STREET LIGHTING AND CRIME:

AN ASSESSMENT OF THE NEAR EASTSIDE OF INDIANAPOLIS

by

Samuel Nunn
Kenna Davis Quinet
and
Joseph Rubleske

September 1996

Publication Number 96-U10

Authors
Samuel Nunn
Kenna Davis Quinet
Joseph B. Rubleske

Research Assistants
Tamara Schmidt
Kelley Gaffney

Editor
Teresa **A.** Bennett

Assistants to the Editor
Jeannine G. Smith

About the Center for Urban Policy and the Environment

The mission of the Center for Urban Policy and the Environment at Indiana University is to work with state and local governments and their associations, neighborhood and community organizations, community leaders, and business and civic organizations throughout the United States to identify issues, analyze options, and develop the capacity to respond to challenges.

The Center's expertise is available to provide research and analysis of policy issues, develop community consensus, offer implementation and public facilitation assistance, and evaluate outcomes and outputs. It is the Center's goal to empower local citizenry and community leaders to enhance the quality of their lives and the decisions that affect them.

The Center's role within the School of Public and Environmental Affairs on the Indiana University-Purdue University Indianapolis (IUPUI) campus is to provide important applied research, publication, and service opportunities to faculty and students, with special emphasis on SPEA's urban and environmental degree programs and policy concentrations. The Center also works with other schools and departments on the IUPUI campus and throughout the state and the United States to enhance expertise in urban and environmental policy.

For more information about the Center or its publications, please contact Teresa A. Bennett:

Center for Urban Policy and the Environment
School of Public and Environmental Affairs
342 North Senate Avenue
Indianapolis, IN 46204-1708
Telephone (317) 261-3000 / FAX (317) 261-3050
tbennett@speanet.iupui.edu

Table of Contents

Executive Summary

In the summer of 1995, the Indianapolis Power and Light Company (IPL) and members of the Near East Side Community Organization Inc. (NESCO) area began an initiative to increase street lighting in a variety of neighborhoods in the Near-Eastside area. Many of these lights have now been in place for periods of up to one year, long enough to potentially present evidence of whether enhanced lighting has had a deterrent effect on crime in the area. During the summer of 1996 the Center for Urban Policy and the Environment at Indiana University was commissioned to conduct an evaluation of the effects of the installation of street lights on crime and disorder in the NESCO area. The research was funded by the Indiana Electric Association.

The evaluation was designed to uncover the impacts, if any, that the installation of added street lighting has had on the number of crimes in a sample of eastside neighborhoods. The study measured crime in terms of calls for service (CFS) to the police.

As a first step, we conducted a review of existing literature and previous research on this topic. This review indicated that the effect of street lighting is mixed: sometimes it is associated with reductions in certain types of crime, while at other times it does not appear to have an impact. Clearly, citizens of a neighborhood feel safer when it is well-illuminated, but empirical impacts on crime are not guaranteed. As a result of the review of previous research, we isolated approximately 60 complaint categories that were theoretically most likely to be affected by enhanced lighting. We created substantively meaningful crime categories that allowed us to measure changes in such categories as violent and property crimes as well as vehicular/traffic crimes.

Second, we conducted field assessments of all of the 100 newly installed lights to verify their existence and location. Based in part on this field inspection, we selected a sample of target sites from the NESCO area. These sites were chosen as a reflection of preliminary analysis showing the feasibility of nature analysis. Because of the small numbers of events (CFS) at the specific installation locations, we aggregated groups of lights into larger, more meaningful spatial areas. Using this approach, we performed analyses on four different multi-block areas of NESCO, three intersections, and two aggregate address groups. Additionally, we selected two areas that had no NESCO lights installed, and used these to introduce an experimental control. The control areas were matched up with two multi-block areas that received enhanced lighting. The control areas would serve as a baseline comparison against which to measure the pre- and post-lighting changes in the target neighborhoods. Altogether, nine target areas and two control areas were analyzed.

Once the selection of target and control areas was complete, data used to measure crime activity were extracted from the Indianapolis Police Department's database of calls for police service. We selected calls for service as our dependent variable rather than arrests as it presents a more valid measure of activity in neighborhoods. The calls for service database were extracted for the specific areas of study, for particular crimes, and only for crimes occurring at night.

