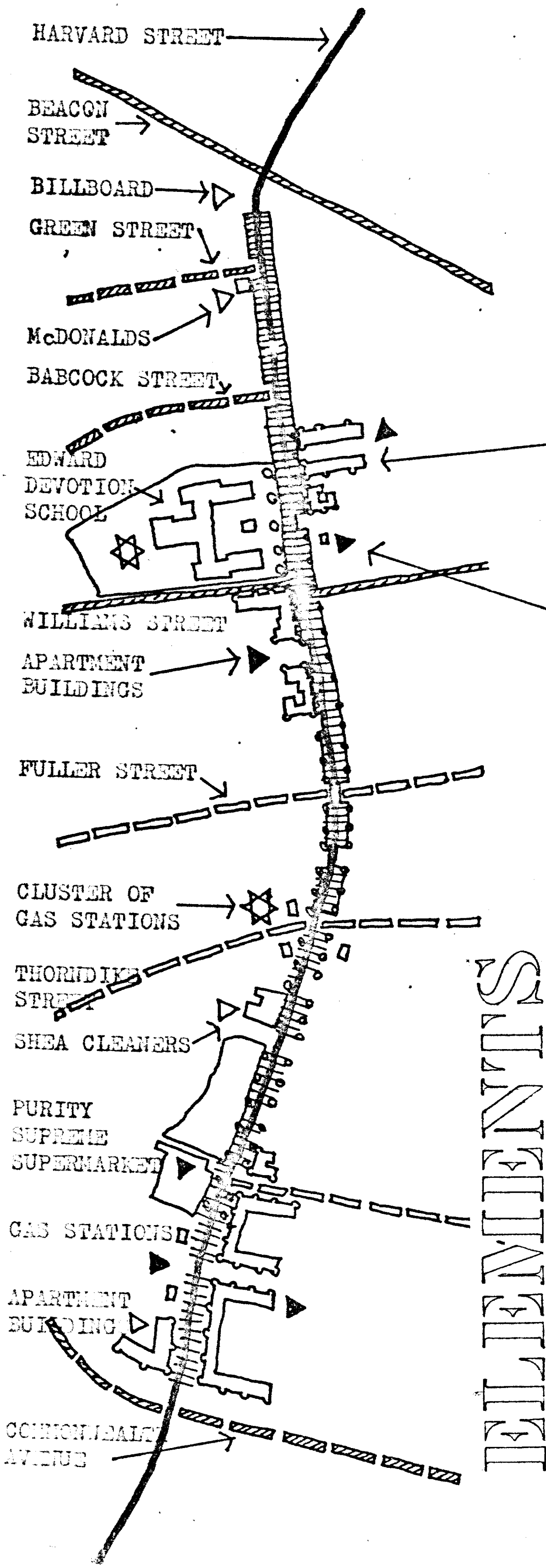
APPENDIX F

GROUP IMAGE MAPS FROM MAP AND VERBAL RESPONSE



* Buildings and open areas are outlined.

LEGEND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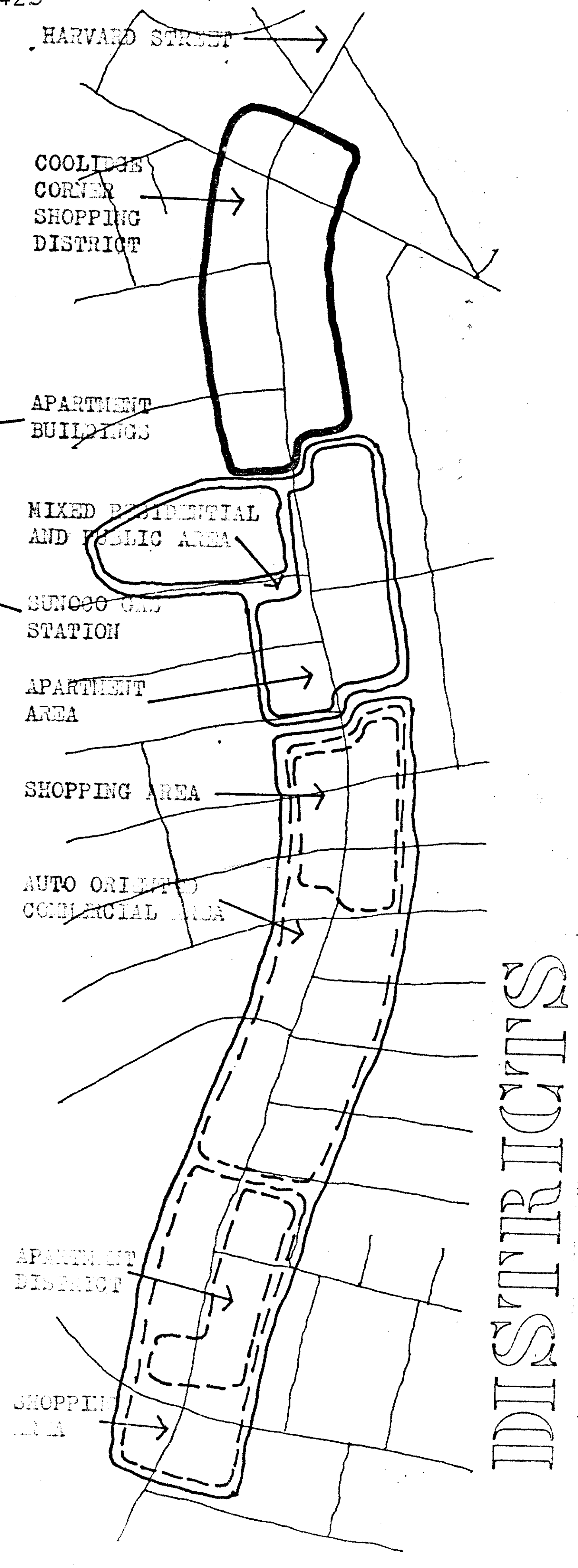
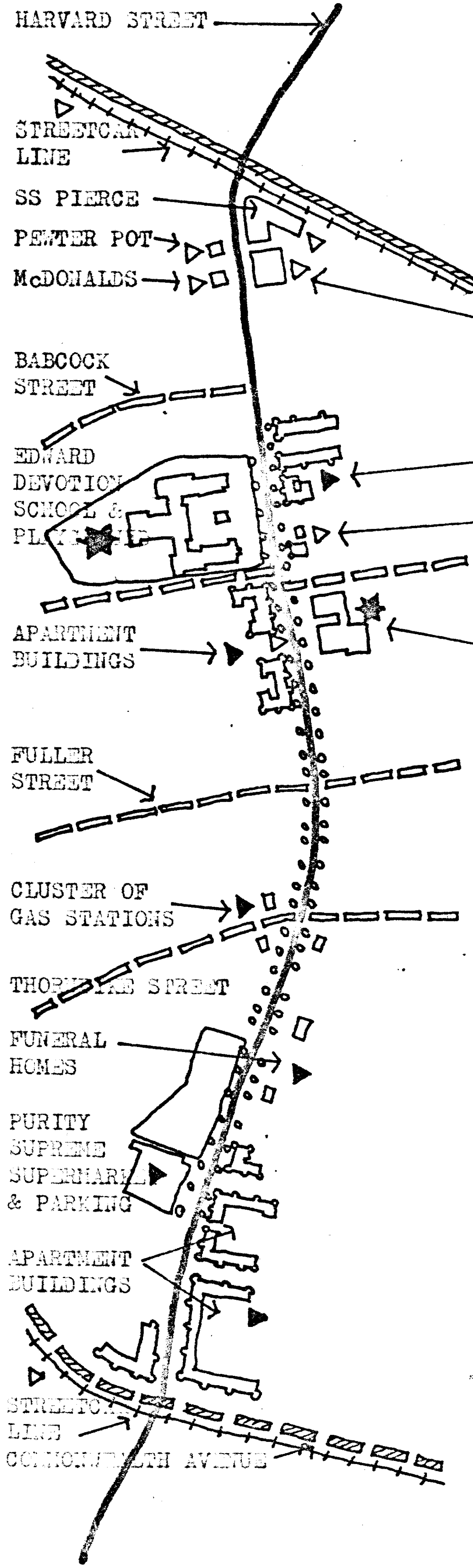
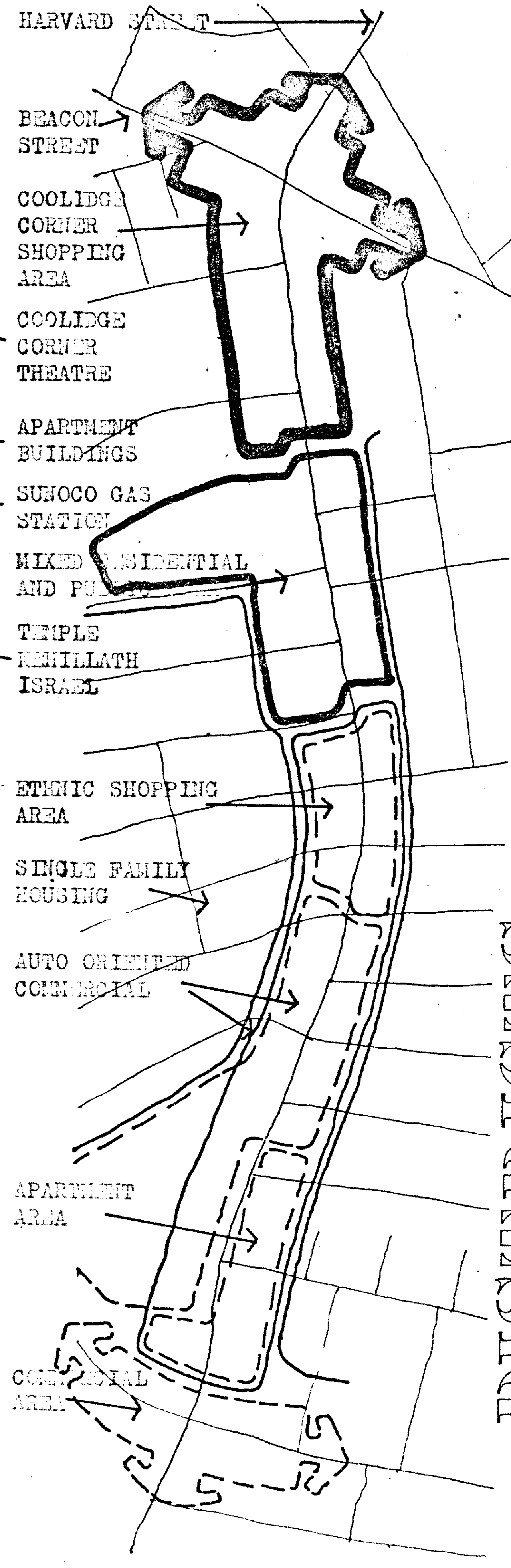
BEACON STREET
BILLBOARD
GREEN STREET
McDONALDS
BABCOCK STREET
EDWARD DEVOTION SCHOOL
WILLIAMS STREET
APARTMENT BUILDINGS
FULLER STREET
CLUSTER OF GAS STATIONS
THORNDIKE
SHEA CLEANERS
PURITY SUPREME SUPERMARKET
GAS STATIONS
APARTMENT
ELEMENTS


