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LIGHTING THE STREET

IN AN URBAN NEIGHBORHOOD

by

LINNAEA TILLETT

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

1999

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Abstract

Lighting the street in an urban neighborhood

by
Linnaea Tillett

Advisor: Gary Winkel

This study examined the impact of the introduction of aesthetically appealing street lighting - designed to support formal and informal social interactions after dark - on pedestrian behavior and attitudes in a high crime, low income community. The study took place over a two-year period and involved five phases: (I) Pilot Study, (II) Pre-Installation Evaluation, (III) Design and Fixture Installation, (IV) Post installation Evaluation Time 1, (V) Post installation Evaluation Time 2.

A pre-post-post1 research design was developed using multiple methods of inquiry. Quantitative data were obtained and combined with qualitative data generated from street interviews and interviews with key players and community network leaders. The instruments and measures for the study were designed to evaluate pedestrian comfort, street use, use of civic institutions, crime, and neighborhood upkeep. The measures included a street interview, pedestrian count, library circulation and attendance records, assault statistics, and a site assessment. Post-evaluation interviews and a final focus group were conducted to generate qualitative data respectively.

The pilot study emerged as the key to the success of the project. By determining that the context of the intervention, the local culture of walking, and the presence or absence of destinations, all had a role to play in shaping the success or failure of the intervention.

It was found that the new street lighting did increase pedestrian reports of comfort and this finding was distributed almost evenly across men and woman. Support was found for the proposition that changes in destination would result from the lighting intervention (that there was an increase in civic use but a decrease in visiting and exercise). Significantly, a modest increase in library circulation and attendance was achieved. It appears that the street lighting functioned most successfully when the opportunities for transaction occurred.

This study draws attention to the context in which the intervention takes place. These include: the role that key informants can play in selecting a street location; the importance of reading the physical character of the community for evidence of participation and community health; and the importance of locating key institutions that foster prosocial behavior.

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CHAPTER 1
INTRODUCTION

In 1961, Jane Jacobs characterized a successful neighborhood as one that provides a public life on the streets. She argued that if a street is functioning successfully, casual public contact at a local level can create a feeling of the public identity of people, a web of public respect and trust, and a resource in times of personal and neighborhood need. Furthermore a "critical attribute of this successful functioning is that a person must feel personally safe and secure on the street" (p.30). Jacobs' characterization explicitly links the success of a neighborhood to an interrelationship between social phenomena (neighborhood life), activity (casual public contact or informal social street life), a emotional state (sense of safety), and a physical site (the street).

A broad research question suggested is as follows: Has Jacobs' (anecdotally based) characterizations been supported by research? This broader question has nested within it a number of more narrowly focused questions. Can physical interventions in a neighborhood environment assist in supporting conditions such that informal social street life can be enhanced? Can we identify features of the street that have the capacity to foster social interaction? Can designs of these features be implemented? As an environmental psychologist and a trained lighting designer, I am interested in urban public street life and whether street lighting may be designed and implemented to support formal and informal social interactions after dark.

Empirical and theoretical research to support Jacobs' assertions can be found in the following diverse literatures: social disorganization theory, crime and neighborhood environment research, quality of neighborhood life studies, street design research, aesthetic/cognitive perception research and finally, lighting research. These literatures will be reviewed in Chapter II and are summarized briefly here in order to build a

foundation from which the present study was constructed. Specific methodological issues are also addressed.

Social disorganization theory is central in the literature on urban decline describing an unhealthy community as one that contains sparse friendship networks, under-supervised teenage peer groups and low organizational participation (Sampson & Grove, 1989). While social disorganization theory has gone far in describing the social factors related to the decline of urban neighborhoods, it does not consider the impact of the physical environment on people's behaviors and perceptions of the quality of community life. The effect of the physical condition of public spaces on fear of crime and perception of safety has been extensively explored in other literatures leading to a range of perspectives and explanatory models (Rohe & Bury, 1988; Skogen & Maxfield, 1981; Taylor, 1987; Wilson & Kelling, 1982). In brief, some researchers have examined the physical and social cues that trigger fear of and decline of the neighborhood, such as broken windows and drunks on the street. Others have focused on features of the physical design of the street, such as refuge for perpetuators or low visibility (Newman, 1972). These features are conceived of as *actual* barriers to people's sense of safety and fear of crime, rather than cues or mediators.

Most of the literature on neighborhood life has focused on the *decline* of urban neighborhoods and fear of crime. This is understandable since, according to a 1989 Gallop Poll, individuals in the United States viewed fear as the main problem threatening quality of life. However, focusing on urban decline does not provide enough direct information on how to support a healthy community life. Only recently has literature emerged that focuses on issues supportive of positive community development. Bardo (1994) has argued that public social interaction plays a key role in the health of a community and is important to the quality of neighborhood life. Research has documented the stress-buffering nature of social ties in protecting both physical and emotional health (Cobb, 1976; Dean & Lin, 1977; Gottlieb, 1979; Kaplan, Cassel, &

Gore, 1977). Further, research on street design has significantly expanded our understanding of the physical conditions of the street required to facilitate street life. According to Schumacher (1978) and Gutman (1986), the physical dimensions of a successful street that are necessary (but not sufficient) conditions in which neighborhood social life can occur are: user density; land use; pedestrian/vehicular interaction and configuration of street and context.

In the realm of the physical design of the environment, the work of Lynch (1960) has served as a starting point for others to examine the cognitive quality of city settings. For example, legibility, or the capacity of a physical layout to support people's navigation of their environment, has emerged as an important dimension of people's sense of emotional security in settings ranging from hospitals and museums, to city streets. Additionally, there is some support for improving the aesthetic quality of physical settings such as city streets. It has been argued that improvements in visual quality may affect psychological well being and spatial behavior (Nasar, 1979).

One characteristic of a city street that aids people's navigation of their surroundings, heightens emotional security, and has the capacity to foster informal and formal social interactions is lighting. Within these diverse bodies of literature there is some evidence that street lighting functions as a cue to social organization, and facilitates or inhibits social interaction. The literature specifically concerned with lighting supports the notion that improved lighting may fight crime and fear of crime, and increase physical activity on the street (Painter, 1995). It is the general contention of lighting research that lighting adds a significant dimension to a dark and underused street.

An initial integration of findings suggests that Jacobs' general premise has been supported; there is an interrelation between informal street life, neighborhood well-being/perception of safety and the physical character of the street. The research perspectives of social disorganization theory and quality of neighborhood life are suggestive of some dynamic relationship between informal and formal social networks,

and neighborhood success, or perceived quality of life. The physical impact literature indicates that the physical dimensions of a neighborhood have a strong ability to cue fear and disorganization. Street design research suggests that certain physical conditions must be in place for street life to occur. Finally, urban cognition and aesthetic quality research indicates that the look of the street and its visual organization are important elements in assessments of public places.

However, a specific empirical link between a feature of the physical street and informal interaction has not been established. The ecological model of social disorganization has received cross-sectional support but lacks the support of longitudinal studies (Taylor, 1991). The incivilities literature has also received primarily cross-sectional support. Typically, in these studies, neighborhoods, schools districts etc., are grouped together according to the degree of clustering around a given level of variables. The presumptions in these cross sectional studies, that an increase in the quality of the physical environment will result in positive social exchanges, increased levels of community feeling and decreased crime, have not yet been tested.

Street lighting is a plausible candidate for testing these cross sectional presumptions. However, in 1979 Tien recommended that a major street lighting project not be undertaken at that time, but that single project evaluations be conducted on a systematic and uniform basis and that a model evaluation be developed that can be used as a guide and reference. Therefore, the present study tests a lighting intervention strategy in one selected site. As no prior studies exist concerning the capacity of streetlights to support neighborhood life, it is important that this study be viewed as a model and reference for future street by street assessments. It is the intention of this research project to determine whether a change in street lighting (which hypothetically can impact on informal social interaction and community involvement) will result in empirically verifiable changes in behavior and attitudes of urban street users. The study

exceeds the limitations of prior post-only designs by including a pre-installation measure to serve as a baseline and two post-installation measures.

The study began in 1995, when The New York City Department Of Transportation Pedestrian Projects Group (NYCDOTPPG) awarded the faculty and students of Parsons School of Design, Masters in Lighting Program, the funds to develop, install, and evaluate new approaches to street lighting that would result in aesthetic, practical and social solutions for pedestrians. These lighting schemes were to impact on people's perceptions of and activities in the street environment positively. In addition, it was important that the lighting design have the capacity to be implemented and maintained with minimal public and private resources. The NYCDOTPPG asked for an approach that was exploratory and experimental and for design plans that were not modifications of, or alternatives to, conventional approaches but were, rather, supplements to the design solutions already in place. Finally the NYCDOTPPG requested that an area be selected which had both generalizable urban features and which presented some special problems. It is the NYCDOTPPG intent to use the results of this project to inform 20 other such projects to be installed throughout New York city

I was made principal researcher for the study in 1995. The study took place over a two-year period and involved five phases: (I) Pilot Study, (II) Pre-Installation Evaluation, (III) Design and Fixture Installation, (IV) Post installation Evaluation Time 1, (V) Post installation Evaluation Time 2. (See Appendix A: Time Line)

CHAPTER II
REVIEW OF THE LITERATURE

The Urban Neighborhood: Its Social Structure

Research in the tradition of the Chicago School of Sociology (the ecological model of social disorganization) regards a high degree of social organization as facilitating the development of formal and informal associations within the community (Kasarda & Janowitz, 1974). The prevalence and interdependence of both informal and formal social networks in the community and their ties to social disorganization have been linked to crime (Sampson & Groves, 1989; Shaw & Mckay, 1972). Bursik (1984) and Kornhauser (1978) observed ecological patterning of delinquency rates and link the offender rates of juveniles inversely with socioeconomic status and with housing location.

According to Sampson and Groves (1989), the structural dimensions of community social disorganization can be measured in the prevalence and interdependence of social networks in the community both informal and formal, and in the span of collective supervision that the community directs towards its local problems. There are three important constructs: the ability of a community to supervise and control teenage gangs; the existence of community social organization and informal local friendship networks; and the rate of participation in formal and informal organizations. In their totality, the local community is viewed as a complex system of friendships and kinship networks and informal and formal associative ties rooted in family life and ongoing socialization processes (Sampson, 1986). Social disorganization occurs when teenage supervision, community social organization, and participation fail to occur resulting in the inability of a community structure to realize the common values of its residents and maintain effective social controls.

While social disorganization theory has emphasized the factors which undermine community life, research in the "quality of neighborhood life" arena addresses the positive advantages of informal and formal neighborhood life. Researchers have documented the stress-buffering nature of social ties in protecting both physical and emotional health (Cobb, 1976; Dean & Lin, 1977; Gottlieb, 1979; Kaplan, Cassel, & Gore, 1977). It has been argued that ties to others in one's neighborhood and involvement in local community life could provide support in the face of neighborhood based problems (Rigor, LeBailly & Gorden, 1981). The positive relation of informal social supports, social networks and "neighboring" have also been demonstrated (Warren, 1977). For Warren (1977) the neighborhood can serve as a basis for group identity and a social context organized around public behavior. The existence of an informal neighboring level can provide an important source for social belonging for the individual (Kellor, 1968) and predict neighborhood satisfaction (Bardo, 1984).

Valuable as this research is, much of it fails to recognize that neighborhood participation and the realization of community values requires a physical environment in which to flourish. Demographics, neighborhood integration, and lack of neighborhood homogeneity may all work against organized community life, but so does fear, physical deterioration, dilapidated housing, garbage strewn streets, inadequate lighting and the absence of structures in which to meet and share community values. Community social life requires physical locations in order to occur. Social clubs, committees and PTA groups require physical space (churches, a library, a community center) as well as passable streets connecting these spaces to residences. As Warren (1977) points out, one distinct dimension of the concept of neighborhood is that it can be defined by its spatial or geographical boundaries and by where institutional and community facilities that support social activities are located. The geographical unit has physical properties that either support activities, such as shopping and going to the library, or hinder daily transactions because of the distance from transportation. A horror of inner-city

neighborhood destruction in the 1960's and 1970's was that buildings that afforded meeting places were simply burnt down or vandalized, rendering them unusable. In the seventies, "you'd go to the same street in the Bronx and buildings standing one day would be in shambles the next month" (Varga, 1995, p. 6). Churches in many of the worst neighborhoods stopped offering nighttime services because it was too dangerous for parishioners to attend; community centers stopped offering after work classes. When physical entities like churches and day-care centers are closed, the opportunities for social interaction are constricted. As Rigor, Gorden and LeBailly (1981) point out, involvement in community settings is a multi-dimensional phenomenon which includes community attachment (social bonds and residential ties within a geographical location) and community involvement (social interaction with neighbors and use of local facilities).

Furthermore, social disorganization perspectives, while stressing the importance of family life, omit any consideration of the social and proactive role of children and their physical needs in building social life and creating networks. Children play a role in social disorganization theory only when they grow into delinquent teenagers. In fact, children bring people together, attract energy and vitality and consequently enhance neighborly communication and cohesiveness (Jacobs, 1961; Suttles, 1968). Children need physical destinations and ways to get to them in order to enhance neighborhood social life. Hart (1978) suggests that kids want to be where the action is, places that adults frequent – namely the street - and these streets need to be safe in order for parents to allow them to travel on them (Blakely, 1993). Moore (1989) argues that among children street activity is a universal phenomenon that will be maintained even if the street is hazardous. Children also need safe parks, day-care centers, a library and passable streets to get there.

According to the New York Times (1988) libraries are becoming de facto after-school day-care centers. Computer technology is attracting teenagers and libraries are increasingly viewed by parents and teenagers as a safe haven from trouble on the streets. According to Parr (1973), the public library system may be considered to occupy an

intermediate place between the cultural institutions of entirely informal and optional attendance and the educational system of formally required studies. In urban neighborhoods that lack any physical spaces for children to meet after dark or any entertainment facilities, libraries represent the only cultural institutions in addition to providing a safe, quiet place to do homework and perhaps to socialize. The need for a physical environment that supports community life suggests that interventions at the local neighborhood level may profitably take a physical form. An intervention such as improved lighting on a neighborhood street may be designed to explicitly connect residents, children, and adults with key community facilities thereby supporting neighborhood residents in their efforts to use local facilities and to participate in neighborhood life.

Crime, Safety and the Physical Environment

The impact of the physical condition and design of public spaces on neighborhood residents' fear of crime and perception of safety have been extensively explored. The abundance of research has led to a range of perspectives and explanatory models which hypothesize that physical and social cues trigger fear of and decline of the neighborhood (Rohe & Bury, 1988; Skogen & Maxfied, 1981; Taylor, 1987; Wilson & Kelling, 1982). Crime and fear of crime has been connected to the appearance of physical "incivilities" (signs of breakdown of social control). Physical decay may signify to residents that a neighborhood is socially decaying and keep people off of the streets (Perkins, Meeks, & Taylor, 1992; Skogan, 1990; Wilson & Kelling, 1989).

Fear of crime is highest in areas which provide refuge for potential offenders and low visibility (Appleton, 1975). Locations with prospect (an open view) and the opportunity for escape lessen fear. Women perceive locations that are poorly lit and hard to see by others as particularly unsafe (Lohman & Soomeren, 1986). Jacobs (1961)

argued that it is people watching people on the street, or "informal surveillance," that keeps a street safe. Newman (1972), building on Jacobs' insights, suggests that physical modifications be made to structures to permit this natural surveillance, allowing residents to observe criminal activity, increasing risk to the potential offender.

Such a research emphasis on crime and fear of crime is understandable. Beginning in 1964 and continuing unabated through 1975, there was a tremendous upsurge in crime. A 336% jump in the violent crime rate (Skogan, 1978) and the physical/social devastation that followed the desertion of many neighborhoods by landlords and tenants in the wake of the civil rights "riots" of the mid-sixties created a potent climate of fear. Fear of crime has become the major urban stressor (Nasar & Jones, 1997) one which "public clamor over and media coverage of crime in the streets has pushed to the forefront of American urban consciousness" (Lee, 1981, p. 611). Indeed citizen anxiety about crime and disorder is now treated as a social problem of its own (Stanko, 1995). However it is dangerous to place research emphasis exclusively on urban decline and fear of crime. As Skogan (1986) points out some of this research has come to assume that "a glacial, sociologically inexorable downward slide characterizes urban neighborhoods" (p.205). There is, in reality, a downturn in national crime patterns (a 40% drop in neighborhood crime in New York City alone) and a renewed interest in proactive support for "quality of neighborhood life" on the part of public officials. New housing initiatives and funding for empowerment zones are shifting the landscape of inner-city neighborhood life, nationally, city-wide and in some of the most heavily crime-ridden neighborhoods in New York City (*The Daily News,* December 1997; *The New York Times,* December 1997, February 1998). In New York City, Police Commissioner Bratton (1998) was responsible for the explicit direction of policy initiatives to reclaim neighborhood streets.

In the more devastated urban neighborhoods the magnitude of the recovery is hard to measure. Media accounts, by and large, use terms more appropriate to the resurrection

of Christ: "Even Dead Zone Has a New Life" (*The Daily News,* 1997); "Philadelphia's Neighborhood Reborn" (*The New York Times,* 1998); "South Bronx, Despite Hype, Hope Builds" (*The New York Times,* 1996). More plausibly, neighborhoods in the South Bronx, East New York, Northern Philadelphia and urban areas across the country have been helped by community activism, church-based housing programs, immigration, city investment and better economic times, to achieve some modest gains in stability and quality of life. A comment by a resident of East New York is suggestive of how delicate the measures of increase in urban neighborhood quality of life can be. "We know we've really improved because the pizza guy delivers to Cypress Hills. They wouldn't do that before. They were afraid their people would get shot" (New York Times, 1998).

This change in the direction in which neighborhoods are heading does not render the crime and physical environment studies irrelevant. Rather it forces a consideration of how to use their insights to create designs that support a healthy community life rather than using existing physical cues solely as predictors of neighborhood decay. It is important to determine which dimensions of the crime/fear of crime concerns are the most critical to pedestrians and how a lighting installation might address these fears and sustain neighborhood life.

The works of Skogan (1990) and Wilson and Kelling (1989) on social incivilities are particularly informative for the purposes of this research because they make explicit the understanding that "all" increases in street use are not desirable. Changes in the physical design of the street should be directed toward increasing activities that can be described as pro-social. Perkins, Meeks and Taylor's (1992) observations linking crime and fear of crime to the appearance of physical "incivilities" suggest that one role a physical intervention can play is that of a signal to the neighborhood that there is municipal concern for the community life and an increasing presence of civilities. A dimension of incivilities/civilities that has not been explored is the role that the community itself plays in upgrading and maintaining the physical quality of its own

neighborhood. The existence of repainted graffiti-free buildings, children's murals, freshly planted neighborhood gardens, well-maintained churches may all be evidence of community participation in the upkeep and maintenance of the neighborhood environment. Decorations such as ornaments, plants, and furniture on the street front side of houses may indicate that a person cares about his or her neighborhood (Taylor, Browser, & Stough, 1976). The presence of these elements in the community may be a visual cue to the existence of some degree of local participation just as signs of visual decay were treated as cues to community deterioration.

The Physical/Social Character of Streets

Gutman (1978) argues that the street has both an instrumental and an expressive function. Instrumentally, streets link buildings through which goods and people can pass. The streets' expressive function serves as a link between people and facilitates communication and interaction, thus serving to bind together the local urban community. This includes its use as a site for casual social interaction, including recreation, conversation and entertainment. In order for informal social contacts and network building to occur, a neighborhood must have an "influence zone" that affords these informal interactions (Wolf, 1978). An influence zone includes the street, abutting structures and the surrounding area served by a mode of transportation. Streets must be served by some kind of transportation in order to deliver people to them (Wolf, 1978) and must both link destinations (Levitas, 1986), and be destinations (Czarnowski, 1986).