HARVARD
COOLIDGE CORNER SHOPPING DISTRICT
APARTMENT BUILDINGS
MIXED
AND
STATION
APARTMENT AREA
SHOPPING AREA
AUTO
DISTRICTS

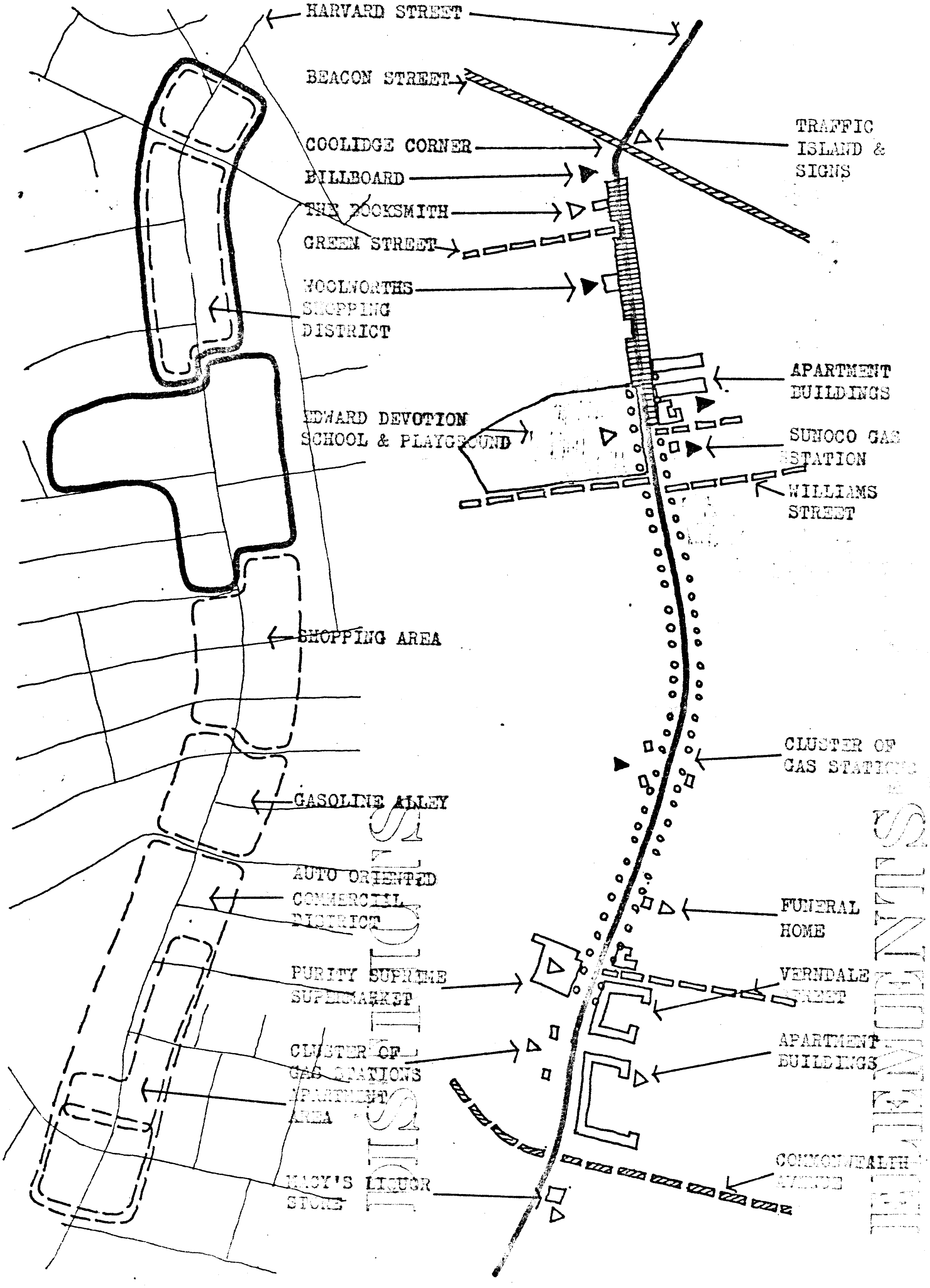


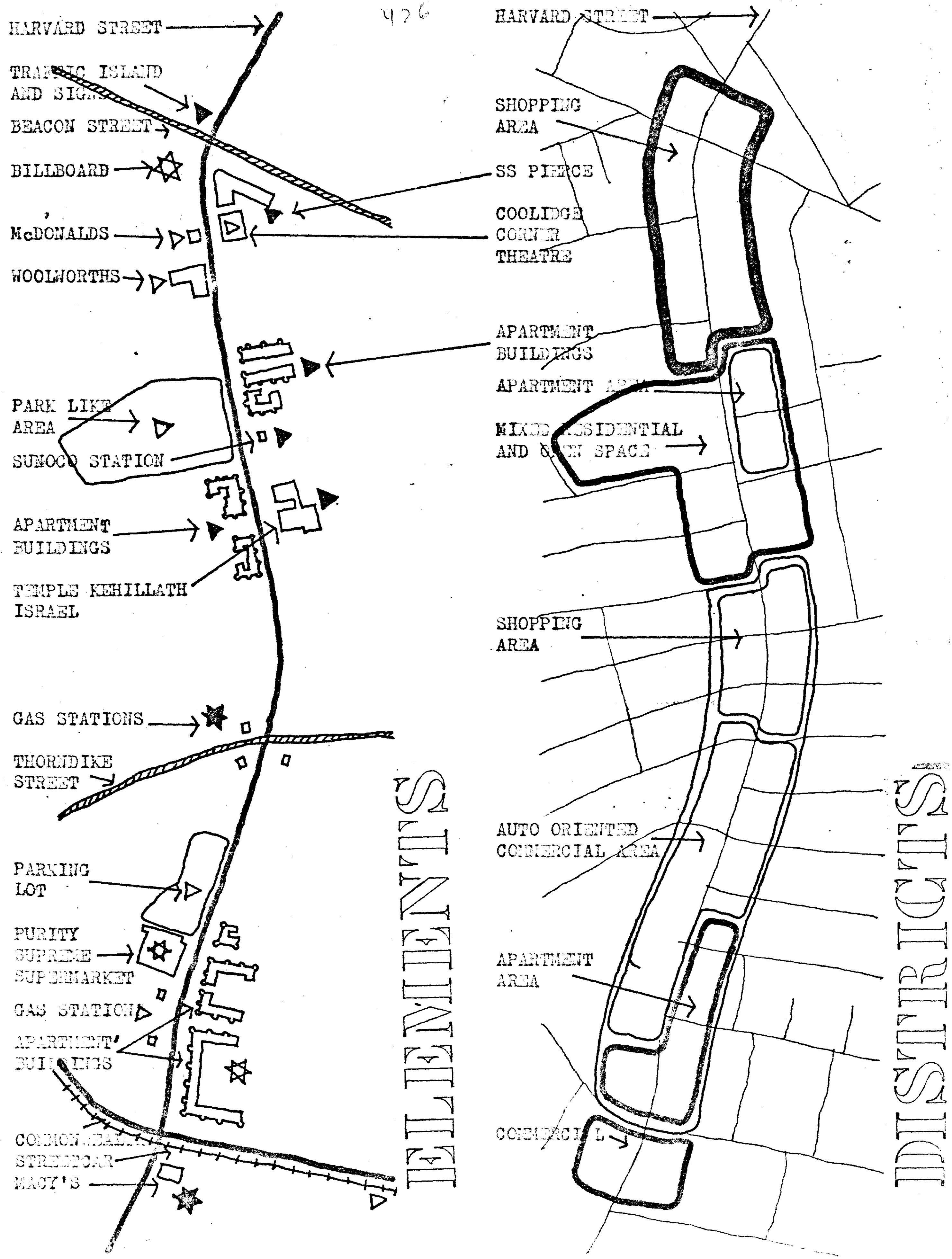
ELEMENTS



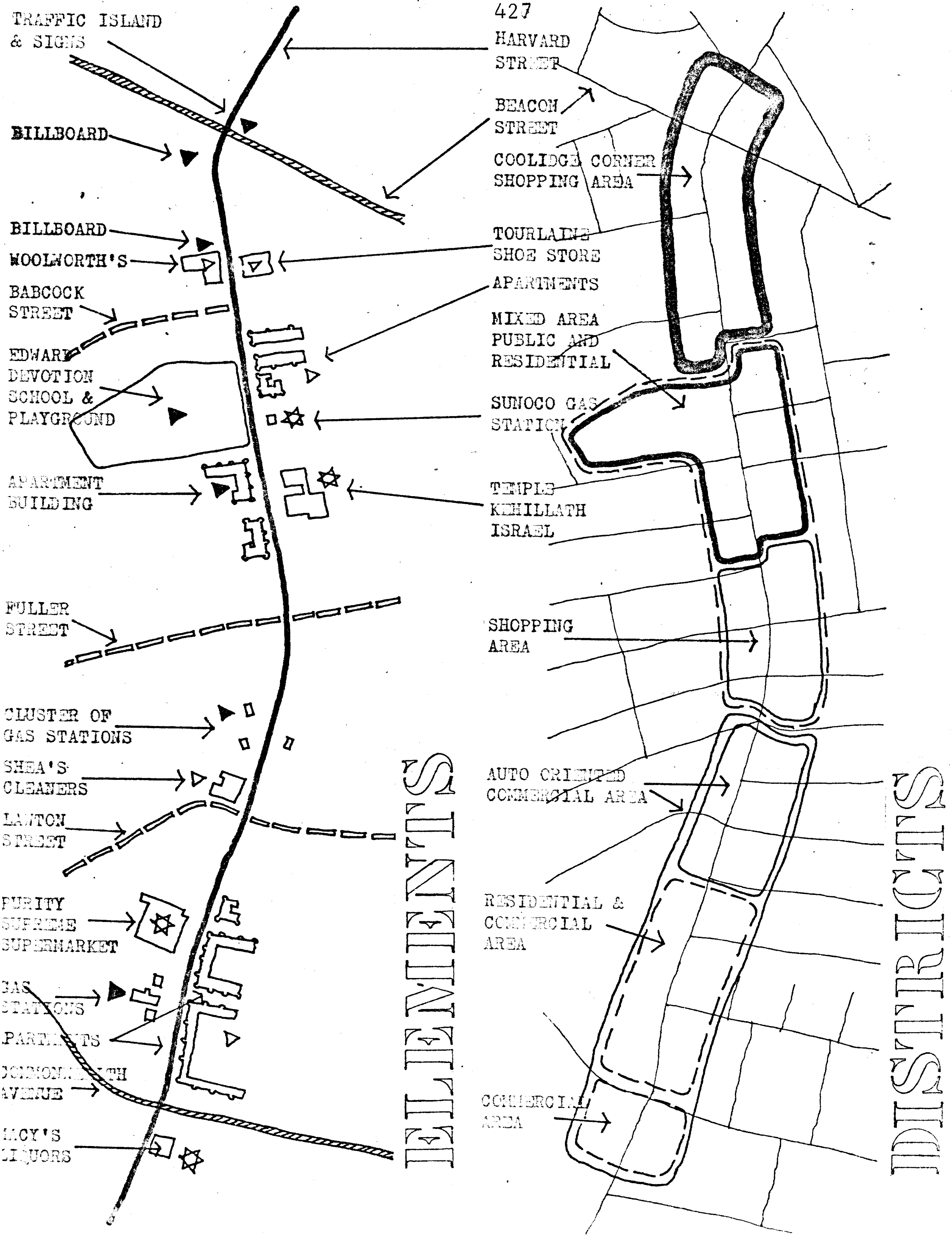
DISTRICTS

1 CONTROL GROUP

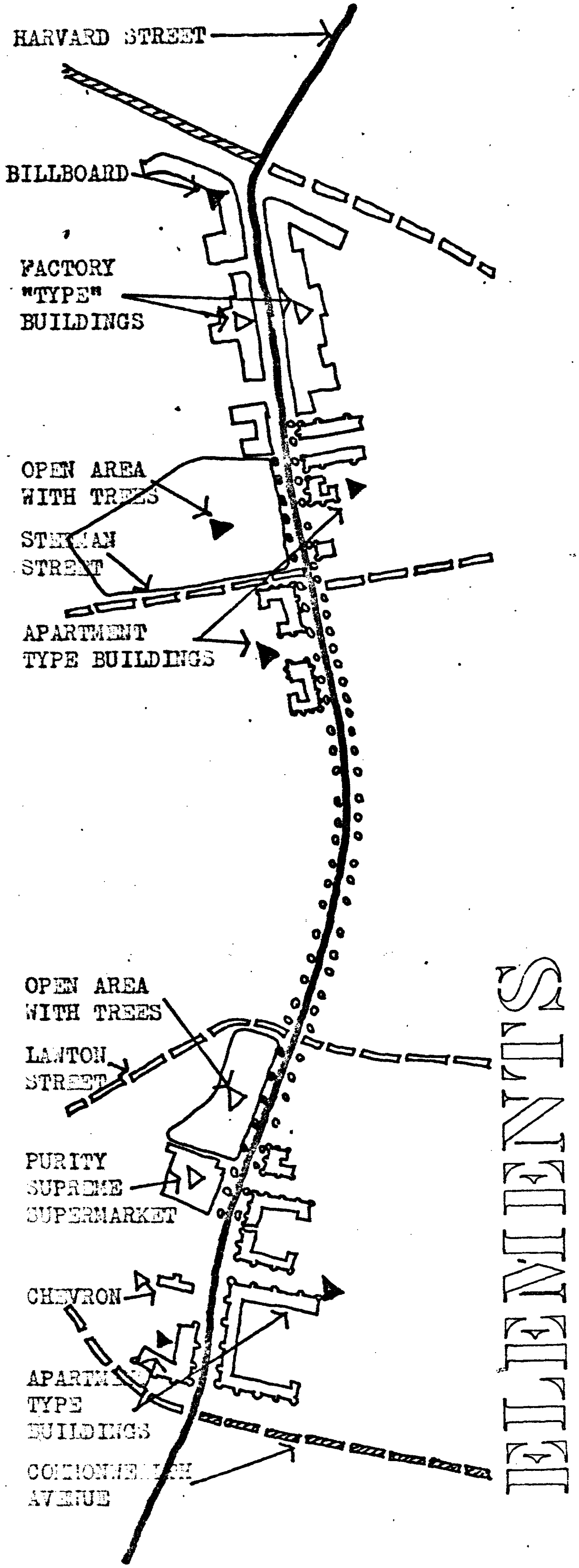

HARVARD STREET
BEACON STREET
COOLIDGE CORNER
TRAFFIC ISLAND & SIGNS
BILLBOARD
THE BOOKSMITH
GREEN STREET
WOOLWORTHS
SHOPPING DISTRICT
APARTMENT BUILDINGS
EDWARD DEVOTION SCHOOL & PLAYGROUND
SUNOCO GAS STATION
WILLIAMS STREET
SHOPPING AREA
CLUSTER OF GAS STATIONS
GASOLINE ALLEY
AUTO ORIENTED COMMERCIAL DISTRICT
FUNERAL HOME
PURITY SUPREME SUPERMARKET
VERNDALE STREET
CLUSTER OF GAS STATIONS
APARTMENT BUILDINGS
APARTMENT AREA
COMMONWEALTH AVENUE
MACY'S LIQUOR STORE