According to Schumacher (1978) and Gutman (1986), successful streets require the following features: user density (the accessibility of the street to a large number of pedestrians); land use mix (the inclusion of various uses within an otherwise residential neighborhood); pedestrian, vehicular interaction (the existence of roads or public transportation to deliver pedestrians to the street); and configuration of street and context

(support for goal-directed activities, shops, schools, etc., sufficiently close to each other so that pedestrian orientation is a clear choice and the potential for unplanned non-directed activity exists). For Appleyard (1981), safe and easy access to neighborhood streets continues to be a major factor in residential satisfaction.

Jacobs (1961) has argued persuasively for the implementation of mixed-use design in support of vivid, lively streets in continuous use. Residences should be flanked by small stores or restaurants which act as destinations for pedestrians. These destinations keep the street teeming and lively. As compelling a conception as this is, it simply does not capture the reality of contemporary life in urban neighborhoods. In many of these neighborhoods there are no restaurants or shops within the residential areas. Restaurants and shops cluster near transportation and close after 7 p.m. Informal street life is limited to occasions, such as on the way to transportation, on the way home, outside the library, or picking kids up from school.

Recent research has expanded on the basic findings as to the physical structure of the streets and the surrounding environment that are required for streets to be pedestrian friendly. Wells (1995) suggests that street environments are not only supportive but can also be seen as catalysts to new behavior. In that sense, they release behavior previously inhibited. Anderson (1986) speaks of street environments as "an arena for potential action," where the "latent environment" is the unrealized potential environment. In dealing with streets one is not dealing only with manifest or instrumental functions of safety and convenience but also with latent functions. Owen (1995) suggests that in addition to a street affording instrumental activities (getting to a job, etc.), and discretionary activities (promenading, hanging-out), it also affords unplanned social activities. When someone performing a necessary activity bumps into someone performing a discretionary activity, they create a new social activity.

Wells (1995) points out that the elderly, the handicapped, the very young, the impoverished and women are consistently over-represented in samples of pedestrians.

Members of these groups endure real problems of spatial/environmental inequality, and insensitivity to their issues can result in seriously flawed planning for pedestrians (Hill, 1996). Rigor, Gorden and LeBailly (1981) argue that the design and management of many public spaces is based on the assumption that all wage work occurs during daylight hours and that a greater attempt to support the use of public space at other times would create greater choice and safer spaces. To the extent that the physical character of the street constrains street use or route selection by any pedestrians, it limits their choice and constrains the possibility of preference and this has consequences. Kaplan (1978) argues that the effects of living in a non-preferred environment are complex: "People may be less willing to venture forth, less likely to find and utilize resources available and they may interact less with one another, impairing sense of community" (p.427).

Gehl (1986) argues that changes in physical environment will most likely impact optional activities, such as taking a stroll. Necessary activities (going to school, work, or shopping) will be only minimally affected by changes in the environment because they have to done anyway. Studies of women's activities after dark suggest that those activities pursued least were optional or discretionary ones (i.e., going to the movies) (Rigor & Gorden, 1981). Activities that are less a matter of choice are less frequently avoided.

However, Gehl's argument is exclusive of the realities of poor, urban life and further is exclusive of the wide range of human needs. Criteria for what are considered "necessary" and "optional" activities are constrained by conceptions of shopping environments in middle-class and downtown neighborhoods. As Winkel (1978) argues where options have been severely limited, changes in the form of the environment can have a significant effect on behavior, even necessary behavior. Further, for an elderly person a walk outside may not be deemed "necessary" in the sense that there is an end result. Yet, an opportunity to see human activity on the street, to greet friends, or to get exercise are essential to this population's quality of life. For a recent immigrant the

opportunity to attend an after work English class may well be viewed as a discretionary activity but it could mean the difference in the type of employment he or she can get and thus a difference in both job satisfaction and pay. Finally, the fact that necessary activities must be performed should not mitigate our desire to make these necessary activities more pleasant, more comfortable, and less stressful, particularly for those neighborhood residents who lack any options but walking, such as the poor, children and the elderly.

Aesthetics and Perceived Quality

The importance of the look of the street and its layout to public use and comfort can be found in the literature surrounding urban cognition and aesthetic quality. The appearance of the neighborhood has been described as containing aesthetic and cognitive dimensions (Nasar, 1979). The importance of these cognitive dimensions (mental mapping, imaginability, etc.) have been demonstrated (Kaplan, 1977; Lee, 1969; Lynch, 1960; Stea, 1969). The importance of the aesthetic dimensions has also been noted (Berleant, 1988; Carr, 1968; Lynch, 1960).

The perceived quality of the urban surrounding has been identified as a major dimension in the public's perception of their surroundings (Carp, Zawadsky & Shokrin, 1976; Lansing, Marans & Zehner, 1970). According to Nasar (1979), improvements in visual quality may affect psychological well being (an internal state) and spatial behavior (how people use the environment). The visual quality of a street environment has two major dimensions, cognitive and aesthetic. Following Wohwill (1976), Nasar (1979) defines urban aesthetics as positive feelings in relation to the physical surroundings, including judgments of pleasantness, excitement, or safety of an urban area. Fried (1982) theorizes that an increase in physical quality results in greater congruence between the

positive images the neighborhood residents have of themselves and their images of the neighborhood. Aesthetic quality may contribute to the character or identity of a place (Cullen, 1961; Heath, 1988; Lynch, 1960).

A limitation of studies in urban aesthetics is that so many have relied on static stimuli, such as photos or slides, for their databases. However, aesthetics is not merely a sedentary, visual perceptual experience. More critically, conceptualizations of urban quality have relied on data gathered in communities that are both economically and physically stable.

In less stable, physically devastated neighborhoods, a more reliable assessment of environmental /aesthetic quality should include an appraisal of the environment as it is experienced by the residents. A reasonable standard for aesthetic quality that does not require an appeal to a non-site specific criteria may be formulated. "When citizens look and move around their environment, use it, listen to it, smell it etc., they should be able to evaluate their environment favorably" (Craik & Zube 1975, p.10)

Urban cognition deals specifically with how people visualize and use their environment. Urban imaginability (the features of the urban surrounding which contribute to orientation and way finding) has received extensive research attention. Lynch (1960) argued that legibility (a dimension of cognitive quality) is crucial in city settings because it gives its possessor an important sense of emotional security. Cognitive mapping research suggests that our mental map of the city is constructed from landmark places and significant nodes. When major communication paths or nodes, lack character or aesthetic quality, aesthetic experience will be inhibited (Devlin, 1976). Carr (1967) suggests that we increase accessibility to urban form if we enhance the unique qualities of environmental settings.

The research on legibility is suggestive of design strategies that should be employed to assist in way-finding and neighborhood knowledge, and the addition of

meaning and significance to neighborhood landmarks. Jacobs (1961) suggests that in certain instances buildings that are important in functional fact need to have that fact visually acknowledged and dignified. Landmarks, by her account, can include places of local importance, such as schools, by virtue of their special use combined with visibility. Even an inherently meaningless landmark in a center of activity seems to contribute to a user's satisfaction. The research in aesthetic quality suggests that design strategies should be developed and implemented so as to enhance the visual environment, not simply carve out pathways and pinpoint crime locations.

The importance of considering both aesthetic quality and legibility in the design of street lighting interventions on neighborhood streets can be seen when one considers the following. Traditionally, aesthetics and function have been treated as separate and potentially conflicting objectives by lighting designers and city officials alike (Gabriel, 1995; Leslie, 1996). The implications of this kind of categorical separation can be seen most strikingly in the vastly different lighting approaches used for affluent and poor communities. Both have traditional functional lighting, which is designed to aid motor vehicle drivers. However, in affluent communities additional ornamental lighting poles, lighted monuments and civic buildings are used to improve the aesthetics of the night in a deliberate attempt to attract more users. Additional lighting in poorer communities is usually high-wattage security lighting designed to discourage criminal behavior. As Bouman (1984) notes, poor communities are understood as concerned with safety rather than beauty. This approach to low income lighting has had the unacceptable consequence that "places where people live, mostly in poorer areas, are losing any sense of intimacy, or privacy, or normalcy, they might have had, in the unimpeachable name of safety and security" (Holden, 1997, p. 2.). A study of aesthetically pleasing street lighting designed to encourage social activity may bridge this gap between functional and aesthetic criteria. Saegert (1993) suggests that application of the kind of research which bridges this gap

"would result in more sensorial pleasing, socially and personally meaningful environmental design" (p.73). Boeschenstein (1985) argues that we have "too single-mindedly illuminated our cities for automobile movement and crime prevention thereby sacrificing opportunities to design the nights of our cities as truly enjoyable times and places in which to be" (p. 55).

Street Lighting

The impact of street lighting on street life has been extensively explored. At its simplest level, light enables nighttime walking. It enables action, the ability to see where to put ones' feet and the ability to detect the presence or absence of objects or other people either in the immediate field or at a great distance. Under certain conditions it can permit identification of color, size and feature when mesopic vision is achieved, (Rie, Bierman and Bullough, 1997). At the more complex level it has a profound psychological impact. It has the capacity to diminish or amplify fear. Fear of tripping over objects, fear of bumping into people, fear of harm from other people, other animals, cars or any vehicle that is larger or moving faster than the body. There are also the more nebulous fears, fear of harm from the unseen, fear of the unknown, fear of the uncanny, the disquieting slippage between a place where we should feel at home and the sense that it is, at some level, defiantly unhomely which provided the starting point for Freud's idea that the uncanny, the unheimlich, is rooted in the familiar, the heimlich, (Donald 1995).

As Boyce (1994) points out, visibility is a key element in humans' capacity to navigate, and it affects the distance at which we can see something or someone. The greater this distance, the greater the time to select and act out different approaches. Lighting provides an opportunity to see form, clothing, body language, and even facial expression. It tells a pedestrian who is on the street, so that a decision can be made about whether to proceed or turn back. Hunter and Baumer (1982) suggest that the ability to

differentiate between friend and foe is a necessary condition for increased street usage to decrease fear of crime and fear of strangers. They state "fear of strangers might be more accurately defined as fear of strange types of people, in strange settings, at strange types of day" (p.123). This suggests that individuals made more aware of the nighttime rhythms and routines of the street and able to identify the strangers on the street may, hypothetically, have a lessened sense of the strangeness of the street.

In the same vein, Rigor, LeBailly and Gorden (1982) suggest that residents of urban neighborhoods may receive information about the appropriateness of their fear, not necessarily by talking to others, but rather by becoming familiar with the patterns of behavior that occur in the daily routine of their neighborhoods. They cite Schachter (1959) who demonstrated that anxious people preferred waiting with others in the same situation rather than by themselves, not necessarily for companionship but because the social comparison process which ensued allowed them to assess the reasonableness of their fears. If this account is correct, seeing other people on the street becomes an informal social transaction, albeit a silent one.

Bachelard (1961) takes a psychological and mythological starting point when he argues that "tout ce que brille, voit" -everything that casts a light, sees (p.251). Anyone who is in the dark and sees a light in the distance feels that he or she is being observed because this lantern in the dark is not "sufficient unto itself. It constantly strives outward. It watches so unflaggingly that it watches over things"(Bachelard 1961, p.81). Lighting has significance as an instrument of surveillance and a mark of identification. On a street with sufficient traffic, knowing one can be seen can be comforting. However, on an empty street sufficient lighting has the potential to create a feeling of being watched, and therefore being a target (Ditton & Nair, 1994). Street lighting may be expected to increase the sense of comfort a neighborhood resident feels on the street after dark, if others are also on the street.

Light also delights. It is not the lamppost per se that draws us to it, but the light itself, regardless of its positioning. "When we speak of walking at night, it is necessary to speak not only in terms of function but also in terms of a dramaturgy of desire, fascination and terror" (Jenks, 1996, p. 89). Making a place look more appealing may improve pedestrians' attitude to the street and encourage use, thereby supporting informal activity. Aesthetic improvement may also address fear, and if it does so it suggests that a treatment that helps improve the look of the neighborhood is just as viable a solution to neighborhood fear as one that destroys visual intimacy and aesthetic value.

Street lighting, while not deterministic of behavior, may function as a cue to social organization or disorganization and may act as a facilitator or inhibitor to social interaction on the street and to use of the street (Murray, Motoyama & Rouse, 1980; Nasar & Jones, 1997; Perkins & Taylor, 1992). Street lighting has also been empirically tested for its capacity to fight crime, fear of crime, and to increase physical activity on the street (Boyce, 1993; Painter, 1991, 1994, 1995; Tien, 1972; Vrij & Winkel; 1991). These studies have produced varied and conflicting results regarding the existence of a causal link between the presence of street lighting and a decrease in crime and fear of crime. For example, Tien (1979) found no significant correlation between crime levels and street lighting. Studies conducted by Painter (1994, 1995, 1996) in England concluded that improved lighting can influence the incidence of some types of crime (particularly crimes of opportunity and anti-social behavior) and diminish fear of crime, but does not necessarily lead to changes in walking behavior after dark. Ditton and Nair (1994) also found no reduction in fear of crime but did find that lighting a moderately-used, dark pedestrian route did produce a significant increase in the numbers of pedestrians using the route, decreased numbers of pedestrians hurrying, and increased numbers who seemed to have a confident demeanor. Literature specifically concerned with street lighting, activity and attitude other than fear of crime and crime are primarily anecdotal and speculative

explorations concerned with the impact of street lighting on affluent streets and downtown retail areas (Holden, 1997; Metropolis, 1995; Peters, 1992; Ripman, 1995).

Although the results of the impact of street lighting on crime research are mixed, the research remains highly suggestive of street lights' capacity to promote visibility, to act as both a psychological deterrent to offenders and as a highly noticeable improvement in the aesthetic environment of the neighborhood (Nair & Ditton, 1994). According to Painter (1996), street lighting acts as a catalyst to stimulate the means to solve crime and disorder through a variety of mechanisms, such as its capacity to increase pedestrian density, to improve public confidence, and to add a general feel-good factor for pedestrians.

Street lighting potentially extends the period over which a street is used and the range of uses to which the street can be put. Conklin (1975) argues that crime and fear of crime is closely associated with precautionary activities such as not going out at night, or not talking to strangers. According to Rigor, Gorden and LeBailly (1981) these precautionary behaviors can be viewed as self-imposed restrictions to public access which limit freedom of movement in the urban environment. To the individuals the cost of such restrictions may be lost opportunities for work, leisure activities, or other forms of movement in the urban setting. To the community the costs may be loss of residents' involvement in local life.

The capacity of street lighting improvements to impact on pedestrian use of the street will depend on the specific environmental setting into which it is introduced. Key factors include the existence of a commercial or institutional infrastructure that would support increased street activity and the mix of illegal to legal activity occurring on a street. People's existing purposes for using the street have to be accounted for. Three of the studies by Painter (1993,1994, 1995) found a substantial increase in the number of people using the street but fails to note the significance of the existence of destination.

For instance, Painter finds increases in uses of the street among elderly but street use was determined by their destination to a community program for senior citizens. Thus, a lighting intervention should seriously consider whether a desired destination exists for people to get to. In the absence of a destination, overall increases in total pedestrian count may not be the result of lighting intervention. However, it is important to note that even with a desired destination increases in total pedestrian count may not be significant for three reasons. First, the destination may be geared towards a specific population, as in the above example. Second, the realities of local protocols for women's behavior may be such that women will not go out at night even with improved lighting. Third, if the destination involves illegal activity (for example recreational drug buying) the presence of increased lighting may drive pedestrians away. In the present research, a pilot study was crucial for discovering local protocols and social norms and helped to locate a physical space for the intervention.

Summary and Research Goals

Informal and formal neighborhood networks play a role in supporting quality of life. However, to the extent that people fear the streets, particularly at night, street use and the possibility of social activity is limited. Designs for the physical environment that manipulate prospect, refuge, and escape, and that afford surveillance on compelling routes, could reduce fear of crime, as well as, opportunities for crime thus potentially increasing street use. Street and pedestrian studies are encouraging and suggest that optional, and even necessary, activities are sensitive to changes in the physical environment. There is reason to suspect that a street lighting intervention may support the increase in frequency and/or duration of necessary and optional activities. Research suggests that a key element of the design of a physical street feature is its capacity to support the activities of residents engaged in pro-social activities. A lighting

intervention, then, might focus on significant social institutions on a neighborhood street illuminating routes to and from these institutions. Further, an aesthetically appealing design might enhance appreciation of the visual environment and may increase perceived levels of neighborhood safety.

Taylor, Shumaker and Gottfredson (1984) have argued that the limited attention given to the role of the physical environment in neighborhood life has created a significant research gap. While the present study is an effort to close one small part of this gap, it also considers Tien's (1979) recommendation that a major street lighting project *not* be undertaken at this time. Rather, Tien suggests that single project evaluations be conducted on a systematic and uniform basis and that a model evaluation be developed that can be used as a guide and reference. The following research project is meant as a model, guide and reference for future studies. As no prior studies examine the capacity of street lights to support neighborhood life, it is important that this study be viewed as an opportunity to establish whether such an approach is valuable and to create a guide and reference for future installations so that a systematic street by street assessment can continue. In this regard, a lighting intervention was designed to make a physical change on a particular avenue and then measure its consequences on a number of co-variables that the literature suggests ought to be changed. These include: increased street use or maintenance of current street use; increased comfort on the street; increased use of local facilities; drops in crime; increase in general quality and upkeep of the physical condition of the neighborhood and increased use of the street by women during certain specific time periods.

CHAPTER III
THE EMERGENT ROLE OF THE PILOT PHASE

The pilot study was conceived as a tool for determining pedestrian needs and desires for nighttime walking. It provided a profile of the variables that were important to pedestrians in determining their use of a street, e.g., garbage, aesthetics, presence of tunnels, presence of others on the street. This profile was crucial in designing a lighting intervention that took into account pedestrian needs in the particular communities.

Further, and to be described in greater detail, the pilot study was critical for selecting an appropriate neighborhood and site for the lighting intervention, and as a basis from which to construct a research methodology for the subsequent phases of the study. It was intended to be a discrete self-contained phase of the research project, followed by an environmental evaluation of the pre-, post-one, and post-two type. However, the pilot study played a far more important role in the entire research process than was expected.

The process of selecting a neighborhood and a site within the neighborhood for the lighting intervention was critical to an emergent methodology for the entire study. Below, I will describe the process of selecting a site and then discuss the impact of this process (and the results of the study) on subsequent phases of this research.

Site Selection

The site selection process of the pilot study was key to shaping the entire project. Selecting a neighborhood was informed by findings of previous studies (Dinton & Nair, 1994; Painter, 1994) which suggest that introducing lighting into an environment as part of a package of change increases its effectiveness. Therefore the first step was to look for neighborhoods showing signs of local development. From a large sampling of urban communities, two neighborhoods showed promise. In East Harlem, an active community

board and the construction of a new cultural center on 106th and Lexington suggested that changes were occurring (See Appendix B: Map of East Harlem). In Brooklyn, East New York was described in the New York Times (1996) as a vibrant neighborhood "in a landscape still dominated by damage, with decaying buildings, pockmarked blocks, one in which murder is still too frequent . . . ripe for urban experimentation." (See Appendix C: Map of East New York) My own visits to the site found that a new model of community policing was being tried out in a partnership between the community, police officers and housing experts, and new single family housing was transforming the landscape. In the urban affairs section of The Atlantic Monthly (1997), the authors describe East New York in the following manner: "an urban Levittown now flourishes in what was one of the poorest and most troubled parts of New York City. The home owners - church members, former public housing tenants and long time neighborhood residents - scrupulously maintain their property. A visitor cannot help but be struck by the contrast between the Nehemiah houses- whose owners have adorned them with doves manicured front lawns . . . and the anonymous housing projects in an adjoining district." (p. 35).