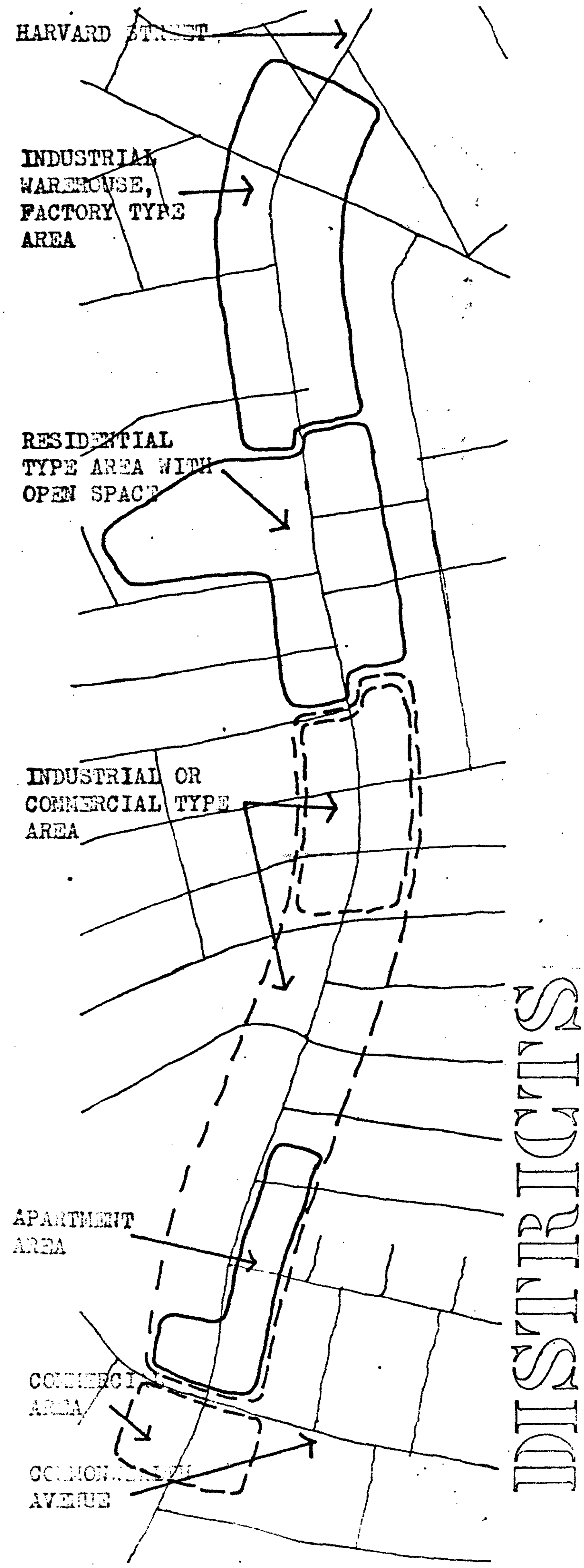


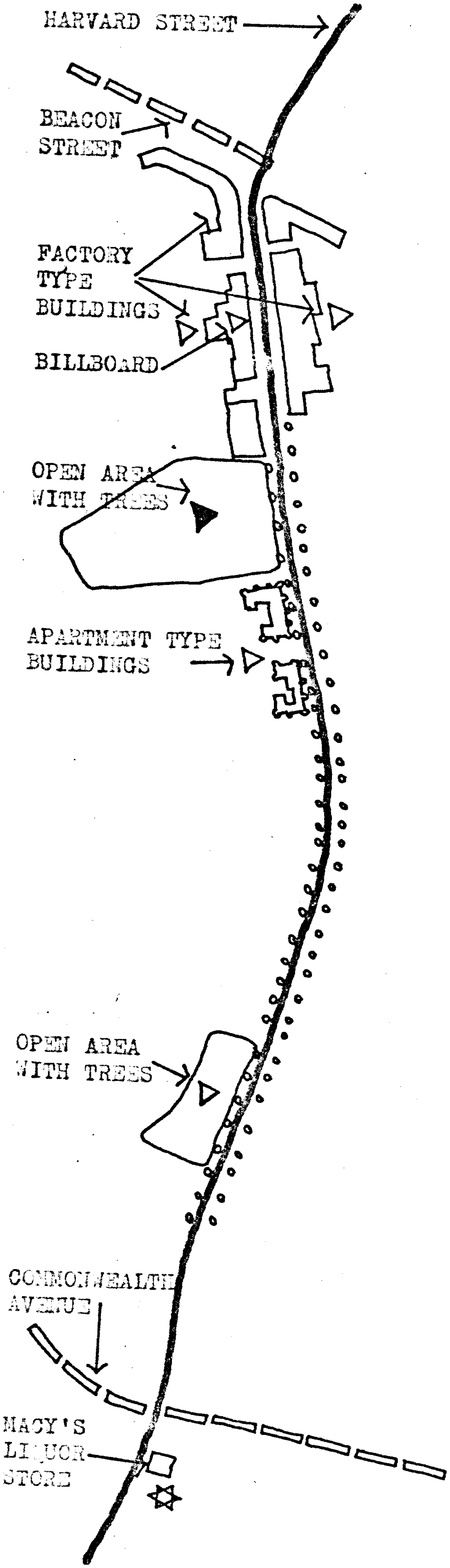
4 PHOTOGRAPHS


TRAFFIC ISLAND & SIGNS
BILLBOARD
BILLBOARD
WOOLWORTH'S
BABCOCK STREET
EDWARD DEVOTION SCHOOL & PLAYGROUND
APARTMENT BUILDING
FULLER STREET
CLUSTER OF GAS STATIONS
SHEA'S CLEANERS
LAWTON STREET
PURITY SUPREME SUPERMARKET
GAS STATIONS
APARTMENTS
COMMONWEALTH AVENUE
MACY'S LIQUORS
HARVARD STREET
BEACON STREET
COOLIDGE CORNER SHOPPING AREA
TOURLAINE SHOE STORE
APARTMENTS
MIXED AREA PUBLIC AND RESIDENTIAL
SUNOCO GAS STATION
TEMPLE KEHILLATH ISRAEL
SHOPPING AREA
AUTO ORIENTED COMMERCIAL AREA
RESIDENTIAL & COMMERCIAL AREA
COMMERCIAL AREA
ELEMENTS
DISTRICTS

DRAWINGS


HARVARD STREET
BILLBOARD
FACTORY "TYPE" BUILDINGS
OPEN AREA WITH TREES
APARTMENT TYPE BUILDINGS
OPEN AREA WITH TREES
PURITY SUPREME SUPERMARKET
CHEVRON
TYPE BUILDINGS
AVENUE
ELEMENTS


HARVARD
INDUSTRIAL WAREHOUSE, FACTORY TYPE AREA
RESIDENTIAL TYPE AREA WITH OPEN SPACE
INDUSTRIAL OR COMMERCIAL TYPE AREA
APARTMENT AREA
AREA
AVENUE
DISTRICTS



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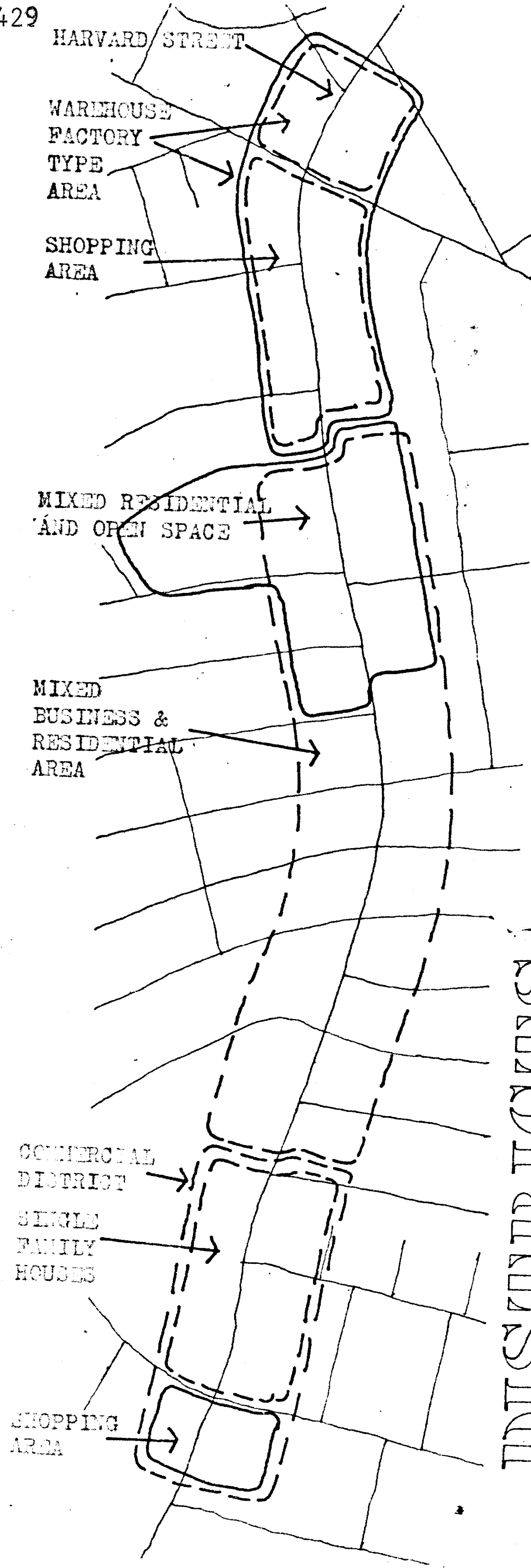
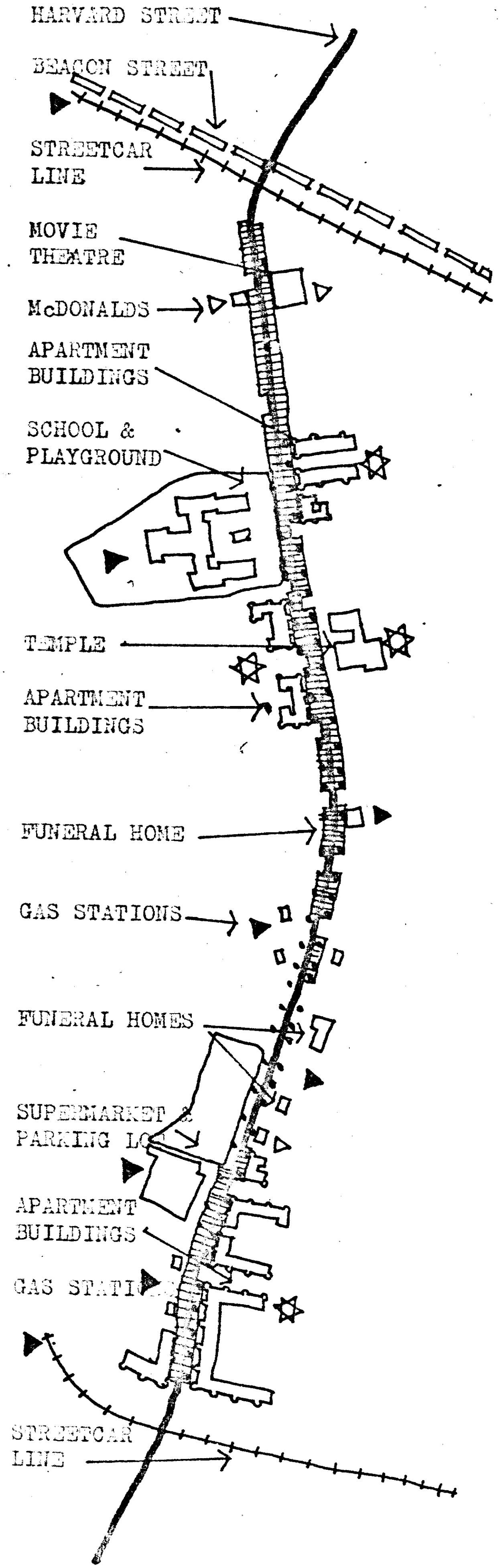


DISTRICTS

7 MODEL SLIDES



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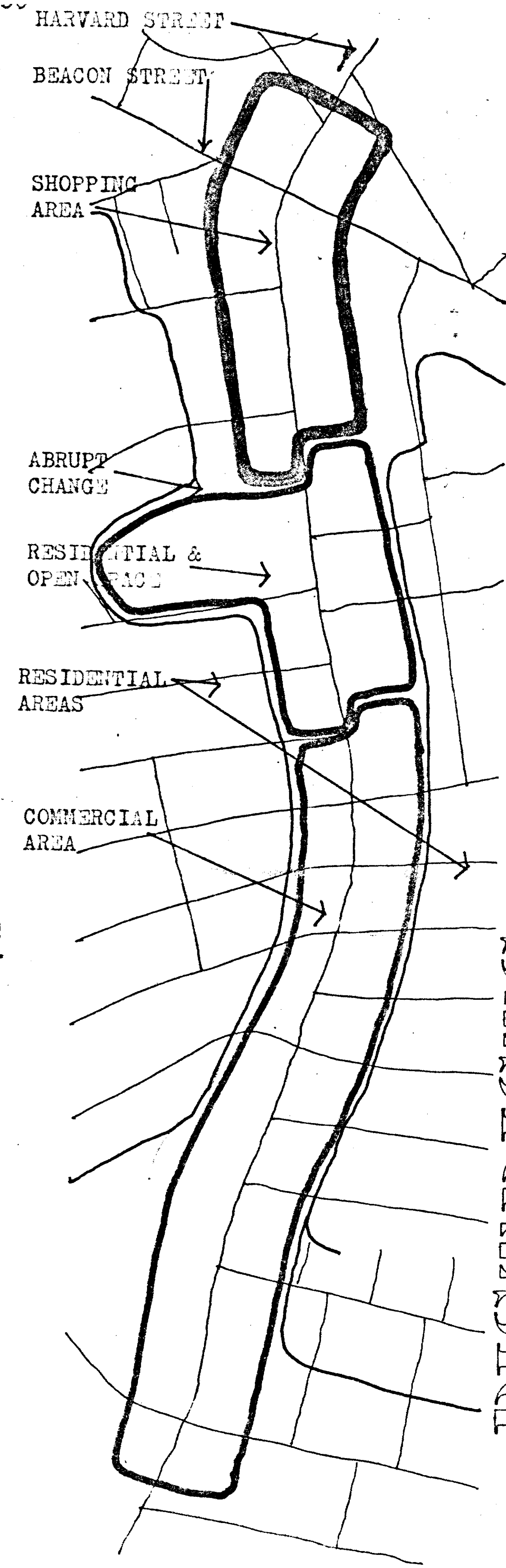
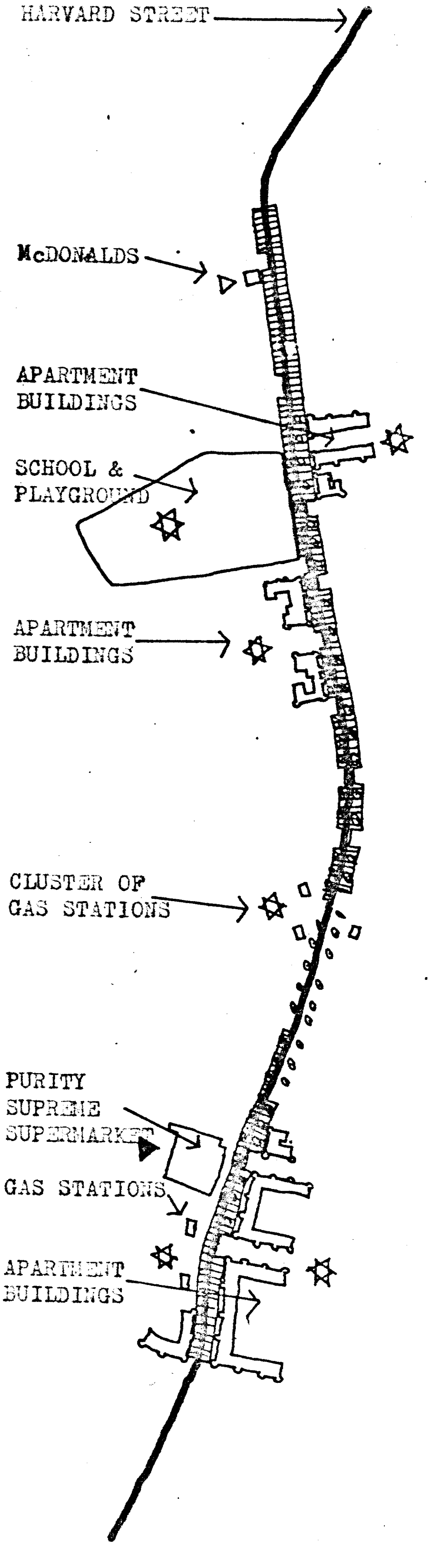