Within these two communities I selected small areas that were identified by community members as ill-lit but oft-used and were associated with people who could become partners in the maintenance of an installation. The proximity of major subway stations and important community institutions made the streets compelling corridors for pedestrians. In East New York, I selected a pedestrian route in an L shape between Ashford and New Lots and along Barby crossing New Lots and Livonia under an elevated #3 train (see Appendix D: Map of East New York Site). In East Harlem, a heavily-used street was selected on 103rd Street between Lexington and Park which included a pedestrian tunnel under the elevated Metro North (see Appendix E: Map of East Harlem Site).

Typically, site selection follows the inventory approach to locate types of streets normally perceived as dangerous (Vrij & Winkel, 1991). In this method one drives through the neighborhood finding dark underused streets and then lights them. One assumes that all deserted dark streets should be lit so that they will be perceived as safe. However, a study by Nair and Ditton (1993) indicates that relying solely on an inventory approach can result in a poorly-lit bad area being turned into a well-lit bad area. They suggest that this result can be avoided by speaking with the community to determine which are the most used routes before implementing lighting changes. The pilot study relied on community contact for determining a street for lighting.

The initial contact in each community occurred through meetings with the Community Board. In the case of East New York, the Community Board recommended contacting the Local Development Corporation (LDC) which had been involved for some years in working to revitalize the strip of commercial activity along New Lots Avenue, east of Pennsylvania Avenue. In East Harlem, the community board served as the direct liaison to the community. These meetings served to sound out the opinions and suggestions from these organizations, to uncover other current or anticipated development projects, review past disappointments, and served as entree into the two communities.

The next step was to learn about the community's perceptions of walking after dark. First, a focus group with community members was organized. Through the LDC in East New York, six women who lived in the community, the local librarian and the coordinator of community outreach, were invited to meet with the principal researcher to discuss pedestrian needs. (Four men were also invited, but were unable to attend). The focus group interviews were transcribed and analyzed. Culled from these were the concerns and issues of these pedestrians and the strategies they used for coping with them.

This information plus information gained from interviews with key players in the community was then used to develop a survey (see Appendix F: Survey; Pilot Study). The survey was used in both communities. A team of interviewers took the survey to busy sites in the selected areas, including a day-care center, subway and bus stops and the plaza outside a senior citizen's center. In addition to these steps, I explored the physical site, taking photographs and noting conditions of the street. I also spent numerous evenings observing pedestrian behavior on-site.

Results of pilot survey

One hundred sixty-seven community members completed the survey (68 in East Harlem and 99 in East New York). Respondents varied in age with slightly more women (59%) than men (41%). The survey focused on three areas: Pedestrian Strategies for choosing a block and side of street to walk down, Walkers' Self-Presentation, and Suggestions for an improved environment for walking after dark.

Pedestrian Strategies.

What leads people to choose or avoid walking down a block? Respondents were offered a set of choices that emerged from the focus group and given the opportunity to add their own. One hundred forty-seven respondents answered this question. The results appear in Table 1. Level of lighting was a factor selected by the most people for determining whether or not to walk down a block (89.9%) and this was largely true for men (84.8%) and women (93.3%).

Table 1 -- Pilot Study

Factors determining choice or avoidance of a block[1]

Determinant factor in choice or avoidance of a block	% of Respondents Indicating Factor is Important (n=147)		
	Total	Men	Women
Level of Lighting	89.9	84.8	93.3
Tunnels/Hiding Places	76.2	67.8	81.8
Empty Lots/Abandoned Buildings	74.2	66.1	79.5
Offensive Behavior	70.1	64.4	73.8
Cleanliness/ Garbage	67.2	76.3	60.9
Activity on the Street	66.9	64.0	68.6
Open Stores	63.7	69.5	59.7
Well-kept Homes	57.5	57.6	57.4
No Activity on the Street	57.3	58.6	56.5

[1] Thirteen respondents added that knowledge of specific crimes that happened in certain blocks kept them away

While close to 70% of respondents indicated that activity on the street was a reason to choose a street, 64% qualified those statements by saying that their decision depends on the type of activity encountered. It is not possible to talk about the issue of "activity" on the street without specifying the type of activity. Respondents would rather walk down a street that is "too quiet" than walk down a street where a gang of teenagers are hanging-out or drug sales are taking place. This same issue affected the response to

open stores. Many women in particular find open stores to be a mixed blessing. They could either be an oasis of light or a site for "undesirables" to gather.

Pedestrians from the two sites had similar beliefs about the importance of the level of lighting. When asked if the level of light is an important consideration when selecting or avoiding a block, 93.6% of the respondents from East New York answered that it is important as compared to 90% of the East Harlem residents. Lighting is also important for selecting a side of the street to walk down, after type of activity. The type of activity going on was the reason most often given for choosing a side of the street (43.8%), followed by the quality of lighting (28.8%) (see Table 2.)

Suggestions for making walking more appealing.

In an open-ended question, pedestrians were asked for suggestions for making walking in their neighborhoods after dark more appealing. Three categories were generated from the responses including security, aesthetics, and/or leisure activities. Greater security, for example, more police presence, was recommended by 61.8% of respondents. However, the data highlight how security concerns predominate women's perceptions of the street environment (92% of women, compared to 55% of men noted security as a suggestion). Aesthetic considerations, from flowers to cleanliness, were recommended by 52% (74% of men, 55% of women), and leisure activities from organized events to bike paths were suggested by 20% of respondents (12% of men, 26% of women).

Table 2 -- Pilot Study

Factors determining side of street selection

Determinant Factor for Choosing a Side of the Street	% of Respondents who Report Factor is Important (n = 167)
Type of Activity	43.8
Level of lighting	28.8
Empty lots	11.0
Traffic patterns	9.6
Rats/ Garbage	9.6
Condition of pavement	8.2
Relevance to destination	8.2
Habitual preference for a particular side of the street	5.5
Other	11.0

Summary of Findings

The field study clearly supports the conclusion suggested in the lighting literature that light plays an important role in determining street use. However, the results are more sensitive to pedestrians' walking behaviors in relation to lighting. That is, while lighting was the most important factor in choosing a block to walk down, type of activity on the street was most important for choosing a side of the street. It should be pointed out that lighting does help illuminate activity on the street.

The findings agree with those of Painter and Nair (1991,1994,1995) with respect to light's capacity to change pedestrian use of the street. Light's presence is a necessary but not sufficient condition to change pedestrian walking habits. There are streets that people will not walk down no matter how well they are lit. The study indicates that being able to see who is on the street and what they are doing are major factors in determining street use. Sixty-four percent of respondents said that "type of activity," not just "activity" determined whether they went down a street or not. Women and older pedestrians may avoid a well-lit street with drug selling teenagers and groups of men hanging-out. Conversely, a dim street with families taking the air on their stoops or playing cards may get a lot of pedestrian use. As Czarbowski (1978) points out public life is very fragile. Who is on the street may well determine the character of the public life of any particular street.

As Boyce (1994) points out, visibility is a key element in humans' capacity to navigate. It affects the distance at which we can see something or someone. The greater this distance, the greater the time to select and act out different approaches. While lighting may not reduce crime, or fear of crime, it does provide an opportunity to see form, clothing, body language, and even facial expression. It tells the pedestrian who is on the street, so that they can make a decision about whether to proceed or turn back.

Further, there is a gender distinction in the importance of factors other than light in affecting pedestrian use. After level of lighting, men put cleanliness and garbage as the most important factor in choice or avoidance of a block. Woman put tunnels, hiding places, empty lots and offensive behavior above cleanliness and garbage. This is consistent with the literature on women's use of the street and fear of public spaces. Men are more secure on the street and look to other factors, such as visual quality to improve street use. One older man, when asked how he wanted his street to feel at night, said simply, "Like those streets in the '80s'---nice lights, clean, lots of shops."

The final selection of the site was guided by findings with respect to the importance of lighting to pedestrians contacted in East New York and East Harlem. While lighting was important to members in both communities, when asked for ideas that would make walking more appealing after dark, 43.2% of the East New York residents suggested better lighting as compared to 28.4% of East Harlem residents. These data in conjunction with my own observations, namely that the level of open drug-related activity on 103rd street far surpassed that at New Lots, informed site selection. Furthermore, residents and pedestrians on 103rd street told me informally that they were most concerned with this drug activity, with the strangers it brought into the neighborhood and with the possibility of police raids or violence. They picked their children up from the subway even during daylight hours. While they welcomed new lighting, they doubted that it would make the difference in how they used the street.

Impact of pilot study

I anticipated that the focus groups and survey data, described above, would provide me with data on pedestrian use of streets after dark, a basis from which to construct a research methodology for the subsequent phases of the study, and a basis for site selection. However, the decision in the pilot study phase to go into the community and explore the social and physical context had unanticipated consequences on the entire study, including the design of the lighting intervention. The pilot study gave me a tool that I employed (however unselfconsciously) throughout the stages of the study. This "tool" was the inclusion of context, the culture of the community as it pertained to pedestrian activity and the role of particular spaces in the particular community. Pedestrian culture, I learned in the pilot study, included social norms for appropriate walking behavior in the community, local strategies for getting around the community, walking styles, and local negotiations as to which spaces may be used and when. The

role of public space included the importance of particular civic buildings or outdoor spaces to the community, the history of the use of the spaces and history of the neighborhoods' struggles to control, upgrade or maintain the space. Not only was I made aware of the details of local life but also, and perhaps more importantly, I learned that the study of these local details was crucial to the development of the design intervention and the research methods.

This exploration of context shaped each and every stage of the study process. It taught me about the strategies residents of East New York---who must traverse dark streets on their way home or to public transportation---use to get around in the existing lighting condition. For example, a local strategy not mentioned in any literature I reviewed is the use of 'dollar cabs' to get to and from destinations after dark. These cabs cruise up and down the main streets ferrying passengers from the projects to the shopping areas, the libraries, the churches, and from the station to home. I also found that community members who walk after dark rely on a mixture of functional lighting and unplanned street lighting to get around. They move from light pool to light pool finding the light that leaks onto the sidewalk from garages, storage depots, stores and the elevated train station. Unlike the roadway lighting provided by the city these secondary light sources not only provide additional sidewalk lighting they may also indicate the presence of others such as a watchman, toll collector or store owner. The drawback from the pedestrians' point of view is that they are unplanned and therefore may disappear without notice. A pedestrian commented in reference to new pizzeria lights, "The only reason I go to school at night is because of those lights, the lights outside the pizza place and that little Bodega. When I come home I try to run with the people and pray that little Bodega is open."

The importance of institutions in the community, in particular the library, church, and community center, emerged from my investigation of context. Unlike other

communities that have a movie house or small theaters or even video rental shops, East New York relies on its library as the major cultural institution. It's where speakers come, movies are shown, poetry readings occur, and neighborhood networks meet and form. It also houses a day-care center and in the evening becomes a safe place for students to do homework. In contrast the significance of the Dutch Reformed Church, built in 1824, is to be found in its aesthetic qualities and landmark status, rather than in its limited day-time use. The local community center is extremely vibrant, housing a afterschool programs and a preschool. It is a major locus of after-dark pedestrian activity with parents pick up their children on the way home from work. The director of the center informed me that he had previously offered evening classes in English as a second language but has abandoned the project because so few residents were willing to go out at night.

By spending time in the community at night I was able to observe the changes in activity on the street on different nights. Except for traffic home from work and increased traffic to drug selling areas, the streets were clearly emptier Friday night. On the other hand, because the library was open late that night, Wednesday was a significant night for pedestrian traffic. Furthermore, I found that the community lacked a variety of after dark destinations. With the exception of the above-mentioned civic institutions, the liquor store and pizzeria, nothing was open after 8 p.m. Shops typically closed at 6 p.m. and there are no restaurants, cafes or movie houses within walking distance. Therefore the pilot study both affected my choice of nights on which to do the interviews on the street and pedestrian counts and shaped my expectations as to the impact of the lighting on increased street use. Recent studies on the advantages of adding lighting to community streets (Ditton & Nair, 1994; Painter, 1994, 1995, 1996) generally show an increase in pedestrian use of streets after lighting is added, but overlook the importance of destinations to increasing pedestrian street use at night.

All of this information was critical in shaping my hypothesis about the changes I could expect after a lighting intervention and informed the type of data that would be sensitive to changes in the community. The importance of the library to the community suggested the value of adding library attendance and circulation data to my measures.

Context-specificity alerted me to the possibility that the results of my study might not match those of other studies that had a variety of nighttime destinations. I knew that elderly people and children lack places to go after dark. I was aware of local codes of behavior that might deter women from walking alone at night (e.g. they would be mistaken for hookers). The pilot data were critical in providing details about community life that guided the finer decisions throughout this investigation, and also shaped my understanding of the constant need to be grounded in context. This level of specificity was sought throughout the study.

The design of lighting was also informed by the exploration of context. I learned that neighborhood networks had historically played a key role in obtaining and maintaining physical benefits from the city (a new park, a redesign of the community center). Therefore I was careful to include a sample of the community in the design process. Once the design was completed on paper, I took visual representations of it to the local community board and asked for their comments. Using photographs of the site I created computer-altered photographs showing how the streets would look after installation (See Appendix G: Computer Altered Photographs). The community board responded positively both to the lighting effects and to the fact that I solicited their responses to the design before it was installed. I offered the community board a choice between aesthetically pleasing but more vulnerable lighting fixtures versus unsightly but more durable "crime lights." (From the data gathered through the street interviews I learned about the importance of the "look of the place" to male pedestrians (woman are generally more concerned with safety). The community board insisted that they wanted

the more fragile solution. When I pointed out that the more fragile units would not be replaced by the city maintenance organization, they proposed that the community would organize to protect the lights. This interaction taught me about the existence of informal social structures in the community.

Had I not known where the drug traffic occurred I could easily have placed my lighting in a dangerous drug selling location, which might have resulted in the lights being immediately disconnected or vandalized. Or worse, I could have lit a dangerous under-used street signaling to new and unsuspecting pedestrians that this was a safe route when in fact it may or may not have been made more safe by the introduction of lighting.

From my questions on walking strategies I learned how important activity on the street is to route selection and therefore chose a street where "socially acceptable" activity was already occurring. Side of the street emerged as an important issue so I selected a side of the street with more civic and residential buildings on it. Paradoxically, it was not until I began the analytic phase of the study that I became self conscious of how important the gathering of contextual information had been to the entire study. As I realized the degree to which I was relying on my contextual information (what Pearsol, 1987, calls "thick descriptions ") to make sense of the results, I became aware of how much exploration of context had shaped the entire process. The pilot study, which had once seemed a self-contained study designed to provide information for the larger study, now emerged as the source of an organizing principle which governed the entire study, framing hypothesis-building, methodology, design strategies, and interpretation of results.

CHAPTER IV
METHODOLOGY

Introduction to Study

This study falls in the research tradition of Environmental Design Evaluation (EDE) because it is a "change oriented" research process. According to Winkel (1993), there are interrelated issues that distinguish EDE studies from other types of evaluations. First, the explicit intention is to utilize evaluation results to bring about change. Second, is the recognition that the possibility and direction of change must take into account differences in value perspectives among those in the setting. In an EDE pre-study, the focus is on analyzing conditions so as to create feasible, cost efficient and maintainable alternatives. In an EDE post-study, the focus is on assessing the design that has been implemented in a manner that is systematic and rigorous, focusing on users and their needs.

While there is considerable diversity in what post-occupancy evaluators are trying to achieve, the situational and flexible character of POE studies most clearly matched the research objectives of this study. The study incorporated both the requirements of Winkel (1978), that whenever possible the generation of research data should be judged in terms of its potential utility to decision makers, and those of Preiser (1988), that the design support and enhance the activities and goals of its users. The pilot study, as discussed, laid the groundwork for the feasibility and utility of this study.

Further, this study, unlike many Environmental Design Evaluations, added a second post measure. Pre-Installation Evaluation provided a baseline from which to measure changes across the one-year study. The design was implemented and installed, and two post evaluations were undertaken at 3 month and 12 month post-installation intervals (see Appendix A: Time Line).

Hypotheses

The hypotheses for this study focus on outcomes of a lighting intervention in five areas: Pedestrian Comfort, Street Use, Use of Civic Institutions, Crime, and Neighborhood Upkeep. Each hypothesis is discussed below in the context of relevant literature and/or experiences leading to such conjectures.

> **H1: Lighting that was designed in a decorative fashion (poles with decorative lanterns on the top) would result in greater reported pedestrian comfort walking at night.**

A significant and compelling body of research already exists to support the proposition that pedestrians feel safer with more light (Ditton & Nair, 1994; Painter, 1991, 1994, 1995). Indeed, the proposition that increasing street lighting will increase perceptions of safety is so widely accepted that the potential of lighting to impact on other experiences of public space has been largely ignored by designers who work in communities where fear of crime is viewed as a major factor. This has led to lighting design treatments of high crime neighborhoods (in America) that would be considered visually unacceptable in so called "safer" communities.

In his discussion of the impact of improvements in visual quality on urban street users Nasar (1986) makes an important distinction between a person's cognitive judgment of the physical environment (i.e., judgments of safety) and a person's internal state or psychological well-being. The latter "might be assessed through questions aimed at uncovering mood" (Nasar, 1986, p.37). My choice of comfort as a variable was an attempt to get at such an internal state, a mood that might not *necessarily* be connected to a person's judgment about whether improvements in the visual environment led to improvements in overall assessment of safety. What Nasar's distinction illuminates is that, measures of safety judgments and measures of comfort might not yield the same findings. The decision to employ an aesthetic lighting intervention centered around civic

institutions or community destinations led further to an interest in assessing the impact on comfort rather than perceptions of safety. That is, while forty harsh flood lights on the avenue might impact perceptions of safety, my purpose as a designer was to increase comfort in a manner reminiscent of how I would install lighting in a low crime high-income neighborhood in Manhattan. However, I did not deny that comfort might vector down to feelings of security for a majority of pedestrians.

In fact, pedestrians were asked in an open-ended question, "What do you think of the lighting?" Even if the effects of lighting vector down to issues of security, the data from this question can be useful to those researchers more specifically concerned with lighting and perception of safety. While there is recognition among researchers that the effects of public lighting on fear of crime are mediated through the varying dimensions of the lighting (its symbolic character, its "feel good" impact, its aesthetic value, its association with security) there are no studies which look at these particular dimensions. Boyce (1993) argues that we need information on the reasons that lights influence fear of crime and he argues that we need information "from the horse's mouth" (p.10). Therefore, I used these qualitative data to enrich my understanding of the different features of the visual environment to which pedestrians might be responding and these different emotional or cognitive responses.

It was also considered important to look at these effects by gender. Comfort while walking alone is a variable that has been used to measure women's changes in attitude to walking alone in prior studies. The literature on women's use of the streets after dark indicates that women feel significantly less comfortable on the streets than men (Riger, LeBailly & Gorden ,1981; Stanko, 1995). However, it must be noted that none of these authors define comfort or distinguish it from feelings of safety. Given that the pilot study indicated significant discomfort walking in the community by men as well, I chose to measure changes in comfort for men as well as women.

H2: Decorative pedestrian lighting combined with flood lighting of civic and quasi-civic buildings would result in reports of more frequent and shorter trips at night by pedestrians and would result in reports of shifts in destinations.

In a study of transit use in several cities, Michelson (1985) found that, regardless of mode of transportation, women's travel involves other people more and more purposes than does men's travel. A number of studies (Giuliano, 1979; Gorden, et. al, 1989; Hanson & Johnson, 1985) have shown that women have significantly different travel patterns than men. Women, for example, tend to have shorter average trip lengths but tend to make more trips than men and to have less access to the family car than men, if one exists (Michelson, 1983; Rosenbloom, 1988; Rosenbloom & Burns, 1993; Skinner & Borlaug, 1980).

Evidence for changes in trip time and frequency is to be obtained from pedestrian interviews. In addition, changes in the purposes of walking are captured by the street interviews.