DISTRICTS

1 CONTROL GROUP

31



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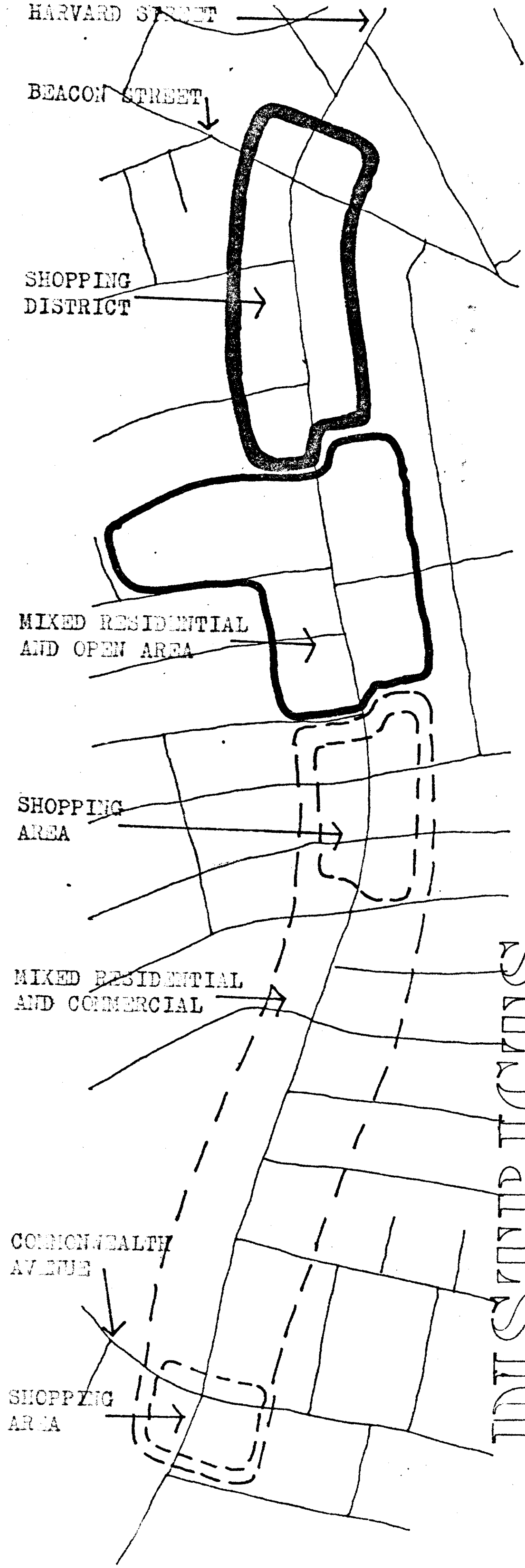
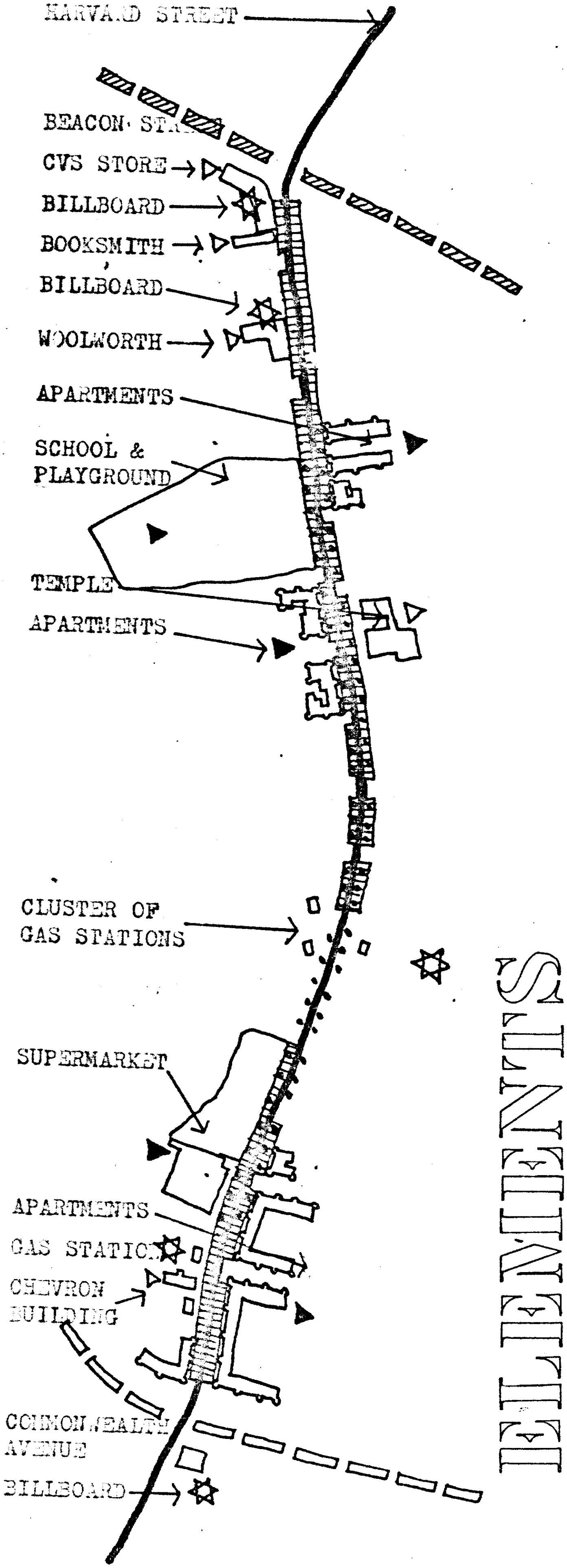
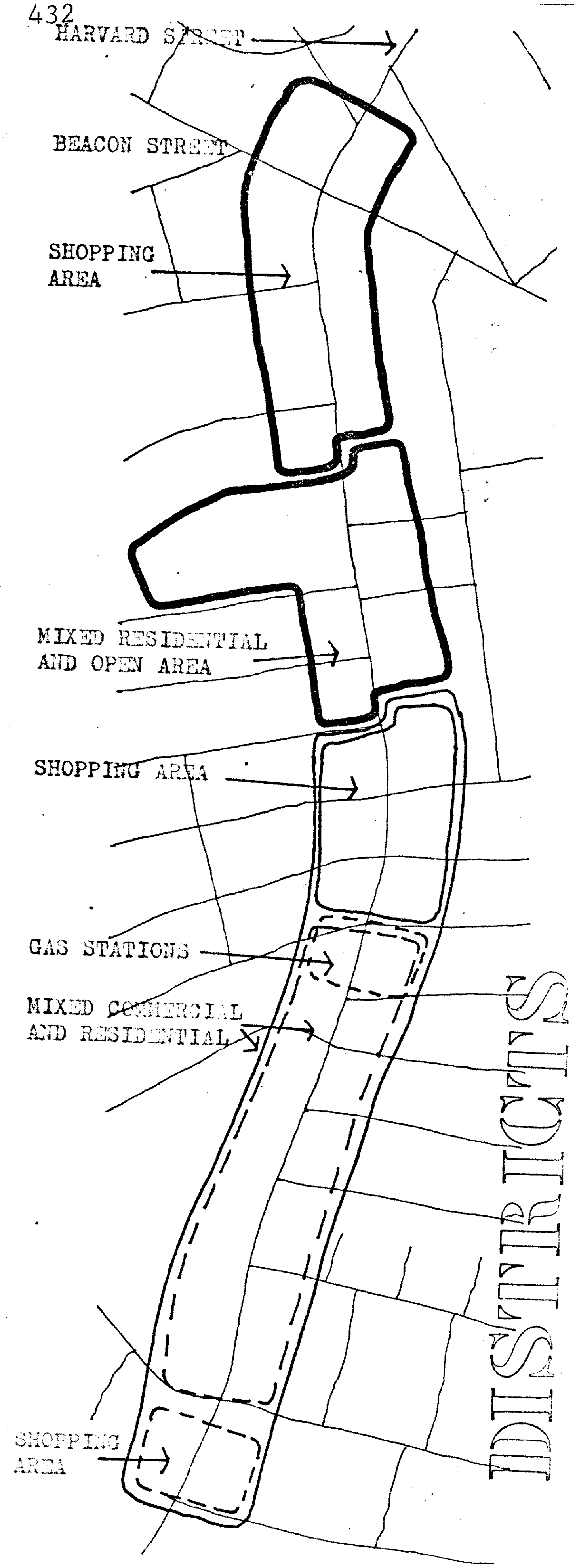


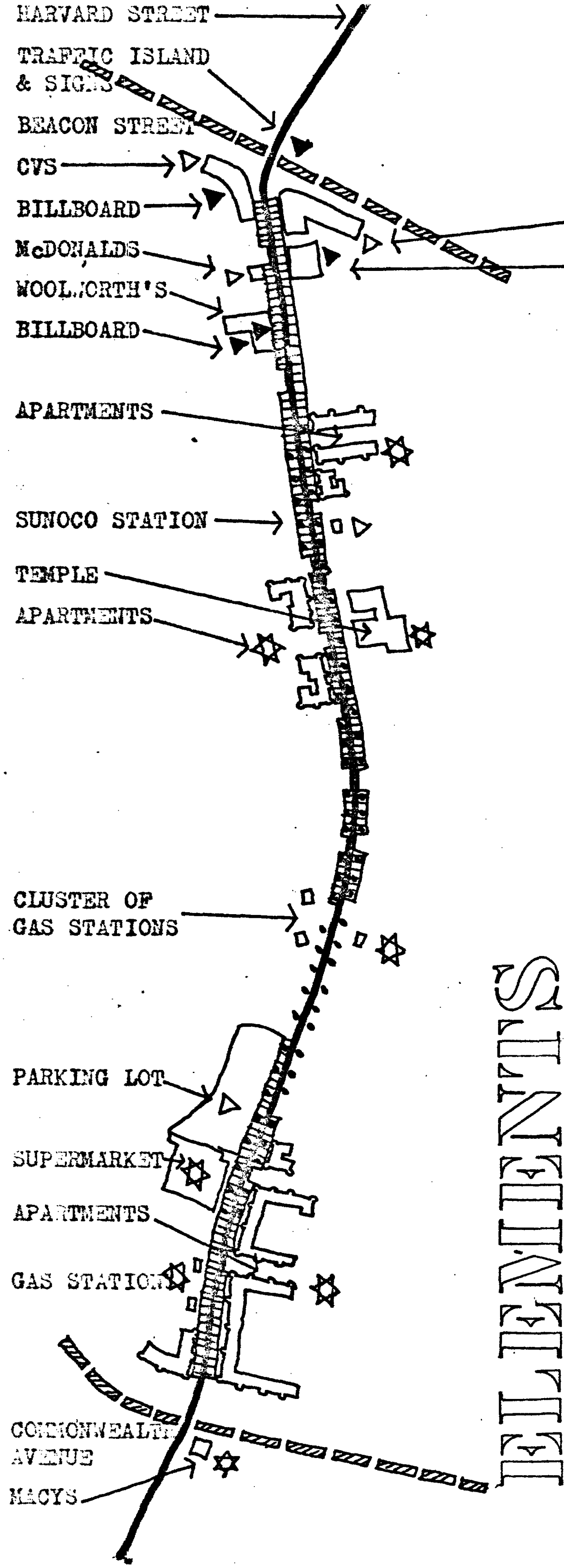
DISTRICTS

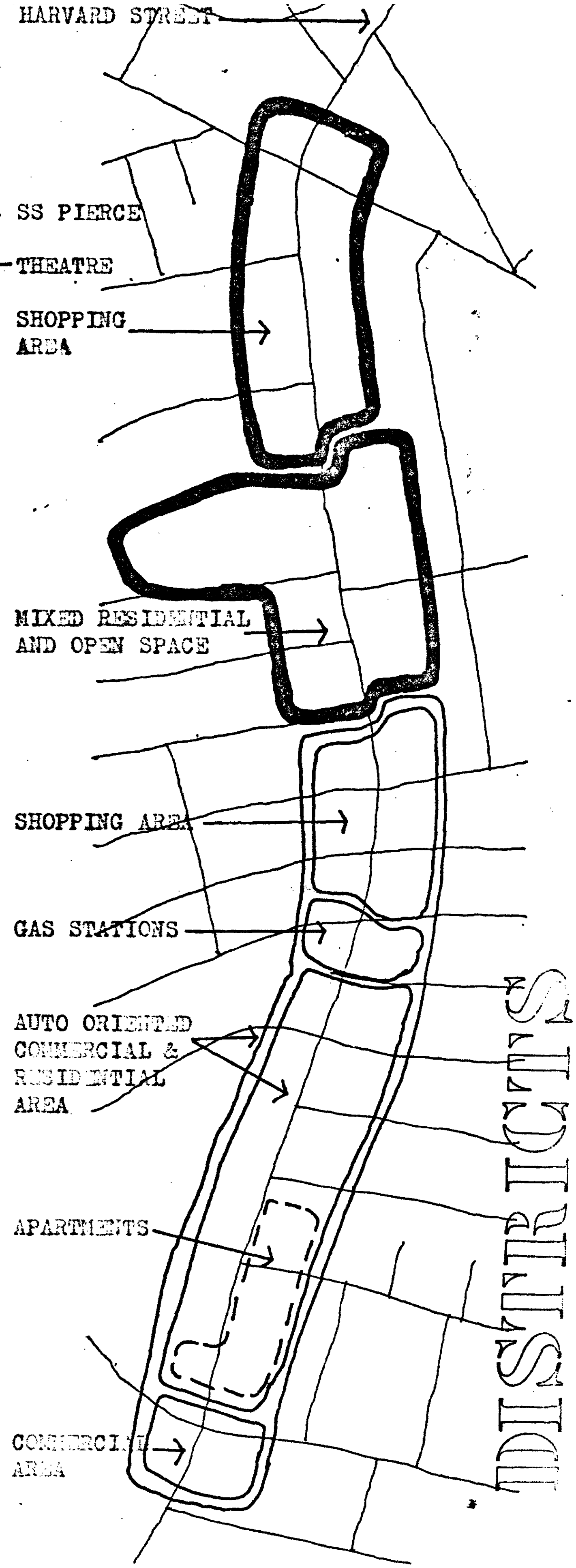
2 COLOR MOVIE



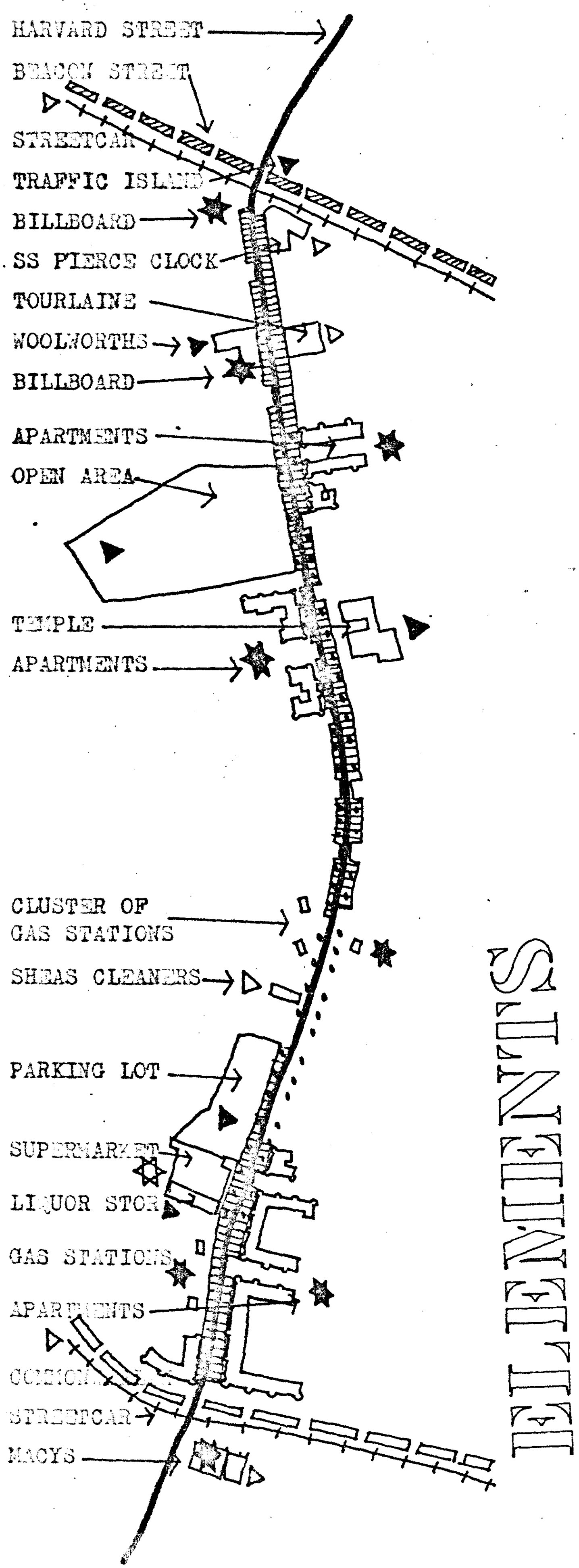


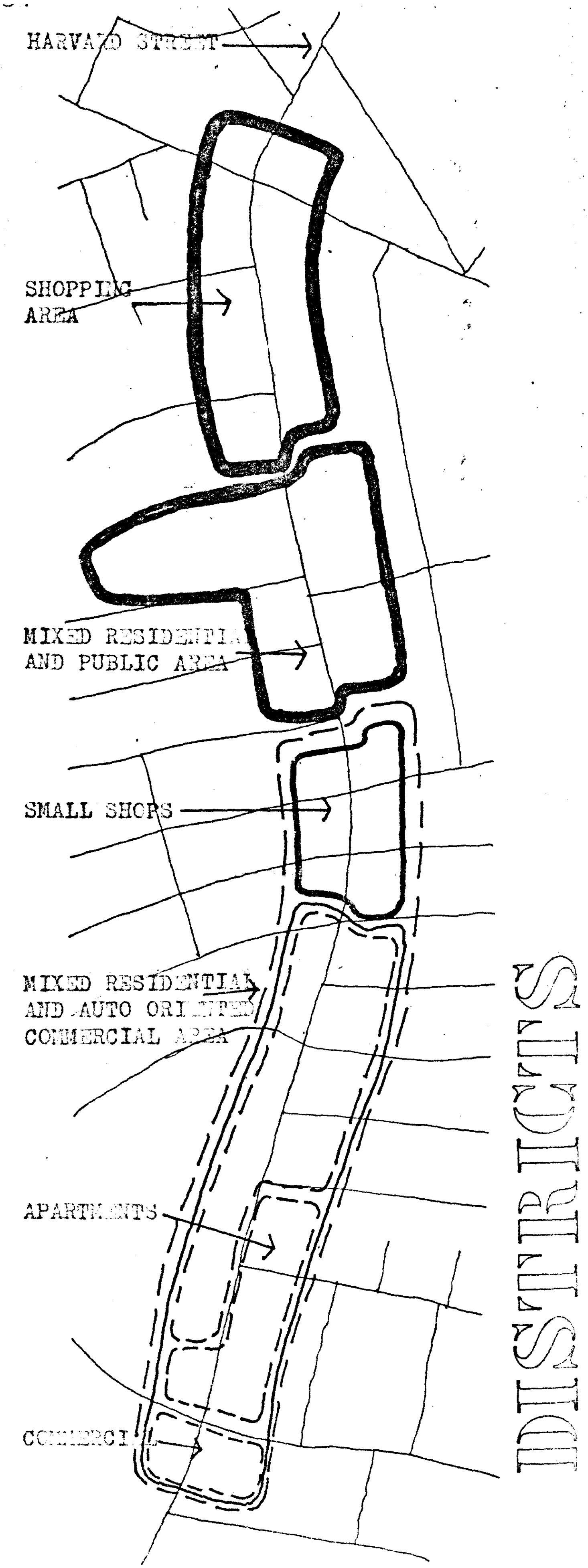
3 COLOR SLIDES



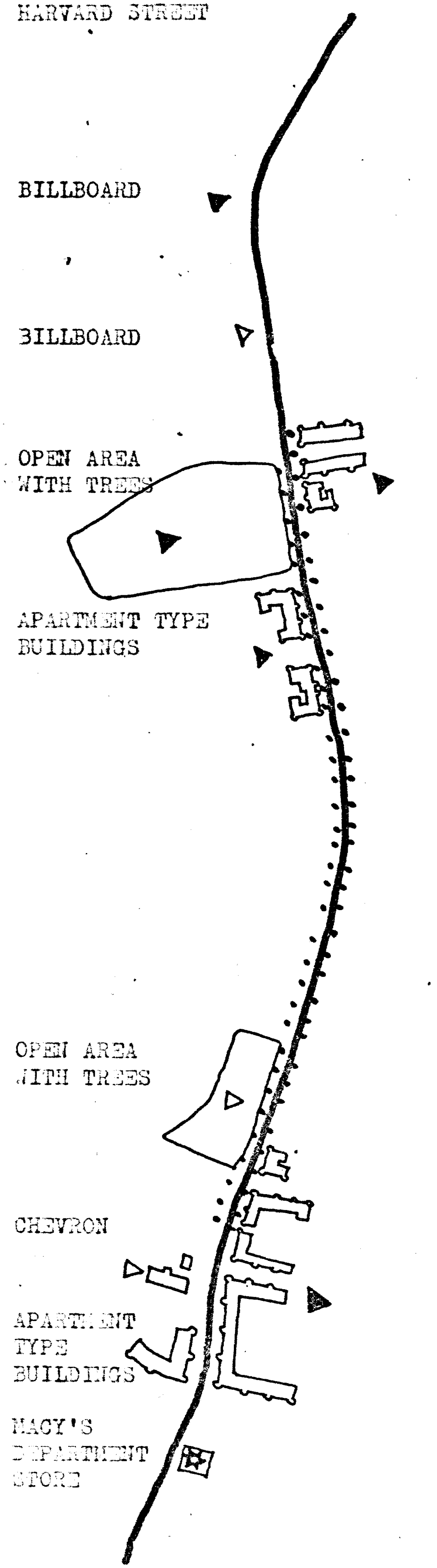


4 PHOTOGRAPHS

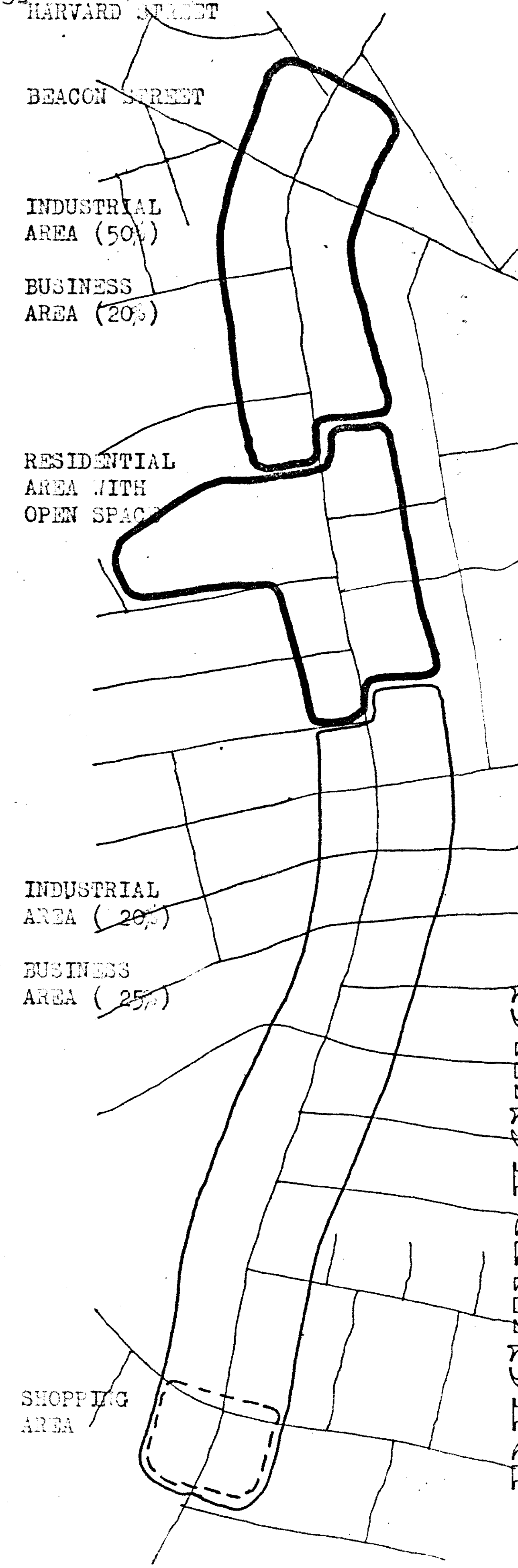

HARVARD STREET
BEACON STREET
STREETCAR
TRAFFIC ISLAND
BILLBOARD
SS PIERCE CLOCK
TOURLAINE
WOOLWORTHS
BILLBOARD
APARTMENTS
OPEN AREA
TEMPLE
APARTMENTS