Traditionally, changes in pedestrian behavior resulting from increased lighting have been measured by a simple numerical count of street use. An improvement in lighting is supposed to result in more pedestrians walking on the street. However, in addition to getting from one place to another, walking provides informal social contact and often leads to more static activities, such as sitting, standing, hanging-out, window shopping, making purchases from street vendors, etc. Furthermore, Nasar (1986) has argued that improvements in visual quality may affect spatial behavior which, on his account, refers to how people use the environment, which places they visit or avoid, or how long they stay. Pedestrian counts are simply not sensitive to these wider dimensions of pedestrian activity. Therefore in the study I chose to include three measures of walking behavior that could enrich my understanding of the changes that might occur in

neighborhood use of the street when I improved the lighting. I was interested in whether pedestrians stayed on the street longer and I was concerned with whether pedestrians took more frequent but potentially shorter walks. For example, instead of doing domestic chores on one long trip home a pedestrian who was more comfortable on the street might make several trips back and forth to the stores and to the library encountering other pedestrians on route. Finally, I was interested in whether the placement of the lighting on the library, community center, and church might change the purpose of walks. If the lighting was successful, I would anticipate more trips to civic facilities that were open (hypothesis #5). I anticipated that the data gathered to answer a hypothesis about walking behavior would also be useful in interpreting the results obtained from the Library attendance/circulation study and the simple pedestrian head count. I anticipated that if walking behavior changed, one change might be in destination.

> **H3**: Given the relative absence of supporting commercial establishments that would encourage street use, the introduction of decorative lighting may be associated with an increase or no change in total pedestrian activity.

For the purpose of this study, the Pedestrian Count provided a simple base line of street use on three particular nights for comparison with samples to be taken approximately six months and one year later. Climate and sunset conditions were approximately the same at each of the study dates to avoid possible confounds. The measure is a quantitative indication of pedestrian activity on the nights before and after the new lights were installed. It also includes a breakdown of percentages between male and female walkers and a comparison of walking patterns between two weekdays and one weekend night. Knowing that the site lacked a variety of nighttime destinations alerted me to the possibility that the results of my study might not match those of other studies which across the board showed a significant increase in pedestrian use but which had a

variety of nighttime destinations. Therefore evidence for changes in street use was obtained from pedestrian interviews.

Measurements were taken on three nights during the month of April 1996, immediately prior to the beginning of Daylight Saving Time. They were taken again one year later at approximately the same time of year (1997) and then finally in November of 1997. The climate and general weather conditions matched across all three samples. The times selected, 6 to 9pm, anticipated peak nighttime walking hours during that time of year. The following nights were chosen to meet certain criteria:

1)Tuesday or Monday provides a sample of walking activity on the street when no extra curricular activities were scheduled at the public facilities (library, community center or church).

2) Wednesday is to give some insight whether nighttime pedestrian volume is increased when any of these public facilities -- in this case, the library -- are open.

3) Friday provides a sample of weekend night activity.

H4: The ratio of female to male pedestrians should become more equitable post intervention, during the hours of 6-8.

The use of the street after dark was examined across gender. Congruent with past literature, ineffective lighting discourages pedestrian activity. However, pilot data suggested that lighting in and of itself would not encourage women to stay out later at night because they would be mistaken for hookers. Increases in street use by women, then, might be expected to occur during the earlier evening hours, e.g., 6-8 p.m. Evidence for changes in street use was obtained from pedestrian interviews

H5: Lighting designed to highlight civic and quasi-civic buildings would result in increased use of these institutions.

Given the importance of destinations to the study and given the lack of attention paid to this dimension of pedestrian use of the street in prior studies it was thought that such a measure, while exploratory in nature, would potentially enrich the study and provide valuable information for future studies. The community center lacked a system for visitor counts and the church was not open at night so no measurements of attendance could be taken. The importance of the library to the community suggested the value of adding library attendance and circulation data to my measures. In the pilot study, respondents indicated they would like to use the library more and be able to take their kids there. The librarian who was concerned that the library would be forced to close on Wednesday, its one late night, felt that providing lighting would help get more attendance thereby bolstering her fight to keep the library open. She remarked that "people work, so the only way they have access to the library is at night or on Saturdays." She also stated that "the library *is* the cultural institution in this community" as well the meeting place for many neighborhood groups which suggested that attendance may, on many occasions, not be connected to book circulation but rather an indicator of the use of the library for other community purposes. Thus, the inclusion of library circulation and attendance records was in part generated by the researcher's desire to include information generated by dialogues with community members.

Therefore, the hypothesis is tested in relation to library attendance and circulation data, and interviews with the head librarian.

> **H6**: Lighting would change assault patterns in the immediate area where the lighting intervention took place when compared with assault patterns in the area around the installation unaffected by the lighting.

I felt it important to include a measure that had been included in all prior studies, even though, unlike all prior studies in this area, my study was not focused on crime reduction or increases in perception of safety. At the very least, I wanted to evaluate

whether the introduction of new street lighting might be correlated with an increase in crime in particular assault patterns. There is some precedent for this concern. In a study by Painter (1991) in Ashton-under-Lyme there was convincing evidence gathered that, overall, the incidence of crime had been reduced following the lighting improvements. Yet, some kinds of crime, including physical assaults, increased. Thus, it seemed important at the very least to determine that the present lighting intervention did not result in increased crime.

The assault data were supplied by the Center for Violence Research and Prevention and consisted of data obtained from the Department of Health.[1] It consisted of assault and murder statistics covering the period 1996 through 1997 gathered for the four block area in which the lighting intervention took place and for four blocks immediately adjacent to the intervention site, on either side. (See Appendix H: Assault Map of Site)

> H7: Lighting *may* impact the general quality and upkeep of the physical condition of the neighborhood.

Garbage, defacement and or poor maintenance of public facilities was mentioned in the pilot study as a major concern to male residents. It was thought initially that the new lighting may act as a deterrent to public nuisance crimes such as dropping garbage on the streets by residents or passing motorists (which I was told typically happened at night), window breaking, and the dropping on the street of drug paraphernalia such as crack vials. The site assessments were designed to record changes in the physical condition of the site over the life of the study. To gain some independent verification of my assessments of the condition of the site my observations were compared with those of nine independent observers. These observers, none of whom were residents of East New

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[1] I would like to express my appreciation to Dr. Susan Wilt of the New York City Department of Health who supplied the data to the School of Public Health, Columbia University.

York, were employees of the New York City Department of Transportation and students hired as researchers for the project.

Additionally, during the pilot study community members said they would protect the new street lights from vandalism. Therefore while the survey did not directly address the conditions of the new lights, I was very interested to see whether the lights were broken after installation and therefore monitored their condition through the life of the study and up to May 1999. Intercoder reliability among the coders was for the assessment of the physical condition of the site calculated as 80% at the beginning of the study.

Description of Study

Site

East New York is a multi-ethnic and multi-racial community which has had a recent influx of new immigrants from the English, Spanish and French-speaking Caribbean and Latin American countries. About 30% of the population is foreign born. According to the 1990 census, the population is 38.4% Hispanic, 47.9% African-American, 9.5% white and 4.2% other. While the East New York/New Lots area is the poorest section of Community Board 5, with 43% of the population below the poverty line, the blocks selected as the study site have a relatively high median income -- roughly $24,000 per annum. The site selected included a long boulevard, New Lots Avenue, and four intersecting cross streets which link the public facilities -- including a library, church and community center -- located on New Lots with residential areas (see Appendix D: Map of East New York Site). On either end of the avenue are excellent public transportation alternatives which draw a certain level of pedestrian traffic. North of New Lots Avenue is a development of affordable single family homes. Community residents

who desire to walk from the train station in general proceed in an L-pattern, down New Lots Avenue and then make a dark crossing under the tracks to get to the single family housing.

Lighting Design and Implementation

For illustrations and drawings of the lighting plan for the site see Appendices I1 through I4: Illustrations and Drawings of the Lighting Plan.

1. The design created a lighting boulevard down the main corridor of New Lots Avenue, which led to and from transportation. With the cooperation of Con Edison, pedestrian lights were mounted at a low height on existing Con Edison poles.

2. A second set of focused lights was pole-mounted to wash the front of the community center, library and church.

3. Lights were mounted on the front of the community center to highlight the murals on its exterior walls.

4. Uplights washed the underside of the elevated train at four intersections where pedestrians must pass to reach their residences. At our request, the Metropolitan Transit Authority painted the underside of the EL structure white. Thus the additional lights created large pools of light under the EL, dispelling the dark and frightening shadows.

   For fixture specifications, see Appendix J: Fixture Specifications

   For post-installation photographs of the site see Appendix K.: Photographs.

Participants

The study relied on multiple samples of pedestrians. Different samplings of pedestrians were included in pedestrian counts and street interviews. Because pedestrian

counts are focused solely (on interest in) a quantitative indicator of people on the street demographic information, except for gender, is not reported here. The street interviews, in total, comprised 317 pedestrians at pre-installation, 331 at post-installation 1, and 306 at post-installation 2. Most of these pedestrians were over the estimated age of 18 (approximately 60-67%) or teenagers (approximately 26-31%). Fewer than 10% of the sample were either children or elderly.

Instruments

In order to gather the quantitative and qualitative data needed for a sensitive, detailed analysis and explanation of the impact of enhanced lighting upon street use, a research design was developed using multiple methods of inquiry. Quantitative data were obtained and combined with qualitative data generated from street interviews and interviews with key players and community network leaders. Consistent with the hypotheses, the instruments and measures for the study were designed to evaluate pedestrian comfort, street use, use of civic institutions, crime, and neighborhood upkeep. The measures included a street interview, pedestrian count, library circulation and attendance records, assault statistics, and a site assessment. Post-evaluation interviews and a final focus group were conducted to generate qualitative data respectively.

Street interview

The Street Interview (see Appendix L: Street Interview) consisted of seven questions, in addition to demographic information (gender, age, family size). Five forced-choice questions were designed to assess the frequency, duration, comfort and purpose of walking. Frequency and duration of walks were quantitative indicators. Pedestrians responded to the question, How often do you walk?, with responses ranging from number of walks per day, per week and per month. Pedestrians also were asked to report the duration of their walks in minutes to hours.

The interview also assessed comfort level walking in two parts: Comfort walking alone (Yes/No) and Comfort walking with others (Yes/No). The purpose of walks was assessed through a checklist including shopping, commuting, household chores, picking up children, etc. The post-installation interview also comprised two open-ended questions: Have you noticed the lighting? What do you think of the lighting? The

interviews were conducted between the hours of 6 and 9 p.m. on the streets on which the design intervention was implemented.

Pedestrian count

Pedestrian counts occurred at ten sites within four intersections of The New Lots Avenue (see Appendix M: Pedestrian Counter Sites). Observers, paid members of the evaluation team, counted the total number of adults and children continuously from 6 to 9 p.m. The data were summarized in 15-minute intervals and accounted for gender. Age data were aggregated.

Library use and circulation

Monthly attendance (total number of people entering library) and monthly circulation records (number of books checked out) were obtained from New Lots Library for the pre- (five months in 1995 and all of 1996) and post- (all of 1997) evaluation periods. Records were also obtained from three libraries in the immediate area, Arlington, Spring Creek, and Brownsville.

I compared attendance and circulation data at New Lots library before and after the lighting installation. I also compared attendance and circulation data from New Lots library with the same data from the three other libraries located in the surrounding communities. A description of all the libraries included in the study follows.

Library Descriptions

New Lots library is the largest physical library in East New York and has the largest collection of books. It serves a population of one and two family dwellings, rentals and some limited population of residents who travel a number of blocks from a

housing project. In addition to book loans it is also a location for neighborhood meetings, after-school programs, poetry nights, and video rentals.

Brownsville is a smaller library located on Glenmore Avenue in the center of the Howard Houses Housing Projects. Patrons can walk within the project itself to get to the library. They do not have to take public streets and the walk itself is no more than five minutes from the furthest point of the project. The library has an informal after-school program that ends before dark but no specific nighttime activities are offered. Its late night is Tuesday and the facility does not have a lighting problem, according to the assistant librarian. In February of 1988, Brownsville introduced new computers that, according to the assistant librarian, is a "big draw."

The Arlington Branch of the Brooklyn Public library is located on Arlington Avenue on a quiet residential street. It serves a community that lives in private houses and apartments rather than housing projects. While the community around the library does not have the same "bad" reputation that the area around New Lots has, according to the assistant librarian, it does have gang activity that is of concern to the residents and the local precinct.

Spring Creek Library is located at 12143 Flatlands Avenue. The library is housed in a tiny, poorly marked building at the edge of the Starrett City Housing complex. During the daytime it is used primarily by retirees (many of Russian origin) who live in Starrett city, and in the afternoons and on the one night it is open late (Mondays) it is used by children and teenagers who attended the many after-school programs that are offered. According to the head librarian it attracts children and adults in part because the area lacks any other recreational centers.

Crime statistics

Assault and murder statistics were obtained from the New York City Department of Public Health for the period 1996 through 1997. Assault statistics comprise violent incidents ending in hospital admittance. Statistics will compare assault data from New Lots Avenue beginning at Ashford and ending on Schenck bounded on one side by Livonia and on the other by Hegeman to assault statistics obtained for the surrounding area.

Site Assessments

The site assessments consisted of observations of the physical condition surrounding the fixture installation. Narrative descriptions of the observed conditions were generated by the principal investigator and cross-validated with records of observations made by eight hired and trained consultants who did not live in the community. The observations focused on the physical features that community members might be inclined to maintain or upgrade, such as the maintenance of the lights installed, and other surrounding conditions (presence of garbage, graffiti, drug paraphernalia, and broken windows).

Final Focus Group

The final focus group consisted of one three hour meeting with eight community members, held on November 19th, 1997. Participants included residents of East New York who were members of a local organization called "Concerned Citizens of East New York". I was invited to attend the meeting to discuss the goals and the impact of the Pedestrian Lighting Research Project.

Interviews with Key Informants

Interviews with key informants took place over the two year span of the project. Key informants included: the Head Librarian of the New Lots Branch of the Brooklyn Public Library; The Director of the Community Center on Schenk and New Lots that had new lighting added to the front of the building and the Reverend who led the congregation of the New Lots Dutch Reformed Church on New Lots that was relit.

Procedure

The pre-evaluation was conducted in two parts. In April of 1996 (seven months prior to the lighting installation) the pedestrian counts and site assessments were conducted. The pre-installation street interviews took place in July of 1996. The post-evaluations occurred twice, 3 months (March 1997) and one year (November 1997) after installation. All instruments and measures were used three times (pre-evaluation, 3 month post, and 1 year post). (See Appendix A: Time Line)

Data Analyses

Hypothesis One: Pedestrian comfort

To test this hypothesis, pedestrian comfort was recoded into a dichotomous variable (comfortable/not comfortable walking alone after dark). The survey asks respondents to check one of four options to the question, "Are you comfortable walking alone, with others, either, neither. Comfort walking alone was coded as "yes" while the other three responses were coded as "no." While comfort walking "with others" could have been included in the "yes" category, the study was most interested in examining the hardest set of circumstances to impact.

Chi-square analyses were computed between the percentages of people who reported being comfortable walking on the street after dark alone with those who were not comfortable. Three separate tests were computed: a comparison between yes/no responses before lighting change and at the first post, before lighting and second post, and between the second and third post changes.

Hypothesis Two: Walking Patterns

Respondents were asked how often they walked (frequency) and for how long (duration). Frequency of walks was recalculated to obtain a monthly average. One month was made equivalent to thirty days so that a person walking four times a day was estimated to walk 120 times per month. One-way analyses of variance were calculated with treatment as the independent variable (Pre-lighting, Post-assessment One, and Post-assessment Two) and frequency and duration as the dependent variables. Tukey post-hoc tests were used to locate differences between groups. The purpose of the walk was also examined.

Hypothesis Three: Changes In Total Pedestrian Activity

To test this hypothesis a general linear model procedure was used to compare least square means between pedestrian counts obtained on Wednesday nights in the pre- and post-one period, the pre- and post-two period and the post-one and post-two periods. Wednesday night (the one night that the library was open late -- until 8 pm) was selected to be tested from a broader pool of pedestrian count data because of the anticipated significance of destinations to changes in overall use of the street.

Hypothesis Four: Changes In Ratio of Female To Male Pedestrians

To test this hypothesis a general linear model procedure was used to compare least square means of the ratio of female to male pedestrians during the hours 6 to 8 p.m.

Hypothesis Five: Increased Use of Civic Institutions

To test this hypothesis monthly attendance (total number of people entering library) and monthly circulation records (number of books checked out) from New Lots Library for the periods pre- (five months in 1995 and all of 1996) and post- (all of 1997) were compared with identical records from, Arlington Library, Spring Creek Library, and Brownsville Library. A general linear model procedure was used to compare least square means between the data obtained from the four libraries. Comparisons were made between the pre- and post-one period, the pre- and post-two period and the post-one and post-two period. Within these periods, the data were examined for changes across discrete times of year when the public schools were open; September to November, December to February and March to May. Two tests were performed: Comparisons of raw frequencies and comparison of percentages of library loan and library attendance.

Hypothesis Six: Changes in Assault Patterns

Assault data were collected from the immediate areas in which the lighting intervention took place including New Lots Avenue and four intersecting streets. These were compared with data collected from four areas that immediately abut the intervention site. The data set was too small too permit statistical analysis.

Hypothesis Seven: Impact on quality and upkeep of the physical condition.

To test this hypothesis a Cochran-Mantel-Haenszel test was performed on the garbage data. The lack of variance in the other data made a statistical analysis impossible.

CHAPTER V
RESULTS

In the following report of results I have chosen to present the findings in relation to the specific hypothesis and have folded findings from the key interviews into the discussion of findings and the conclusion section. The focus group findings are summarized at the end of this chapter.

Hypothesis One: Pedestrian Comfort

The lighting intervention appeared to impact pedestrians' reported level of comfort (see Table 3). Before the lighting intervention, 64.4% of respondents reported that they were not comfortable walking the streets after dark alone, while 35.6% reported that they were comfortable walking alone. Six months after the lighting intervention, the percentage of people who were comfortable walking the streets after dark alone increased to 48.5% (a 12.9% increase). This increase was statistically significant (chi-square = 10.25, df = 1, p = .001).

Approximately one year after the lighting installation, the second post-lighting assessment indicated that this increase had stabilized. Close to 51% of respondents were still comfortable walking alone after dark, again a significant change from pre-lighting comfort level (chi-square = 12.42, df = 1, p = .0004). The change between the two post assessments (a 2.3% increase) was not significant (chi-square = .117, df = 1, p = .73).

Table 3

Frequencies and percentages of reported comfort across data sets

Comfort walking alone at night	Before lighting	Initial post lighting change	Second post lighting change	Total
NO	64.4% 199	51.5% 168	49.2% 150	55.0% 517
YES	35.6% 110	48.5% 158	50.8% 155	45.0% 423

The data indicated that the above findings were applicable to both genders (see Table 4). There were significant increases in reported comfort from pre-lighting to the first post-lighting assessment for both men (13% increase; chi-square = 4.49, df = 1, p = .034) and women (15.8% increase; chi-square = 8.91, df = 1, p = .003). Similarly, there were significant increases from pre-lighting to the second post-lighting assessment for both men (18.6% increase; chi-square = 7.99, df = 1, p = .005) and women (15.8% increase; chi-square = 8.37, df = 1, p = .004). However, like the overall results, there were no significant further differences between the two post assessments and this was true for both men (5.5% increase; chi-square = .437, df = 1, p = .51) and women (0% increase, chi- square = 0).

Table 4

Reported comfort by gender

Comfort walking alone at night	Before lighting	Initial post lighting	Second post lighting	Before to initial post change	Before to second post
Men	49.7%	62.8%	68.3%	13.1 +	18.6 +
Women	20.4%	36.2%	36.2%	15.8 +	15.8 +

Open-ended question at end of interview

The total sample size for interview data at Post 1 consisted of 331 respondents, of whom 211 gave responses to the question, "What do you think of the lighting?" The second data set gathered in November of 1997 consisted of 306 pedestrians interviewed, of which 222 responses were generated to the question. In collecting and interpreting these data my intention was not to compare post-one and post-two but rather to examine the aggregate responses and find the categories within them. These data make clear the complexity of the role lighting plays in pedestrians' experience of the street environment.

The results may be seen as a map of some of the variables that affect these pedestrians' experience of the street and perhaps may be taken as indicators of what may make up a "comfortable" experience of the street.

The results of the responses to the open ended question, Have you noticed the lighting?" are not reported because a large majority of pedestrians chose not to respond to the question.

Table 5

Results of Open-Ended Question: What do you think of the lighting?

Type of Response	Post 1 (n=211)	Post2 (n=222)	Example
Unequivocally Negative	.02 (n = 4)	.07 (n = 15)	LIGHT DOESN'T MAKE A DIFFERENCE TO WHAT I DO.
Neutral	.19 (n = 41)	.09 (n = 19)	Needs more lighting.
Positive	.21 (n = 44)	.31 (n = 68)	It's great. Lighting is always better.
Positive / Qualified With Locations	.07 (n = 14)	.18 (n = 40)	It's great but we need more at Ashford.
Safety	.31 (n = 66)	.10 (n = 22)	THE WORD 'SAFE' OCCURS IN RESPONSE
Breakdown of safety response	(n= 21) (n= 45)	(n= 13) (n= 9)	It's safer. IT'S SAFER BECAUSE I CAN SEE MORE.
Aesthetics	.03 (n=7)	.04 (n=8)	It looks better.
Improved visibility/brightness	.13 (n=28)	.13 (n=28)	I can see more. It's brighter.

Table 5 (Cont.)

Increased pedestrian count/use	.03 (n=7)	.02 (n=5)	It's great, it brings more people out.
Comfort	.0 (n=0)	.01 (n=3)	I feel good. I feel more comfortable.
Miscellaneous	.0 (n=0)	.06 (n=14)	It's great now I can pick up my kids at the library.

Discussion

The results suggest that the lighting intervention did result in an increase in reported comfort on the street. However, these results do not establish a causal link between comfort and the addition of new street lighting. First, chi-square statistics do not indicate causality. Second, as Campbell and Stanley (1963) point out, the sampling method used (the separate-sample, pretest-posttest design) does not control for "history" (extraneous events other than the intervention occurring between pre- and post-testing that may have impacted pedestrian comfort). There were other changes in the pedestrian environment that could have accounted for an increase in comfort walking, such as the increase in community policing and an overall drop in city-wide crime rates. Furthermore, since the term 'comfort' lacks specific reference, asserting a similarity of meaning across respondents is assumptive.

The similarity of results for both genders suggests the potential of comfort being a more gender-neutral and inclusive term than "safety". Prior studies uniformly indicate that women are more concerned with safety than men or are, at least more willing to say they are. Therefore, one possible reading of this finding is that the perception of comfort

does not necessarily vector down to perception of safety for women. On the other hand, I observed during the open-ended section of the street interview that often men (particularly young men) did not discuss perceptions of safety in terms of their own well being but rather in terms of their concern for women and children. It was clear to me and to the other interviewers, that men in this neighborhood did not easily admit to feeling unsafe. Therefore, it is possible that I may have captured increases in perceptions of safety by men by using the less loaded word "comfort." Stanko (1995) argues that despite all the official data indicating that men, particularly young men, report the largest proportion of personal crime against them, still men, by in large, report feeling safer than women in public. She asks the question ; "to what do contribute such misplaced confidence? Naiveté? Stupidity?" My study suggests the cultural context in which the question is asked may affect the type of answer that is received. Future research would have to confirm whether these inferences are likely to stand up under direct investigation but seems worth pursuing since most lighting studies only employ safety measures and never acknowledge the impact that local culture might have on the accuracy of the responses by men.

The qualitative data obtained from the open-ended question at the end of the street interview suggest that pedestrians have a complex set of responses to street lighting. Thirty-one percent of those interviewed thought that lighting was simply a good thing with another eighteen percent feeling it was good but they needed more. Thirty-one percent thought that safety was an important product of street lighting in the first post interview but many of them connected this sense of safety to some other dimension of street lighting like brightness. In the second post period, safety declined as the primary achievement of the lighting and more diverse activities were mentioned "I can pick up my kids easier" for example. This suggests that the impact of street lighting on sense of security was not sustained or perhaps was now taken a little bit more for granted. One

important finding is that a lighting intervention which was designed to support neighborhood life in an aesthetically appealing manner, did result in an increase in perceptions of safety and this finding may well be significant for designers planning a lighting intervention in what is often called a "high crime community." The director of the community center remarked the following. "So I see the lighting as an increment to the look of the street. And I was a little concerned because I didn't want lights to make it appear like this is a dangerous high crime area, high surveillance machine gun area, and these lights didn't do that. Especially the lights on the library added a little bit of charm. It's not the Berlin wall."

Hypothesis Two - Changes in walking patterns

As indicated in Table 6, before the lighting intervention the average number of walks taken per month was close to 47 and increased to 65 and 62 walks per month at the initial and second post assessments, respectively. A one-way analysis of variance procedure indicated a significant difference across the three data sets on the variable walk frequency ($F = 11.08$, df (2,928), $p = .001$). A Tukey posthoc procedure indicated that there was a significant difference between the frequency of walks reported before the lighting and at initial post assessment. The difference remained significant at the second post assessment. Differences between the two post assessments were not significant.

While frequency of walks increased, the duration of walks decreased after the lighting intervention (see Table 6) from an average of 17 minutes (before lighting intervention) to 15 minutes (at the initial post assessment) to 13 minutes (at second post). Analysis of variance results indicated a significant difference across the three assessments ($F = 5.58$, df (2,907), $p = .004$). However, only pre-lighting and second post lighting

estimates were significantly different from each other. There was no decrease in the average length of walks from pre-lighting to initial post lighting.

Table 6

Frequency and Duration of Walks

	Before Lighting	Initial Post Lighting	Second Post Lighting
Frequency	46.48 (sd = 28.77) (n = 316)	65.37 (sd = 62.14) (n = 326)	61.58 (sd = 62.71) (n = 289)
Duration	17.15 (sd = 18.2) (n = 307)	15.26 (sd = 15.78) (n = 321)	12.82 (sd = 12.48) (n = 282)

Changes in purpose of walk

It was expected that since the lighting intervention was designed to illuminate civic buildings, changes in purpose of walk to these civic institutions might be affected. Respondents were asked the purpose of their walk - commute, shopping, personal business, civic, household, exercise, meal, visit, stroll, other. Chi-square analysis indicated that changes were evident in three areas - use of civic institutions, exercise, and visits.

Table 7

Treatment by Activity

TABLE OF TREATMNT BY ACTIVITY

TREATMNT / ACTIVITY	commute	shopping	persbus	civic	visit	Total
pre	88	83	39	21	53	284
	95.59	60.263	54.376	30.132	43.639	
	-7.59	22.737	-15.38	-9.132	9.361	
	0.6027	8.5782	4.3477	2.7675	2.008	
	10.73	10.12	4.76	2.56	6.46	34.63
	30.99	29.23	13.73	7.39	18.66	
	31.88	47.70	24.84	24.14	42.06	
post1	85	52	60	21	57	275
	92.561	58.354	52.652	29.177	42.256	
	-7.561	-6.354	7.3476	-8.177	14.744	
	0.6176	0.6918	1.0253	2.2916	5.1444	
	10.37	6.34	7.32	2.56	6.95	33.54
	30.91	18.91	21.82	7.64	20.73	
	30.80	29.89	38.22	24.14	45.24	
post2	103	39	58	45	16	261
	87.849	55.383	49.972	27.691	40.105	
	15.151	-16.38	8.028	17.309	-24.1	
	2.6131	4.8463	1.2897	10.819	14.488	
	12.56	4.76	7.07	5.49	1.95	31.83
	39.46	14.94	22.22	17.24	6.13	
	37.32	22.41	36.94	51.72	12.70	
Total	276	174	157	87	126	820
	33.66	21.22	19.15	10.61	15.37	100.00

No significant increase in commute, shopping or personal business is detected as a result of the interventions. There was a significant decrease in personal visiting from Post 1 to Post 2. (Chi Sq.=14.488; $p<0.001$). A highly significant increase is found in the use of the Civic Building from Post 1 to Post two period (Chi Sq. = 10.812; $p<.001$).

Discussion

First, it is important to note that the pre-intervention data were gathered during the summer months whereas the post test one and two were gathered in late autumn and early spring. Since it was warmer during the summer months (at pre-data collection) one might expect frequency and duration of walks to be at their highest. Increases in frequency of walks after the intervention are highly supportive of a direct relationship between lighting and pedestrian walking behaviors, especially when one considers that during the time of the study, no new institutions opened up, no restaurants and no movie houses. Ironically, the drop-in duration may have equally been affected by the weather. Longer walks are more common in the summer months than in late spring or early autumn.

The change in duration of walks is difficult to interpret when examined on its own. First, duration was self-reported in minutes. How long a trip seems may well be a function of other variables, such as purpose or physical tiredness; minutes on the street are hard to estimate accurately. Second, given the lack of shops, or cafes along the route, or even hang out spaces, the lighting intervention may have failed to encourage longer stays on the street. If one looks at the duration data in light of the changes in frequency data, an inference could be made that the drop in duration indicates a shift to shorter, more frequent walks or the feeling that the walk is shorter. But this inference is hard to substantiate.

These data suggest that there was a significant increase in civic use across the time of the study but a decrease in visiting and exercise. One possible confound is the time of year. In the pre-study, more visiting may have been going on, as well as, more summer-related exercise. Further, as school was closed, the use of civic buildings might be expected to be much lower in the summer pre-study. Since school was in session during both post studies the increase in civic use across the two posts may be used in support of library attendance and loan data that indicated an increase in library use across the period of the study. When one considers the changes in frequency data, in light of the information gleaned from the changes in purpose, it appears that what changed were

necessary activities. What did not change, or decreased, were the optional activities. This finding is in direct opposition to prior research which suggests that changes in physical environment will most likely impact optional activities (Gehl, 1986; Riger & Gorden, 1981). However, it supports Winkel's (1978) observation that where options have been severely limited, changes in the form of the environment can have a significant effect on behavior, even necessary behavior. Furthermore, in communities lacking significant leisure opportunities and significant choices in route selection, a role that improving the physical environment can play is to make necessary activities occurring on necessary routes, more comfortable as well as more feasible. A member of the focus group put it in this manner. " In Brooklyn, people walk where it is most comfortable. In Manhattan, you can walk wherever you want. Out here, you gotta walk where you gotta walk."

Hypothesis Three - Changes in Total Pedestrian Activity

Initial pedestrian-count data were collected on April 2nd- 5th of 1996, prior to the lighting installation. Following the installation, further data were collected: first on March 17- 20th and then again November 3rd, 5th, and 21st of 1997. Weather (there was an average temperature of 49 degrees across the entire study) was not found to have a significant impact on use of the street.

Statistically, the difference in the total number of pedestrians is significant only for the difference between the initial and Post #2 data sets ($P<.02$).

Table 8

Number of Pedestrians, Pre-, Post#1, and Post#2 at One-hour intervals

Time Period	Pre-lighting Apr '96	Post #1 Mar '97	% Change	Post #2 Nov '97	%Change
6-9 p.m.	3838	3131	-18	2339	-39
6-7 p.m.	1616	1517	-6	1079	-33
7-8 p.m.	1293	943	-28	855	-34
8-9 p.m.	926	680	-27	405	-56

Counter-intuitively, the data in the preceding table appear to indicate that the greatest change in the number of pedestrians before and after the lighting installation (a decrease) occurs between the hours of 7 and 9pm. It is also apparent in this table, that the larger decrease at Post #2 is consistent across time periods.

Table 9

Comparison of Number of Pedestrians at Hourly Intervals as Percentage of Total Pedestrian Count

Time Period	Pre Apr '96	Post #1 Mar '97	Post #2 Nov '97
6-9 p.m.	3838 (100%)	3131 (100%)	2339 (100%)
6-7 p.m.	1616 (42%)	1517 (48%)	1079 (46%)
7-8 p.m.	1293 (34%)	934 (30%)	855 (37%)
8-9 p.m.	926 (24%)	680 (22%)	405 (17%)

As the preceding tables indicate, an obvious factor that repeatedly (and significantly) affected the number of pedestrians on the street was time of day. On average, the number of individuals decreased between 6 and 9 o'clock at night by about 50%.

Table 10

Mean Number of Female Pedestrians Pre-and Post-Lighting, with respect to time

Time	Pre	Post 1	Significance
6:00-7:00 p.m.	7.2	11.7	P<.0103
7:00-7:30 p.m.	8.3	4.7	P<.03
7:30-8:00 p.m.	6.1	3.4	NS
8:00-8:30 p.m.	3.2	2.0	NS
8:30-9:00 p.m.	4.6	4.9	NS
	Pre	**Post 2**	
6:00-7:00 p.m.	7.2	6.75	NS
7:00-7:30 p.m.	8.3	6.8	NS
7:30-8:00 p.m.	6.1	3.5	NS
8:00-8:30 p.m.	3.2	1.0	NS
8:30-9 :00 p.m.	4.6	2.1	NS
	Post 1	**Post2**	
6:00-7:00 p.m.	11.7	6.75	P<.0001
7:00-7:30 p.m.	4.7	6.8	NS
7:30-8:00 p.m.	3.4	3.5	NS
8:00-8:30 p.m.	2.0	1.0	NS
8:30-9:00 p.m.	4.9	2.1	P<.09

Table 11

Mean Number of Male Pedestrians Pre- and Post-Lighting, with respect to time

Time	Pre	Post 1	Significance
6:00-7:00 p.m.	14.2	13.7	NS
7:00-7:30 p.m.	11.8	15	P<.07
7:30-8:00 p.m.	7.9	7.7	NS
8:00-8:30 p.m.	7.6	4.9	NS
8:30-9:00 p.m.	11.5	6.3	P<.0095

	Pre	Post 2	
6:00-7:00 p.m.	14.2	3.5	P<.01
7:00-7:30 p.m.	11.8	6.8	P<.01
7:30-8:00 p.m.	7.9	8.3	NS
8:00-8:30 p.m.	7.6	4.5	NS
8:30-9:00 p.m.	11.5	3.1	P<.0001

	Post 1	Post 2	
6:00-7:00 p.m.	13.7	3.5	P<.01
7:00-7:30 p.m.	15	6.8	P<.0001
7:30-8:00 p.m.	7.7	8.3	NS
8:00-8:30 p.m.	4.9	4.5	NS
8:30-9:00 p.m.	6.3	3.1	NS

Women on the street.

During the time period from 6:00 - 7:00 p.m. there was a significant increase in women on the street between pre- and post-1 (p=0.1). There was also a significant decrease between post-one and post-two (p=0001). However, there was no significant increase across pre- to post-two.

During the period from 7:00 -7:30 p.m. the was a significant decrease in women on the street (p=.03) when we compare pre- to post-one. When we compare pre- to post-2 and pre to post we find no significant increase.

In the 7 to 7:30 period there was no significant change in street use by women. This was also true of the period 8:00 - 8:30 in all periods.

Men on the street

During the time period 7:00 - 7:30 pm in the pre-to post-one period there was a significant increase in street use by men ($p<.07$) but a significant decrease during the period 8:30 to 9:00 p.m ($p<.0095$). In the comparison of pre to post 2 there was a significant increase in the use of the street by men during the periods 6:00 - 7:00p.m. ($p<.01$) and 7:00 to 7:30 p.m ($p<.01$). Again, there was a significant decrease in the use of the street by men ($p<.0001$). In the comparison of post 1 to post 2 there was a significant increase in the use of the street by men during the periods 6:00 - 7:00p.m. ($p<.01$) and 7:00 to 7:30 p.m ($p<.0001$).

General Discussion

The results of the pedestrian count (which run counter to the results obtained in the last five studies conducted in Great Britain) call into question the value of using this instrument to measure the success of a lighting intervention in each and every experimental situation. In fact, the theory behind pedestrian counts (which involves fluid dynamics) is typically used by transportation engineers who want to reduce the probability of pedestrian conflict on the street. The assumption, that the ideal situation is to eliminate as much friction as possible so as to promote an uninterrupted flow of traffic, reveals its bias towards treating pedestrians as automobiles. (In fact, this kind of study originated as part of automobile traffic control). However, walking (unlike driving), in addition to providing a mode for getting from one place to another, also provides the opportunity for informal social contact and may lead to more static activities, such as sitting, standing, hanging out, window shopping or an extension of time spent walking on the street (a stroll is taken rather than a brisk march). Simple numerical counts of walkers on a street, are simply not sensitive to these wider dimensions of pedestrian activity.

It is clear from the results obtained that the new street lighting did not push more people out onto the street in a simple hydraulic manner. And, in the absence of other changes in the physical environment, (the provision of destinations, new shops or restaurants), this finding is not surprising. Commuters could be expected to commute down the street regardless of the presence of destinations because it is a "compelling" corridor. However, in the absence of the addition of new destinations, it is difficult to see what role the lighting would play in attracting new volumes of pedestrians. The data collected on walking purpose did indicate that the lighting supported an increase in the use of civic institutions. However, it seems unlikely that a head count of pedestrians

taken at three time periods over a year would capture the kind of increase in street use associated with increased use of a library.

In fact, while the results indicated that the lighting did seem to have a significant impact on the use of the street by men during the 6:00 to 7:30 p.m. period, pedestrian volume overall dropped off across the time of the study. While it seems counter intuitive to suggest that lighting drove people off the street some consideration must be given to the possibility that a well lit empty street is less (or no more) appealing than a dark empty street. Lighting does serve to identify pedestrians and a pedestrian, who does not want to be singled out as a potential target, may avoid an under-populated well lit street. A member of the focus group argued that in the absence of other pedestrians or neighbors, who participate in maintaining the health of the street, he would rather the street was dark.

Furthermore, in the highest crime neighborhood in New York, with a well-established presence of street drug selling activity, it is possible that some illegal traffic that previously did occur on the street and which drew pedestrians wishing to engage in these activities onto the street, was forced to move elsewhere. This hypothesis may find some support from the findings of a decrease in men on the street during the 8:00 to 9:00 p.m. period . I had observed that some drug dealing activity commenced at around 8:pm particularly on Friday nights . Lighting, as mentioned in the literature review has functioned as a surveillance tactic and those pedestrians who did not wish to be observed may have chosen to avoid the street. However, this observation must be distinguished from one which suggests that street lighting is a good crime fighting tactic, or that it functioned as such in this community.

Hypothesis Four

It was assumed that the ratio of female to male pedestrians should become more equitable post intervention, during the hours of 6:00 - 8:00 p.m.

After comparing the least square means it was found that the ratio of women to men between the hours of six to eight did not change significantly

Discussion

Similar to the discussion of overall pedestrian counts it can be argued that for women as for men the route that was relit functioned simply as a "compelling corridor" . It was a necessary route to take from the train or stores to home or the bus but the lighting, in and of itself, did not provide any impetus for more women to use the street. While I might have increased the comfort level of the woman who had to use the street, I was not able to attract new female pedestrians. Additionally, local protocols for woman's use of the street after dark may have constrained women from simply strolling after dark.

Hypothesis Five: Increase Use of Civic Institutions

Table 12

Library Attendance

Site	Mean 1	Date 1 Before	Mean 2	Date 2 After	Significance
New Lots	6911	9-11/96	4035	9-12/97	P<.0001 sig. drop
	5748	12/95-2/96	7840	12/96-2/97	P<.01 sig. increase
	5685	3-5/96	7914	3-5/97	P<.0046 sig. increase
Arlington	4353	9-11/96	3121	9-12/97	NS
	4001	12/95-2/96	3737	12/96-2/97	NS
	4001	3-5/96	2003	3-5/97	P<.01 sig. drop
Brownsville	7816	9-11/96	6866	9-12/97	NS
	7708	12/95-2/96	7873	12/96-2/97	NS
	7205	3-5/96	6605	3-5/97	NS

There was a significant increase in attendance at the New Lots Library in the periods December to February and March to May. This increase is not matched in any of the control libraries.