CLUSTER OF GAS STATIONS
SHEAS CLEANERS
PARKING LOT
SUPERMARKET
LIQUOR STORE
GAS STATIONS
APARTMENTS
STREETCAR
MACYS
ELEMENTS


HARVARD STREET
SHOPPING AREA
MIXED RESIDENTIAL AND PUBLIC AREA
SMALL SHOPS
MIXED RESIDENTIAL AND AUTO ORIENTED COMMERCIAL AREA
APARTMENTS
COMMERCIAL
DISTRICTS

5 DRAWINGS

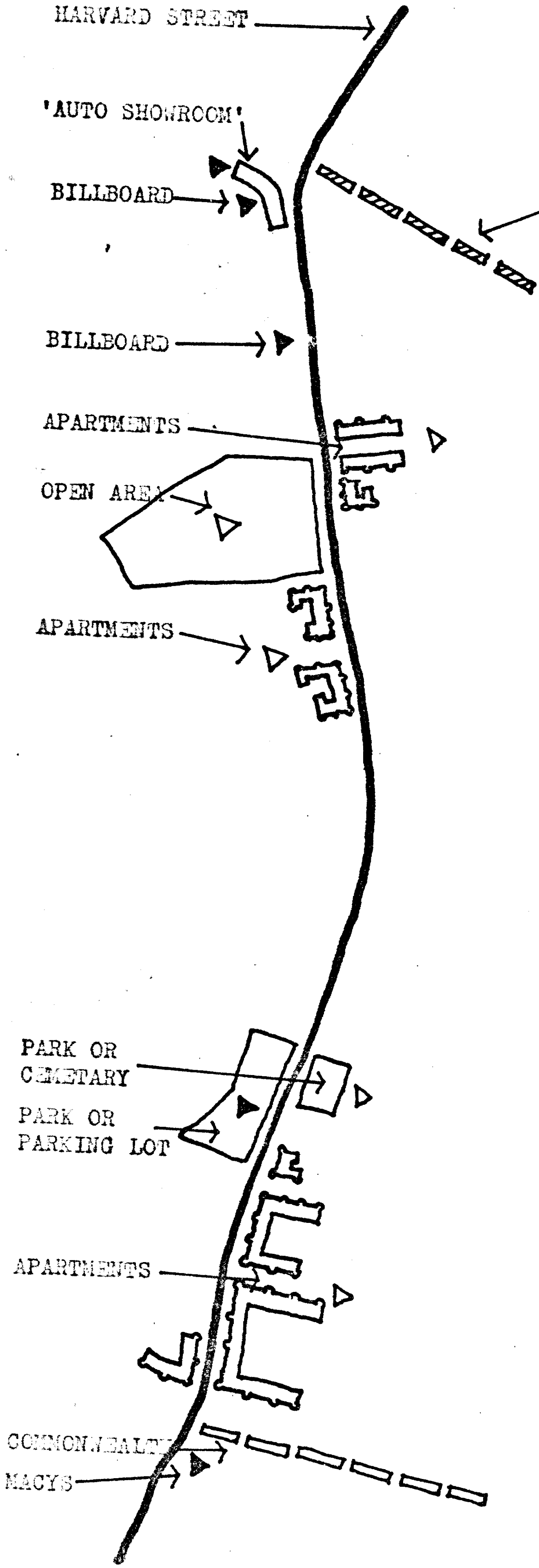


ELEMENTS

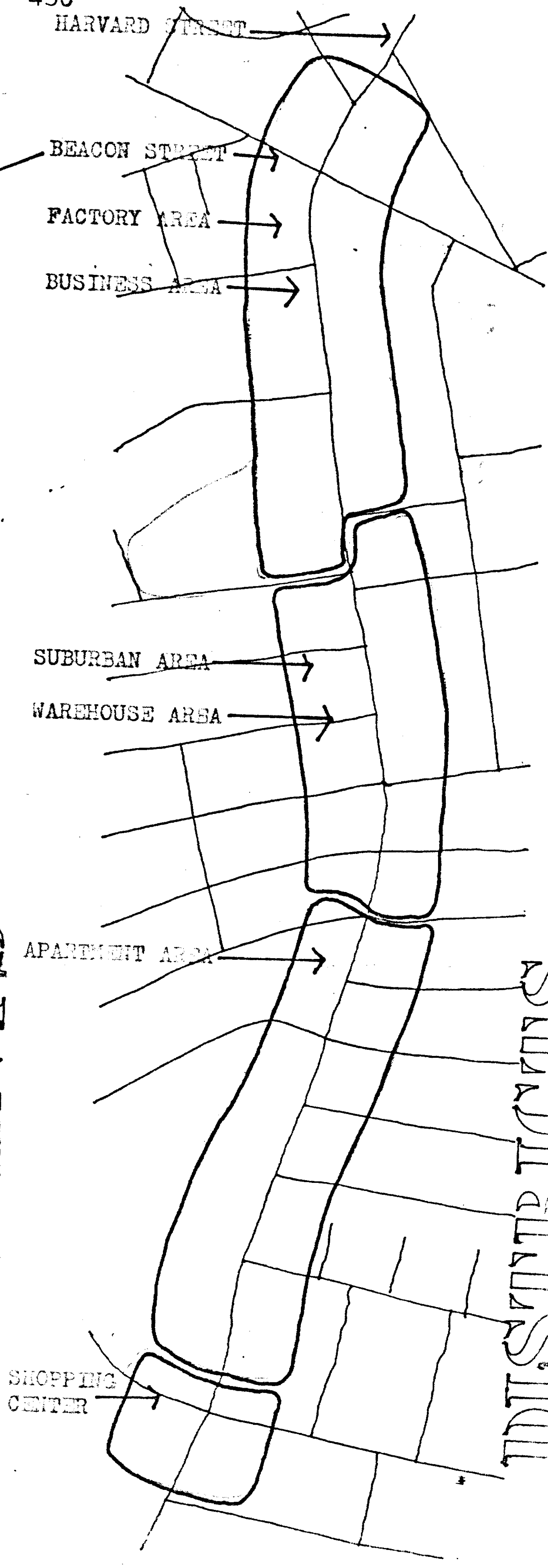


DISTRICTS

6 MODEL MOVIE



ELEMENTS



DISTRICTS

7 MODEL SLIDES