Table 13

Library Circulation

Site	Mean 1	Date 1 Before	Mean 2	Date 2 After	Significance
Brownsville	3.55	9-11/96	3.22	9-12/97	NS
	3.37	12/95-2/96	3.42	12/96-2/97	NS
	3.46	3-5/96	3.74	3-5/97	NS
Spring Creek	3.36	9-11/96	3.67	9-11/97	NS
	3.34	12/95-2/96	3.36	12/96-2/97	NS
	3.53	3-5/96	3.53	3-5/97	NS
New Lots	3.28	9-11/96	3.57	9-12/97	NS
	3.10	12/95-2/96	3.70	12/96-2/97	NS
	2.94	3-5/96	3.6	3-5/97	P<.09 sig. increase
Arlington	2.15	9-11/96	4.18	9-12/97	P<.0001 sig. increase
	3.62	12/95-2/96	1.79	12/96-2/97	P<.0001 sig. decrease
	3.62	3-5/96	3.23	3-5/97	NS

There was a significant increase in attendance at the New Lots Library in the periods March to May 1997. This increase is not matched in any of the control libraries.

An examination of raw data for circulation and attendance across the four libraries is uninformative because site differentials overwhelm all other findings. Therefore the analysis looked at percentage difference in library loan, and attendance rate. These were affected by seasonal variations in loan and attendance data correlated with the beginning and ending of the school year. Therefore, I compared percentages of pre- and post-

intervention data at New Lots Library with data from the other three sites in time period blocks that reflected the school year.

Discussion

Several factors hindered a thorough analysis of library data. First, since the data cannot be broken down into times of day, there is no after-dark assessment of library use. Hence, there is no way of knowing if the lighting was responsible for an increase in library attendance or circulation. However the comparison with the control data obtained from other libraries in the area does strengthen the argument that it was the lighting that made a difference. At the very least there are no other persuasive explanation readily available Indeed the attendance data gathered from the New Lots Avenue Branch (which suggests that there was an increase in attendance) was confirmed by the observations of the head librarian. She made the following remarks: "Patrons have noticed it, they have remarked about how bright it is in front of the library." Furthermore, the hypothesis receives support from the data gathered on changes in purpose of walking, which indicate that a significant number of pedestrians increased their use of civic institutions after the lighting installation.

However, it must be noted that other changes to the physicality of the library itself, such as new racks and a recent painting of the inside of the library, as well as increased outreach may play a role in changes in attendance. As the librarian noted, "Yes there has been a slight increase in the number of people who use the building but it is hard to say why because we have been doing a lot of promoting of the library." The physical changes in the library occurred during the course of the study. The promotional piece began before the lighting installation and continued through it.

Hypothesis Six - Changes in Assault Patterns

Assault and murder data were obtained for New Lots Avenue and four intersecting streets and streets immediately adjacent (See Appendix H). I was not able to obtain assault patterns data for the post intervention period but were able to verify that there was no change in murder rates post installation.

Discussion

There were numerous difficulties with the assault data. First, the collection began during a period when crime was decreasing by 40% in New York City overall. While East New York continues to be ranked the highest crime neighborhood in New York City (in 1999, East New York led the city in reported murders, rapes, robberies and assaults) this standing obscures an overall decrease in crime in East New York itself. Secondly, it has been impossible to obtain a full set of data for the immediate area across the test period. Unlike the majority of recent studies on the effect of street lighting on crime and perceptions of safety, this study did not actively involve local precincts, thereby sacrificing easy access to local police statistics on crime data. Therefore our data were collected from a sample of hospital emergency rooms. Across the study period I was only able to obtain murder statistics.

Third, while prior studies in Great Britain have found that a street lighting installation can result in a decrease in overall crime, on the street of the intervention, there is no comparable American urban study that duplicates the British results. Given the cultural difference in access to guns, drug use patterns, and government control of local municipalities, it seems highly unlikely that a street in East New York would be transformed by street lighting in the same manner that a street in Stoke-on-Trent would.

I did ask Key players and the Final Focus group whether they thought the light had impacted on crime (of any kind) and the responses again indicate how complicated these measures can be. The community center director (who has lived and worked in the community for over thirty years) made the following comments about the installation. "I don't know if it's really reduced crime..... The major deterrent for the abatement of the drug dealing was our raising a consistent fuss about it so that I heard the word on the street is "don't deal in front of the community center between 8 a.m. and 6.30 p.m." What happens after that, I don't know if the lights are stopping anything like that but they (the drug dealers) are sure not in our face when we are here....We have a drug problem, but everybody else knows that there is an ongoing project by the community to upgrade the street, so the lights help that. The lighting reinforced the idea that some good things are happening, even though we have not gotten rid of the drug problem."

A member of the final focus group who is an active member of a neighborhood network argued that, "You go by the community center. Its looks brighter, you say, 'Wow. It looks much safer.' You notice that. You may see more police officers walking up and down the streets. Now those two things aren't related or connected. Because putting more police officers here is not the reason they put up more lights. The more police officers come as a result of Giuliani says he is lessening crime. But you also hear lots about police brutality." These comments suggest that the lighting installation was not identified by key community members as a crime fighting strategy. It is impossible to verify whether their opinions were shared by other community members. However during the installation phase of the project, when I was on site-observing the DOT electricians, the electricians and I were all repeatedly asked whether our lights included police observation cameras. We made very clear to as many people as we could that not only were there no cameras in our lights but also we were in no way connected to the local precinct.

I thought it was important to distinguish this project from one connected to police activities for three reasons. First, the historical function of street lighting has been as a disciplinary social strategy, a tool of surveillance. Consequently it has often become the target of vandalism directed at police institutions. Second, when lighting becomes identified as a surveillance instrument, it incurs more instrumental vandalism by people engaged in activity they would rather not have the police watch. Third, (and perhaps more importantly in the current political climate), if street lighting becomes identified with private or police-oriented surveillance tactics it becomes part of the environment in which civil liberties are perceived as being undermined. If, on the other hand, it is perceived as "a publicly owned and community oriented strategy which benefits all sections of the community" (Painter, 1995, p.15) it has the capacity "to strengthen whatever workable forces for maintaining safety and civilization do exist in the cities we do have" (Jacobs, 1961, p.31).

Hypothesis Seven - Impact on Quality and Upkeep of Neighborhood

Simple observations of the physical condition of the sites where lighting changes took place were conducted. Narrative descriptions of the observed conditions were generated by the principal investigator and cross-validated with records of observations made by individuals who did not live in the community. For the most part, the observations were in agreement.

Table 14

Observations of Physical Features Related to Infra-Structure

Physical Feature	Pre-Lighting		Post-Lighting #2	
	Yes	No	Yes	No
Broken curb or sidewalk?	18	6	17	7
Pot holes ?	11	13	10	14
Street lights working ?	22	2	24	0

Table 15

Observations of Physical Features Related to Local Activity*

Physical Condition	Pre-Lighting			Post-Lighting #1		
	None	Moderate amount	Large amount	None	Moderate amount	Large amount
Any garbage?	5	13	6	10	10	4
Drug paraphernalia ?	23	1		24		
Graffiti ?	19	5		19	5	
Broken windows ?	24			23	1	

* Not all observers responded

Table 16

Treatment as it Relates to Garbage

TREATMNT	GARBAGE			
Frequency Expected Deviation Cell Chi-Square Percent Row Pct Col Pct	none	moderate	large	Total
pre	5 7.5 -2.5 0.8333 10.42 20.83 33.33	13 11.5 1.5 0.1957 27.08 54.17 56.52	6 5 1 0.2 12.50 25.00 60.00	24 50.00
postl	10 7.5 2.5 0.8333 20.83 41.67 66.67	10 11.5 -1.5 0.1957 20.83 41.67 43.48	4 5 -1 0.2 8.33 16.67 40.00	24 50.00
Total	15 31.25	23 47.92	10 20.83	48 100.00

STATISTICS FOR TABLE OF TREATMNT BY GARBAGE

Statistic	DF	Value	Prob
Chi-Square	2	2.458	0.293
Likelihood Ratio Chi-Square	2	2.494	0.287
MH Chi-Square (Mod. Ridits)	1	2.047	0.153
Phi Coefficient		0.226	
Contingency Coefficient		0.221	
Cramer's V		0.226	

Sample Size = 48

Observations of garbage on the street included: residential refuse, tires, abandoned car(s), construction debris, and business refuse. Drug "paraphernalia" included crack vials and drug users. There were no significant changes in the amount of garbage.

Discussion

The preceding data were collected in an effort to discern possible changes in the physical condition of the sites at which lighting was installed. Chi square analysis found no significant change occurred over the period from the first installation to the second post-installation evaluation.

However a key finding that emerged from my exploration of the hypothesis related to the condition of the new lights that were installed in December of 1996. That is, that the lights which the community had undertaken to protect in the community board meeting of 1995 were still unbroken and running in May of 1999. This is an important finding because it goes very much against prevailing attitudes within city agencies as to the wisdom of adding decorative type fixtures to low-income, high crime streets. Representatives of the D.O.T street lighting agency (with the exception of the project instigator) felt strongly that decorative, more fragile fixtures would be destroyed upon installation or shortly after. And there is reason for their concern. Fixtures have been destroyed in many communities. However, I found that the community members stated assurance that the community would protect the fixtures was substantiated and this suggests that involvement by local institutions in the design process may have some impact on the maintenance of the design.

Focus group summary of findings

The focus group explicitly linked participation in community life to the success of the physical intervention. They argued that degree of participation in informal and formal social life was the key to the neighborhood success and, therefore, to the extent that the lighting was successful, it was successful because members of the community took the time to watch each other, to identify strangers and report their presence to other community members or the police. They suggested that lighting installed in areas where there is no participation would not make a difference. This finding contrasts with that of

Baba & Austin (1989) who argue that degree of participation is not related to perceived neighborhood safety but supports the findings of Sampson and Groves, (1989) and Shaw & Mckay, (1972) who argue that degree of participation is a measure of community health.

CHAPTER VI
DISCUSSION

This study examined the impact of a street lighting project on pedestrian behavior and attitudes in a high crime, low income community. The intention was to use the introduction of new street lighting to support formal and informal social interactions after dark. This contrasts with the majority of previous studies which have examined street lighting capacity to impact on fear of crime and crime. Using street lighting to support neighborhood life was deemed feasible and desirable because of the upturn in the economic and social climate of many urban neighborhoods. It was thought that such neighborhoods are no longer concerned solely with issues of survival and crime. Rather, the current environment supports the development of models and research programs that explore ways in which to support community development. Within this context, the study endeavored to establish an empirical link between a physical feature of the street environment (street lighting) and behavior, attitudes and activities of pedestrians. The study built on past research incorporating insights, findings and methods of studies more narrowly focused on crime and perceptions of safety. It also attempted to develop new tools for evaluation and new insights as to the value of existing tools for measuring changing environments. With these ends in mind the following comments can be made.

An initial integration of the findings of this study links the success of a neighborhood to an interrelationship between social phenomena (neighborhood life), activity (casual public contact or informal social street life), an emotional state (sense of safety), and a physical site (the street) as Jacobs (1961) suggested it would. Support is found for the existence of some dynamic relationship between informal and formal social networks, and neighborhood success, as the research perspectives of social disorganization theory and quality of neighborhood life suggested. Support is also found for the presumptions of the incivilities literature that an increase in the quality of the

physical environment will result in increased levels of well-being (comfort and safety) and changes in behavior. Finally, support was found for the notion that improved street lighting increases perceptions of safety and comfort and acts as a cue to general improvements in the physical quality of the neighborhood environment. However, the study found mixed support for the proposition that the introduction of new street lighting increased physical activity on the street or fought crime as the literatures on street lighting and crime suggested it would.

The specific goal of the research project, to determine whether a change in street lighting would result in empirically verifiable changes in behavior and attitudes of urban street users, has been met. Changes in behavior and attitude following the installation of the improved lighting have been verified. Furthermore, the modest increase in library use suggests that the introduction of new lighting was successful in supporting "a setting for informal and formal social interactions" (Parr, 1967).

Indeed, the emergence from the pilot study of the library as a pivotal social institution in the community, the discovery of library attendance and book circulation as a valuable measure of the impact of street lighting on neighborhood life, and the modest success in increasing both circulation and attendance are, in my view, the most significant and compelling results of the entire study.

Although a wide variety of authors have addressed the importance of mixed use streets in a lively neighborhood life, they have focused on small restaurants, commercial establishments and residences, overlooking the fact that many economically deprived communities cannot sustain such a mix. For a variety of reasons that may include the low numbers of population or lack of discretionary income, these neighborhoods may not be able to support a bowling alley, a movie house or small restaurants. Here, civic institutions such as community centers and libraries, become the locations of social interaction, entertainment and a host of pre-school and after-school activities that are part

of sustaining and developing neighborhood life. Hence, access to these institutions is critical to the health of the neighborhood. The study makes clear the importance of identifying these institutions.

The study also points to the value of using the correct instruments to measure the impact of a change in the physical environment on neighborhood life. For example, guided by the pilot study, I selected both circulation and attendance as my library measures having learned that the library was used for functions other than just book acquisition. Future studies might profitably examine the various uses of a public institution in determining which mix of instruments will most fully capture a range of activities.

The modest increase in library use subsequent to the introduction of the new street lighting provides future researchers with a model that can be subjected to testing to see if the results can be duplicated. Finally the study provides a new goal for street lighting. In addition to the more narrowly focused goals of crime reduction and increased pedestrian volume, street lighting can help residents get to where they need and want to go in the neighborhood.

With respect to the remaining individual hypotheses, the following observations can be made. The new street lighting did increase pedestrian reports of comfort and this finding was distributed almost evenly across men and woman. A direction that future research might take is to compare male responses to questions about "comfort" with their responses to the questions about "security" after a lighting intervention has been made. Furthermore, as McLaferty and Preston (1991) observe, analyses of gender differences have largely ignored the intervening effects of race and ethnicity. In this spirit, I suggest that future studies take into account the intervening effects of race and ethnicity, on comfort as well as pedestrian walk length and frequency.

This study's finding on changes in destination as a result of the lighting intervention (that there was an increase in civic use across the time of the study but a decrease in visiting and exercise) support, Nasar's (1986) argument that improvements in visual quality may affect spatial behavior, specifically which places are visited. However, the findings call into question assumptions that optional activities are those most strongly affected by changes in the physical environment. They make questionable the benefit of drawing rigid distinctions between optional and necessary activities. For example, it is not clear whether visits to a library or other civic institutions such as the post office are to be categorized as simply optional or necessary. It depends on the context. In the community in which this lighting intervention took place, the library served as a both a necessary destination for children to get books to study or for neighborhood meetings, while also serving as a location for more optional activities such as poetry readings, video rentals, and informal social gatherings. Future studies should consider a contextually sensitive analysis of local behavior and use of local institutions when designing measures of the impact of changes in the physical environment on local pedestrian use. They may also consider whether a framework that rigidly distinguishes optional from necessary activities is appropriate to the context, or better yet get more detailed definitions of what is optional or necessary activity in the relevant community.

From the qualitative data collected at the end of the study, the dimensions of street lighting that are important or salient to the pedestrians in the study have been established. These include; visibility, brightness, and aesthetics. Specifically, the study found that street lighting plays an important role in allowing pedestrians to see and identify each other and that this is tied into a pedestrian's experience of feeling safe. It is not clear which mechanisms are in operation to delineate how seeing other people increases perceptions of safety. Future research might explore whether street lighting reduces the strangeness of the streets' daily rhythms and routines and whether the ability

to distinguish strangers from acquaintances is an important dimension of the street lighting effect.

Another important finding is that a lighting intervention, which was designed to support neighborhood life in an aesthetically appealing manner, did result in an increase in perceptions of safety and this finding may well be significant for designers planning a lighting intervention in what is often called a "high crime community."

The assessment of the physical condition of the streets on which the intervention took place suggested that the condition of the physical environment can be used as a clue to positive dimensions of neighborhood life. There is an abundance of research leading to a range of perspectives and explanatory models which hypothesize that physical and social cues trigger fear of and decline of the neighborhood (Rohe & Bury, 1988; Skogen & Maxfield, 1981; Taylor, 1987; Wilson & Kelling, 1982). However, notwithstanding the fact that East New York has a reputation as the most dangerous and scary neighborhood in all of New York City, the study found a neighborhood remarkably well-maintained by any neighborhood standards, a place where landlords routinely swept the street in front of their buildings, where any important local civic building was free of graffiti and where the gaps in maintenance had substantially more to do with the gaps in city agency attention than behavior of residents.

Therefore, a dimension of incivilities/civilities that could be explored in future studies is the role that repainted graffiti-free buildings, children's murals, freshly planted neighborhood gardens, and well-maintained churches play as evidence of community participation in the upkeep and maintenance of the neighborhood environment even with high crime neighborhoods. As Taylor, Brower and Stough, (1976) argue, decorations such as ornaments, plants, and furniture on the street front side of houses may indicate that a person cares about his or her neighborhood. The presence of these elements in the

community may be a visual cue to the existence of some degree of local participation just as signs of visual decay were treated as cues to community deterioration.

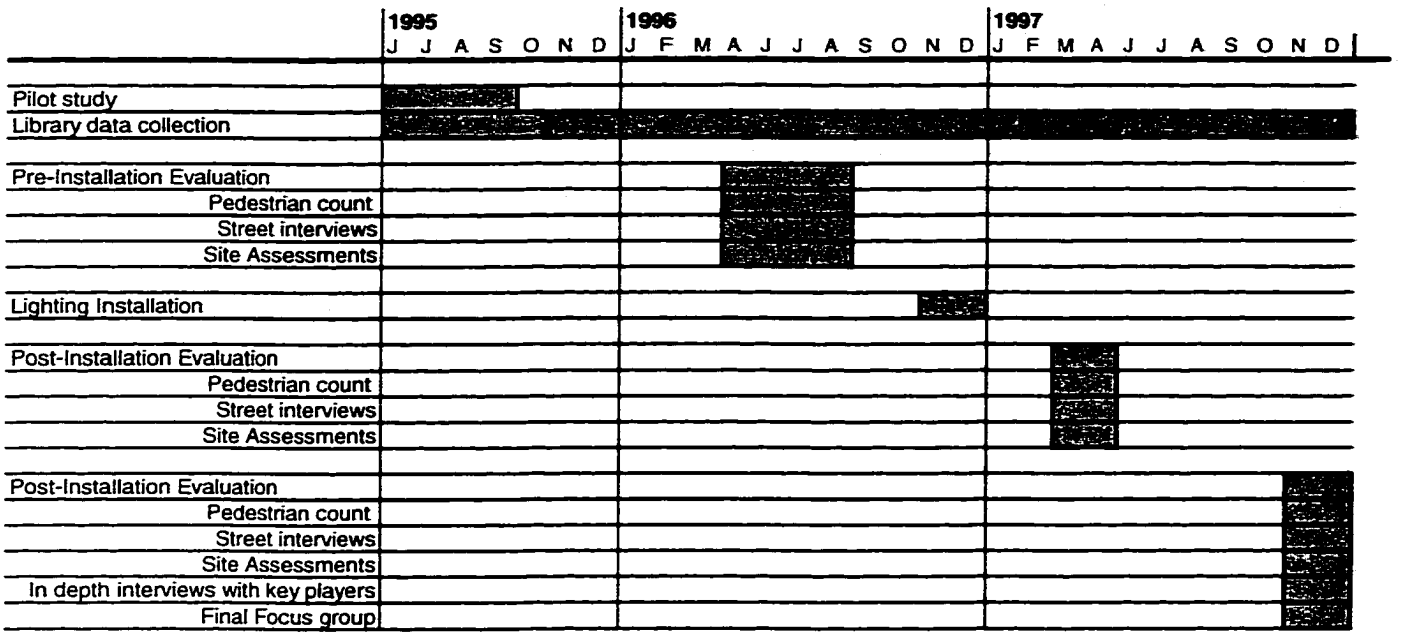
The results of the pedestrian count clearly indicate that increased lighting does not function in a simple hydraulic fashion to push/pull male or female pedestrians onto the street. The context of the intervention, the local culture of walking, and the presence or absence of destinations, all have a role to play in shaping the success of the intervention. In particular, it appears that the street lighting functioned most successfully when the opportunities for transaction occurred. The new street lighting was effective when the library was open and it was effective (according to the focus group) when neighbors participated in street life by using their capacity to identify strangers to alert other neighborhood residents. The new street lighting was salient to pedestrians and neighborhood residents when it was of some use. Gibson's (1979) notion of "affordances" is particularly rich and useful here because it creates a bridge between humans and environment. In his account, affordances of the environment are neither an objective property nor a subjective property. In Gibsonian terms, if we are looking for the "affordances of light," we find these properties by referring to the observer and to the light source. The conceptual perspective is that light as an affordance is partaken of when it is available relative to other factors, such as intentions and projects. As Merleau-Ponty (1963) observed, the world that we see cannot be separated from our projects, and our intentions in the world. Therefore, future studies of the impact of street lighting on pedestrian use of the street which aim to reduce the ambiguity surrounding these critical issues would have to pay close attention to the opportunities for transactions given the nature of the street and street level activities. A new study might compare differences between two streets, both given new lighting but different in their opportunities to transact. Such a study would explore the process issue moving away from hydraulic notions.

Specifically, this study draws attention to the importance of the process by which site selection is made: 1) the role that key informants can play in selecting a street location for the installation that maximizes the probability that the intervention will be a success; 2) the importance of reading the physical character of the community for evidence of participation and community health; and, 3) the importance of locating key institutions that foster prosocial behavior.

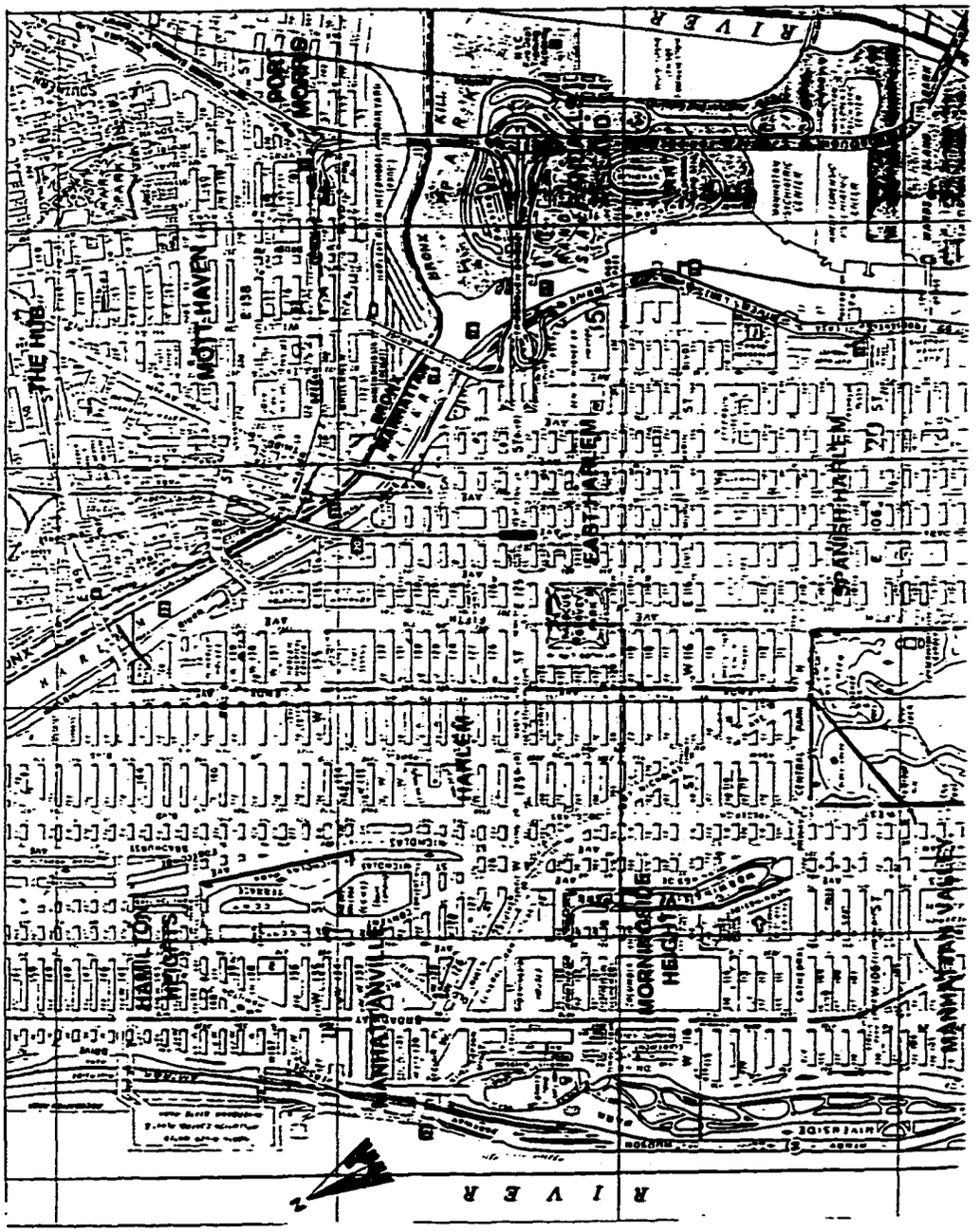
The study also points to the importance of instrument selection and design, for example, the selection of instruments suitable to capturing changes in behavior in the particular environment in which the intervention is to take place; the use of instruments that are sensitive to neighborhood use of institutions; the use of instruments that reflect the impact that street lighting has on this usage.

Finally, a contribution that the findings of this study can make to future studies is to provide a new point from which to start examining the impact of a change in the physical environment on street life. Researchers interested in using lighting to support neighborhood life may benefit from a consideration of the process by which lighting can be used to support positive changes in neighborhood life, shifting away from a narrow focus on outcome measure such as drops in crime rate, or increases in volume of pedestrians on the street. They may also benefit from a sensitivity to the specific context and the activities and projects that occur in this context. As Saegert (1993) argues "environments should be understood as loci of specific social and individual projects that support, oppose, constrain and facilitate each other" (p.p.81). To a great extent, prior research has ignored social and individual projects and the existence of locations in which these projects can be realized in determining the success or failure of interventions in the physical environment

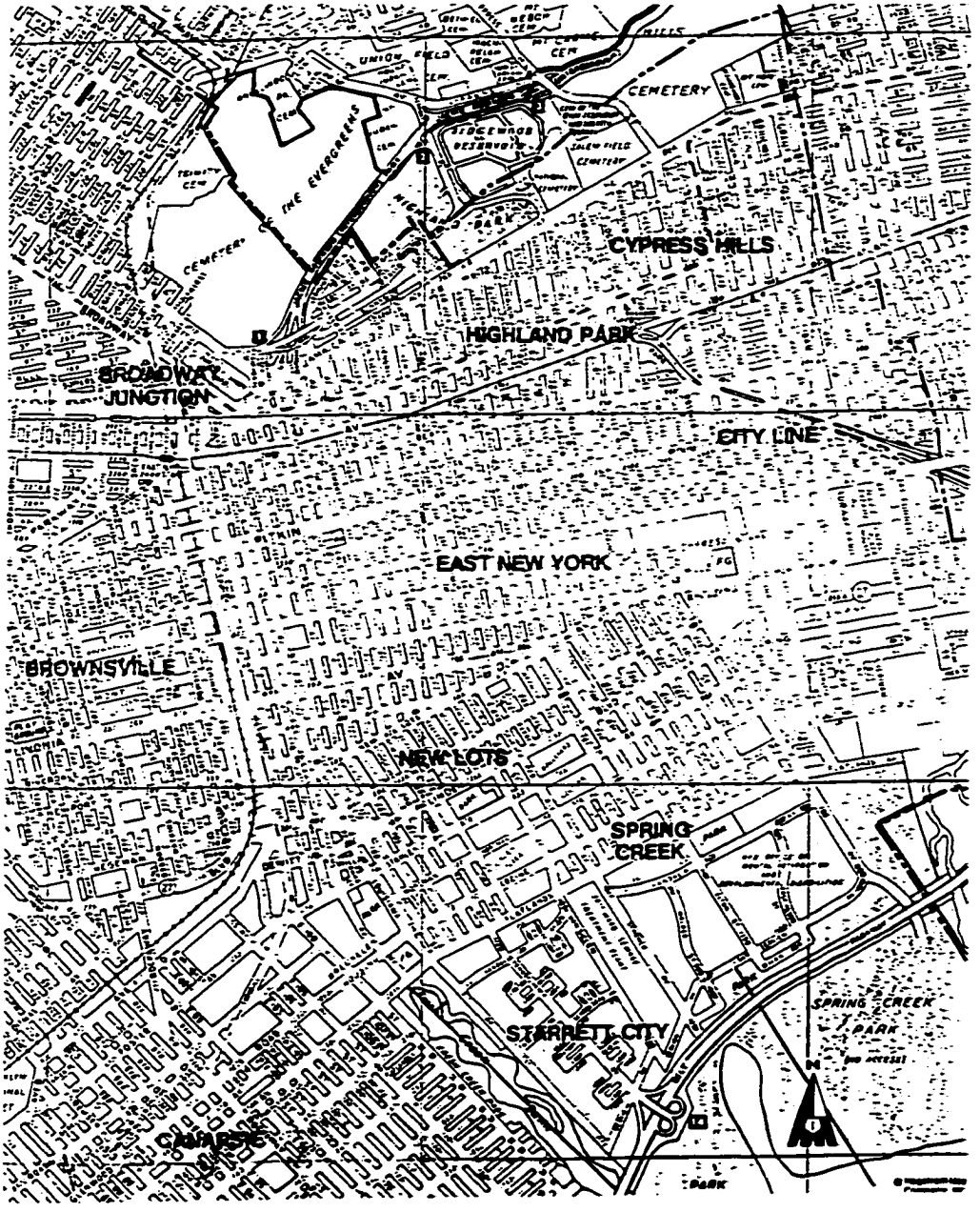
Appendix A: Time Line



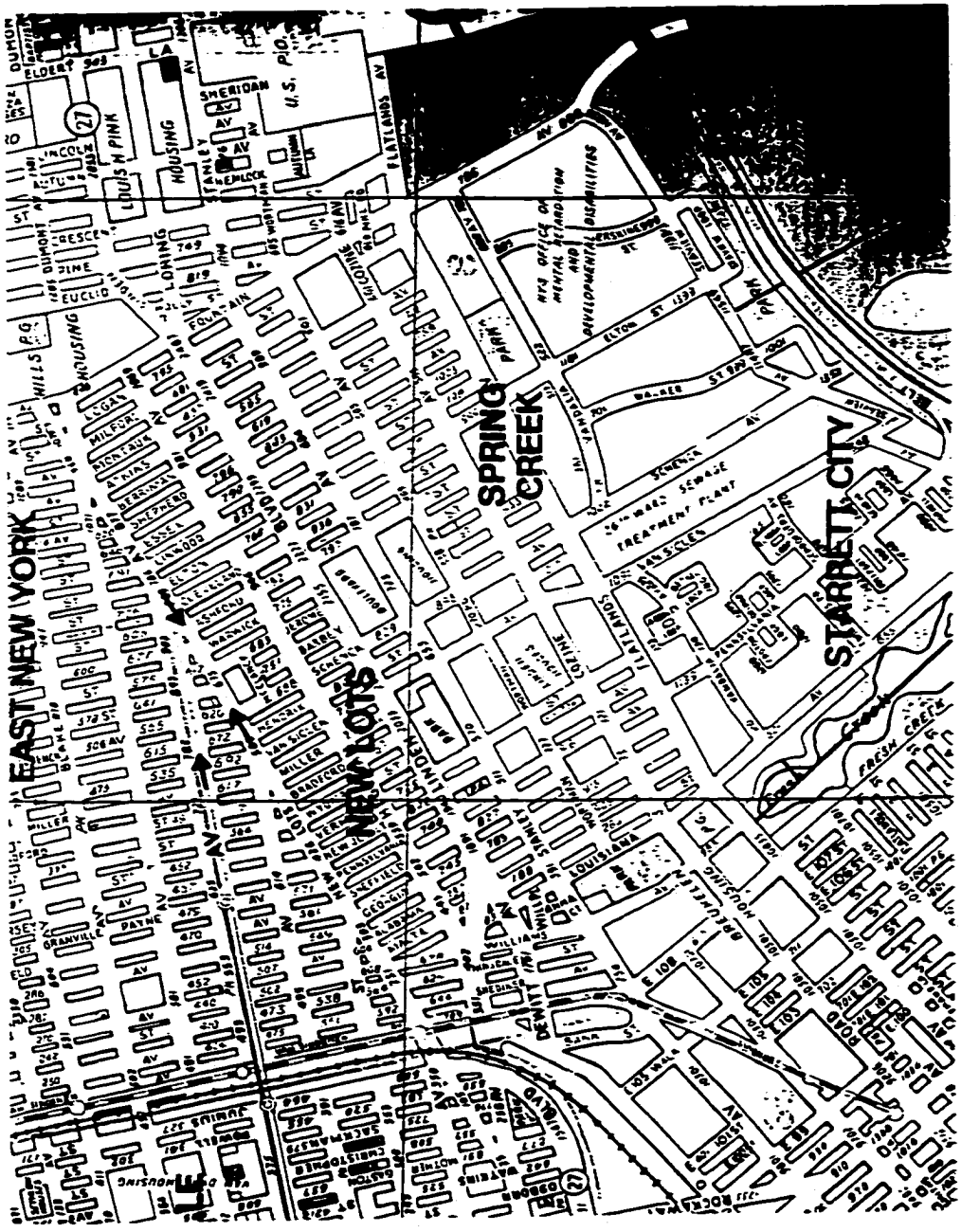
Appendix B: Map of East Harlem



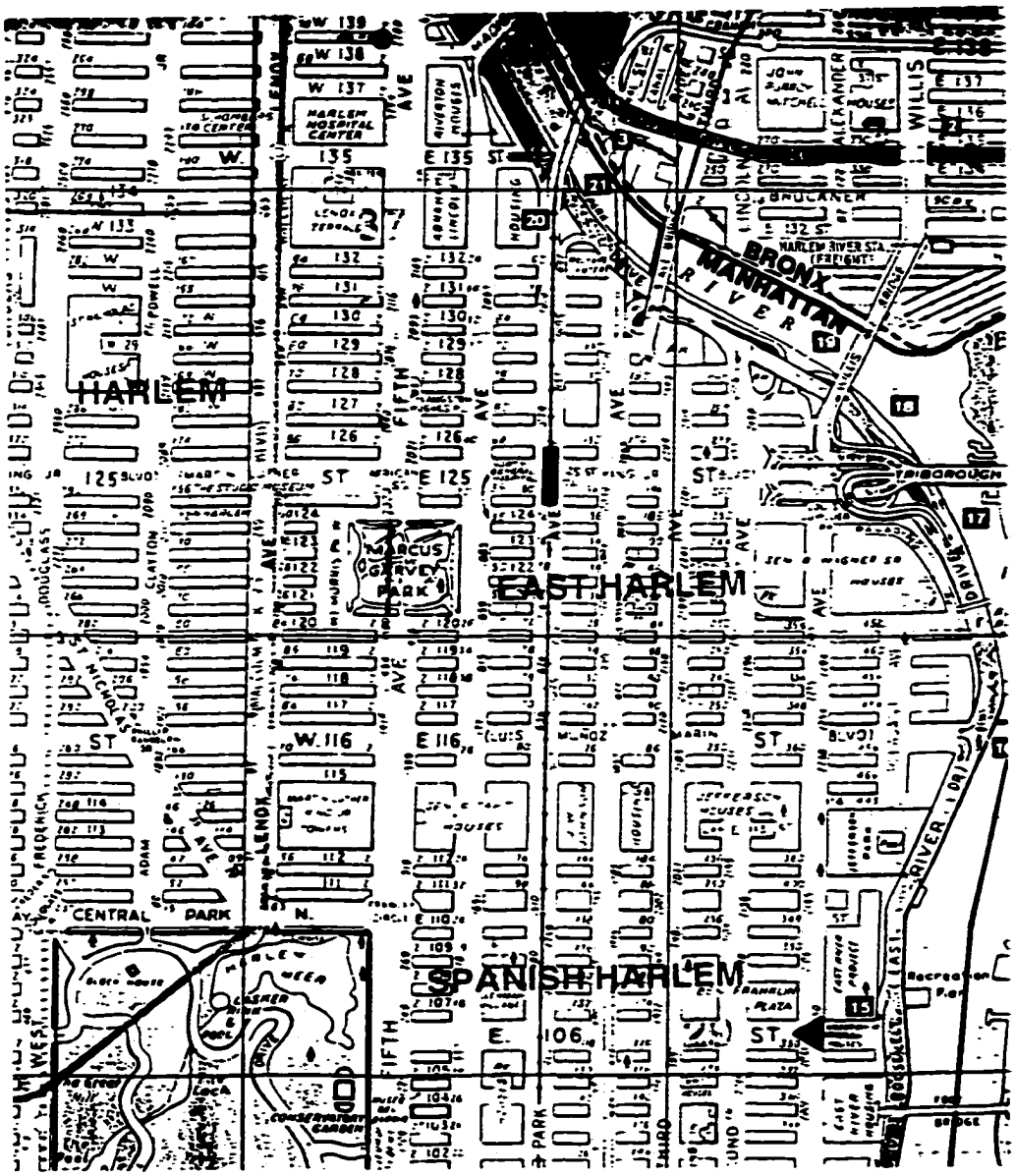
Appendix C: Map of East New York



Appendix D: Map of East New York Site



Appendix E: Map of East Harlem Site



Appendix F: Survey; Pilot Study

Survey/Pedestrian Lighting Study
July 9, 1995 Interviewer_____

Date_____

Time_____

Location_____

M / F

The Department of Transportation is interested in improving conditions for pedestrians. Could you take a few minutes to answer some questions about what it is like walking in your neighborhood?

First some quick information about yourself:

Do you live in East Harlem?

Yes - How long have you lived here?

What street do you live on?

What is the nearest cross street?

No - What brings you to East Harlem?

Which of the following activities do you do here in East Harlem?
(circle all that apply)

Attend school or day care (you or your children)

shop
- supermarkets
- corner stores ("bodegas")
- other (furniture, clothing)

go to the library

attend religious services

go to parks

eat at restaurants

visit with friends

attend community center activities

other_____

Which age range do you fit into (circle):

10- 13 14-17 18- 25 25- 40 40- 60 60+

If you are going somewhere here in East Harlem after dark, how often do you choose to walk? (circle all that apply)

usually sometimes rarely never

If you don't walk, how do you travel?

cab own car train/bus walk

Do you have ideas about what might make you choose to walk more often?

Here is a list of different strategies people use when walking after dark. We would like to know if these are strategies you use.

1) *Avoid certain blocks*

What is an example of a block you avoid when walking at night?

Please review the following list and note how important these considerations are to you when deciding whether or not to walk down a block.

	Important	Somewhat Important	Not Impt
level of lighting			
empty lots/ abandoned buildings			
tunnels/ places where someone might hide			
behavior you find offensive			
traffic			
too quiet/ not enough activity			

What are other reasons to avoid a block?

2) *Select certain blocks*

What is an example of a block you choose to walk down?

Please review the following list and note how important these considerations are to you when deciding whether or not to walk down a block.

	Important	Somewhat Important	Not Impt
level of lighting			
clean			
open stores			
well kept homes			
people on the street/ lots of activity			

What are other reasons to select a certain block when walking after dark?

3) *Take care with how you present yourself*

Do you take special care with any of the following when walking at night?

	Yes	No
They way you dress		
Your body language		
Your attitude		
Carry a weapon		
Carry a whistle		

Does the side of the street you walk on sometimes matter to you?

Yes No

How do you choose the side you walk down?

Do you have children in your care?

What do you tell them about walking at night?

One final question, Picture a pleasant block to walk on after dark. Describe it to me.

Appendix G: Computer Altered Photographs

New Lots Dutch Reform Church - Before lighting

New Lots Dutch Reform Church - After computer added lighting

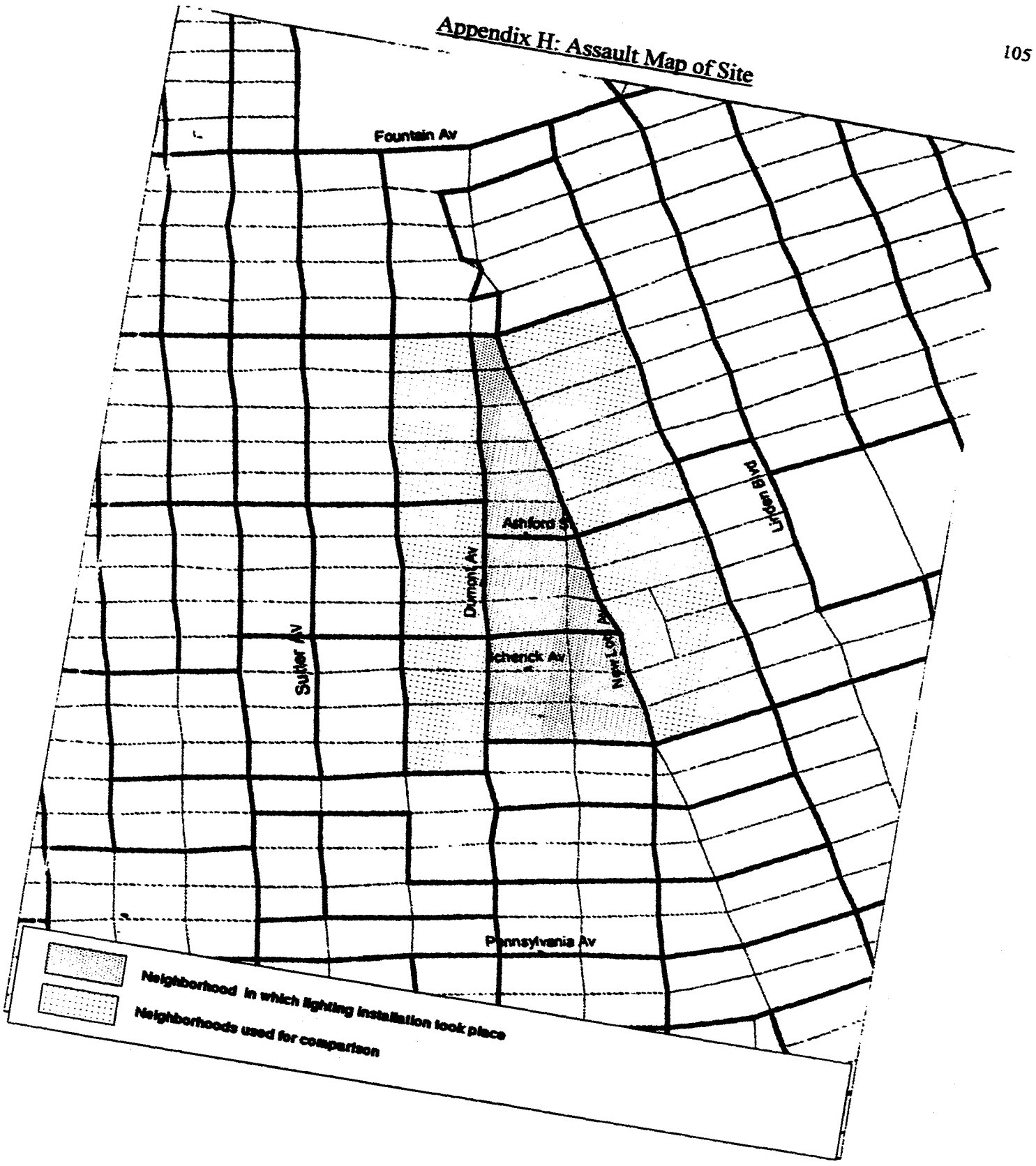
New Lots Community Center – Before Lighting

New Lots Community Center - After computer added lighting

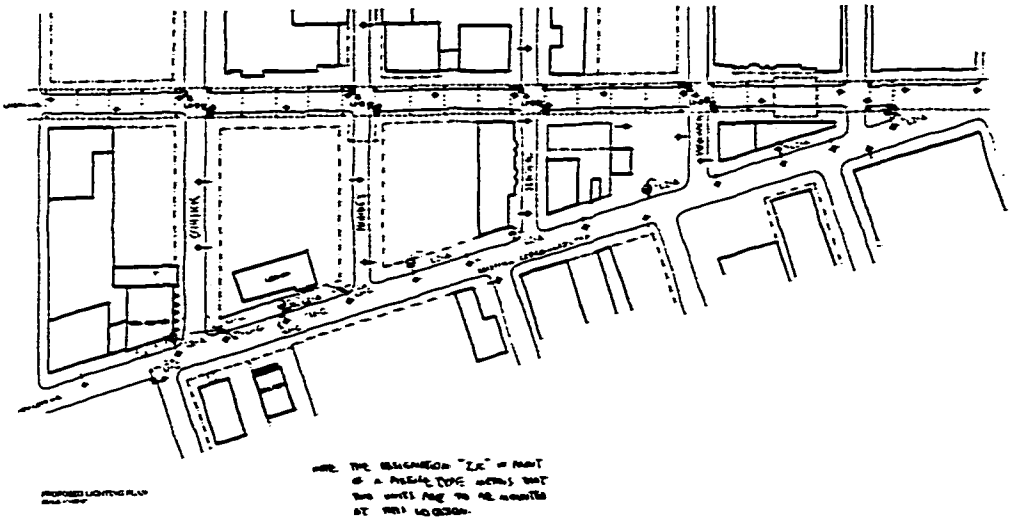
New Lots Avenue, under elevated train - Before Lighting

New Lots Avenue, under elevated train - After computer added lighting

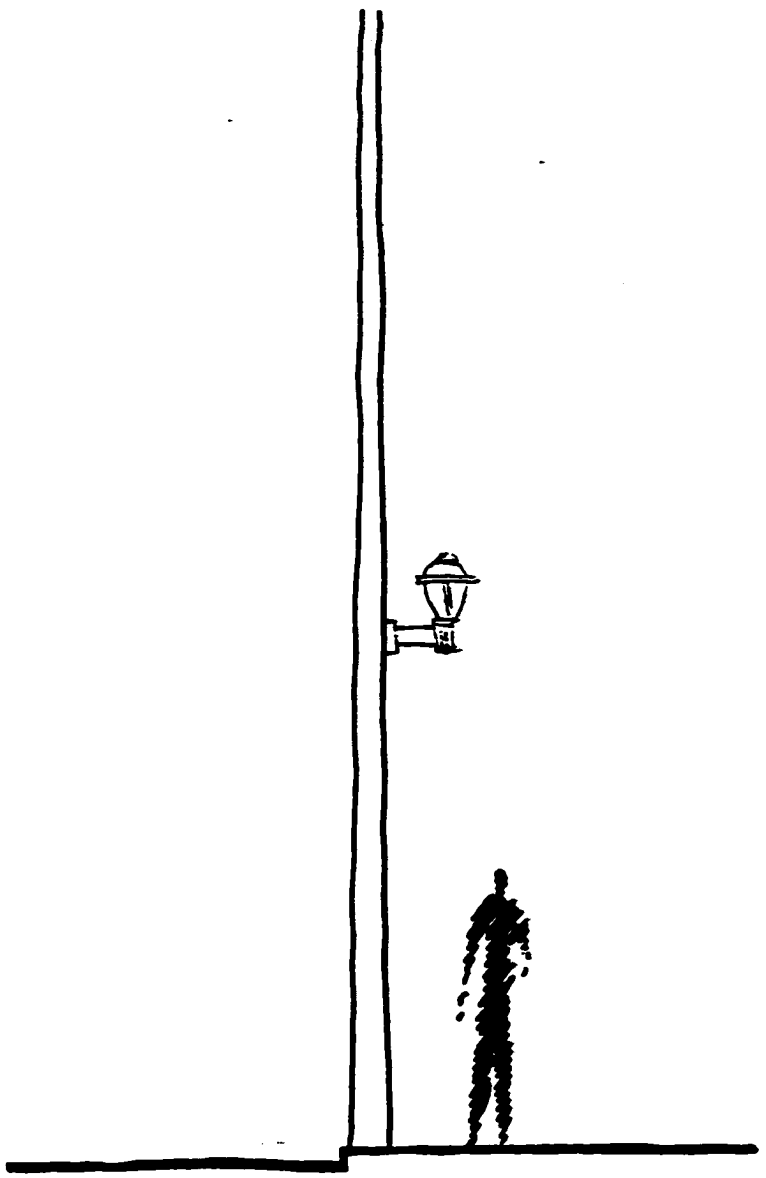
Appendix H: Assault Map of Site



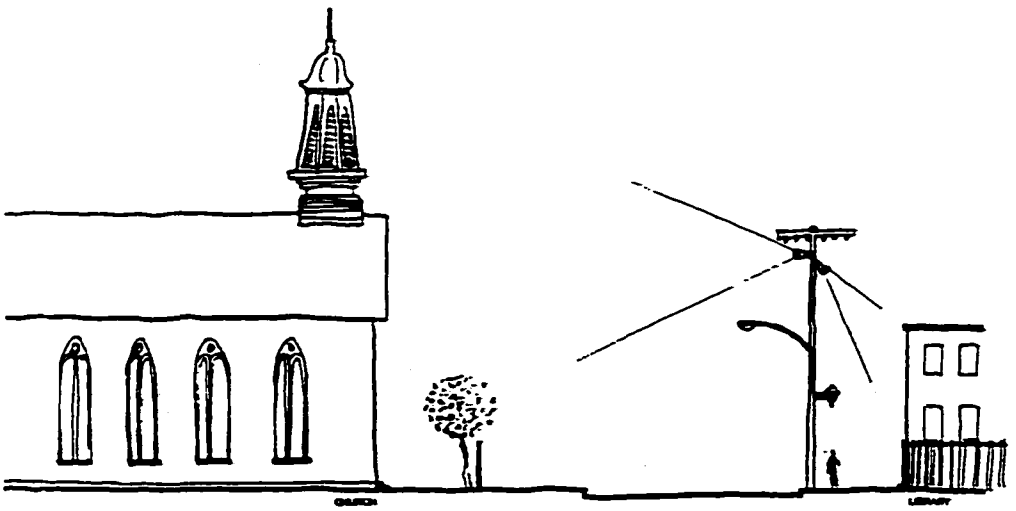
Appendices I: Illustrations and Drawings of the Lighting Plan



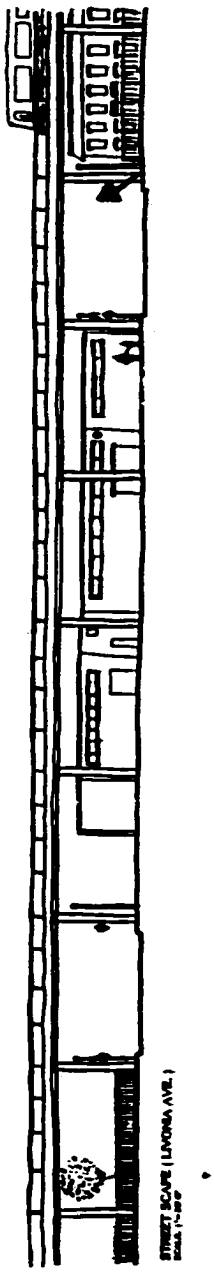
1. **Lighting plan and layout**



2. **Boulevard lantern mounted on existing poles**

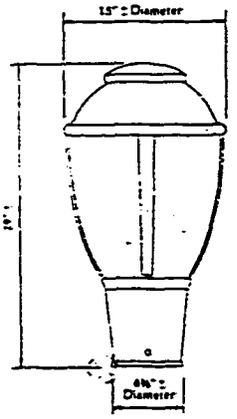


3. **Wash lighting for front of buildings**



4. **Up lighting under elevated train**

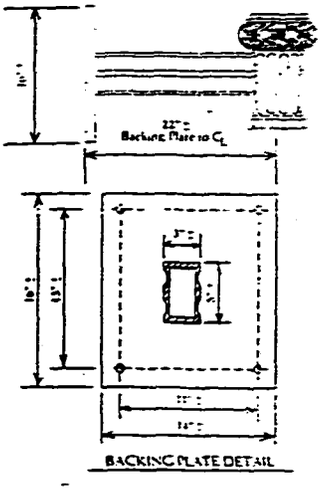
Appendix J: Fixture Specifications



Old New York City Luminaire

LUMINAIRE SPECIFICATIONS

Style:	*Old New York City (2065)*
Height:	*29" ±*
Width:	*15" ±*
Material:	*Cast Aluminum*
Globe/Panels:	*Polycarbonate or Acrylic*
Finish:	*Finish Paint*
Wattage/Lamping:	*Mercury Vapor (100, 175 or 250 Watt)* *High Pressure Sodium (50, 70, 100 or 150 Watt)* *Metal Halide (175 Watt)* *Incandescent*
Distribution:	*Symmetric — Type V* *Asymmetric — Type III*
Voltage:	*120, 208, 240, 277 or 480*
Options:	*Internal Refractor* *Without Struts* *Frosted Globe*



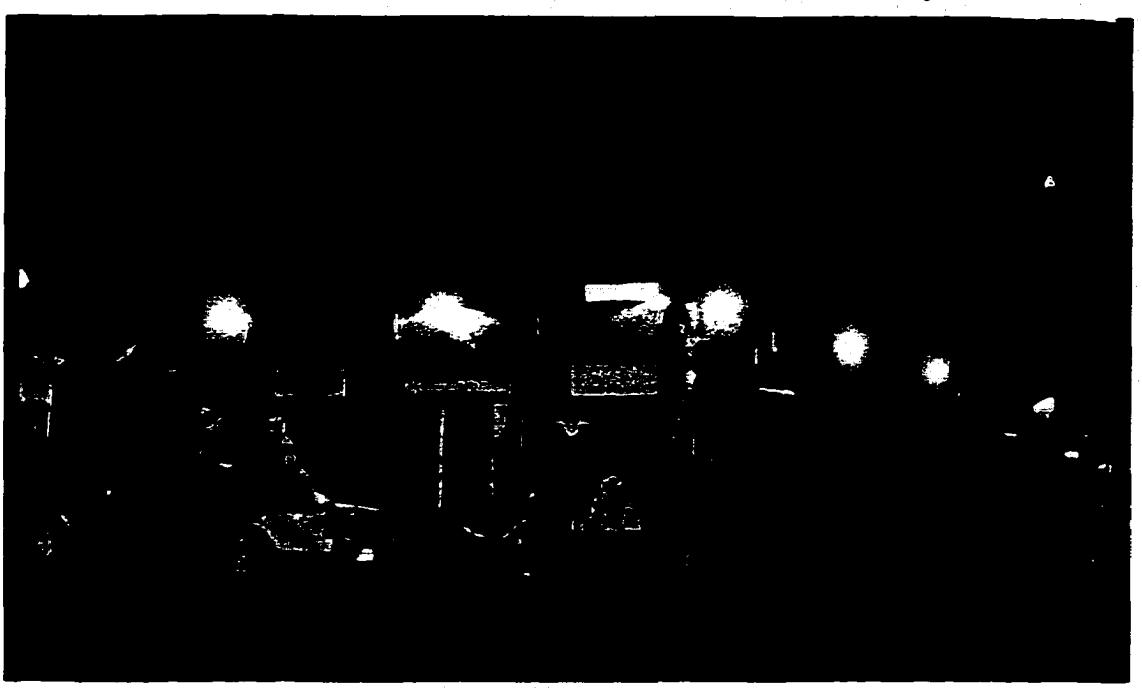
WALL BRACKET SPECIFICATIONS

Style:	*Madison*
Height:	*16" ±*
Width:	*22" ± Backing Plate to C_L of Luminaire*
Material:	*Cast Iron or Cast Aluminum*
Finish:	*Iron Oxide Red — Prime Paint*

Decorative boulevard light

Appendix K: Post-Installation Photographs of the Site

New Lots Dutch reform church and New Lots Library



New Lots Community Center

Appendix L: Street Interview

Introduction:

Hi, my name is Linnaea. I'm with the N.Y.C. Dept. of Transportation. We're researching what it's like to walk at night in this neighborhood. Would you take a few minutes and tell me about your walks?

1. How often will you walk? (circle 1)

(a) more than once a day
(b) once a day
(c) a few times a week
(d) once a week
(e) few times a month

2. How long will you walk? --------hrs. & min.

3.How far will you walk-------miles in blocks?

4. Are you comfortable walking alone after dark or do you prefer to walk with others?

(a) comfortable
(b) with others
(c) explanation

5. The main purpose of your walk is?

(a) Commute (work, school)
(b) Shop (convenience, pharmacy, grocery)
(c) Personal Business (mail, barber, laundry)
(d) Civic (community center, library, religious)
(e) Household (pick-up drop off day care)
(f) Exercise
(g) Eat out
(h) Hang out with friends/people watch
(i) Stroll or play in the street
(j) Other

6. Counting yourself, the number of people in your household is? How many are?

Less than 5 years old--

between 6 and 15
between 14 and 18
65 or older

7. Did you have a car available for your use tonight?

(a) yes (b) no

8. What is the nearest street intersection to you home?

OPEN-ENDED QUESTIONS: USED AFTER LIGHTING INTERVENTION

9. Have you noticed the new street lighting?

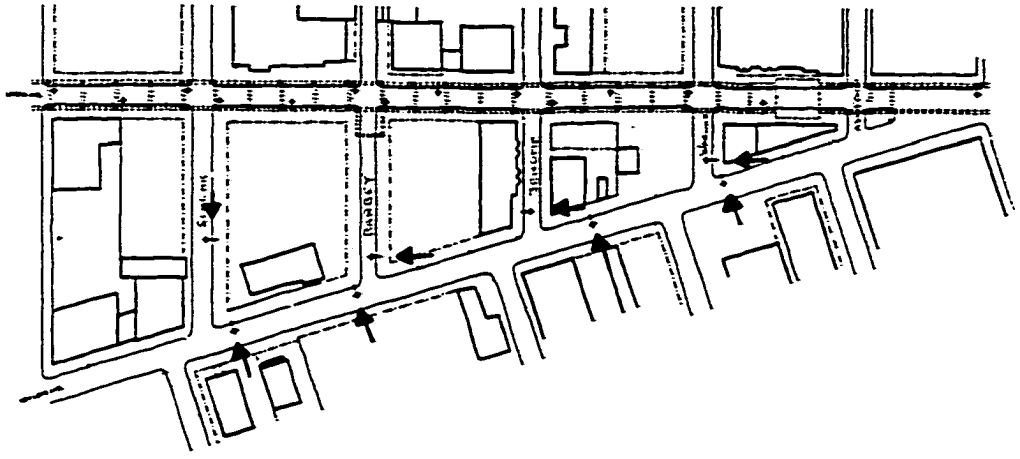
10. What do you think of it?

INTERVIEWER SUPPLIED INFORMATION

Age (a) child (b) teen (c) young adult (d) adult (e) elderly.

Gender (a) female (b) male

Appendix M: Pedestrian Counter Sites



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