Two different approaches were used to assess the impact of lighting. First, we analyzed areas for changes in the raw count (i.e., total calls for service) of CFS before (pre) and after (post) the installation of additional lights. Although the findings of the raw count analysis were mixed, there appeared to be some intriguing impacts associated with enhanced lighting.

Of the nine target areas that received NESCO lighting, six showed evidence of lower CFS volumes after lighting was installed. All three intersections examined showed a reduction in CFS after street ligfats were erected. One of the two multi-address groupings showed a reduction in CFS volume. Results were very mixed, however, for the two multi-block areas that were compared against control areas that did not obtain NESCO lights. In one target area/control area group, CFS volume in the better illuminated neighborhood *increased* while CFS volume in the control area *decreased,* which of course is counter to expectations. The other target area/control area grouping reflected high CFS volumes both before *and* after street lights had been installed in the target area.

A second approach to assess the impact of lighting was a comparative analysis of the average (mean) weekly CFS in the pre-installation and post-installation periods. This was done for the four multi-block areas that received NESCO lights and the two control areas that received no NESCO lights. These findings, too, are mixed, but there is some evidence that street lights are associated with reductions in CFS volume. Two NESCO-lighted areas had a lower mean weekly CFS after installation than before, which is consistent with expectations about the impact of lights. One target area/control area was contrary to expectations: average weekly CFS increased post-installation in the lighted area, but decreased in the less illuminated control area. However, with regard to this area, the more illuminated target area experienced a greater reduction in average CFS for *property* and *miscellaneous* crime than did the control area. Although none of these differences were statistically significant changes, they are, nonetheless, suggestive of the expected deterrent influence of enhanced street lighting.

Overall, the findings of this study are consistent with the mixed results of other previous work on the deterrent potential of lighting. The analysis of the NESCO target areas suggests that enhanced street lighting in particular neighborhoods is sometimes associated with concurrent reductions in reported crime. It is possible that many street lights have a real deterrent effect on *the individual address* but that the spread of positive deterrent effects to other adjacent or near-by parcels may be very limited. This is suggested by the empirical findings that the most clearcut decline in CFS occurred at intersections (all three that were analyzed), less clearcut when examining groupings of different addresses receiving lights (one of the two groups analyzed), and extremely mixed when a group of addresses both with and without new street lights are analyzed together (neither of the two multi-block target areas showed clear decreases).

I. Introduction

Beginning in July 1995, the Indianapolis Power and Light Company (IPL) had joined forces with block clubs and neighborhood organizations in the Near Eastside Community Organization Inc. (NESCO) area in an effort to increase lighting in the area. During the summer of 1996 the Center for Urban Policy and the Environment at Indiana University conducted an evaluation of the effects of the installation of street lights on crime and disorder in the NESCO area. This research was funded through a cooperative effort of all of the power companies throughout the state of Indiana as represented by the Indiana Electric Association (IEA).

The objective of this evaluation was to determine what impact, if any, the installation of street lighting in a sample of eastside neighborhoods has had on the number of crimes as measured by calls for service (CFS). We began by conducting a thorough review of existing literature and previous research on this topic in order to inform our theoretical framework, methodology, and analysis of the impact of lighting on crime. Additionally, we conducted field assessments of all of the 100 newly installed lights to verify their existence and location (see Appendix A).

We selected a sample of target sites from the NESCO area; these sites were chosen as a reflection of preliminary analysis showing the feasibility of future analyses. We found several areas that received additional lighting where there was virtually no crime before or after installation of the lights, thus not allowing for any statistical analysis of impact. Again, because of the small numbers of events (CFS) at the specific installation locations, we aggregated groups of lights into larger, more meaningful spatial areas.

We were able to perform analyses on four different areas of NESCO (areas A-D), three intersections, and two aggregate address groups. Different approaches were used to assess the impact of lighting. First, we analyzed areas, intersections, and groups for changes in the raw count of CFS before (pre) and after (post) the installation of additional lights. We quickly realized that we had, at best, a quasi-experimental design, as we were not looking at areas that had no lights and then a lot of lights, rather a continuum of less to more lighting.

We selected two areas (A and C) to introduce an experimental control area (A2 and C2>—these areas were selected for control group analysis due to the fact they were the largest geographical areas, generally comprising the most CFS. The goal of the experimental control groups was to allow for the assessment of CFS over time in an area adjoining our lighting intervention area, that had similar crime rates, and generally similar socio-demographic characteristics. The control areas had not received additional lighting and therefore would serve as a baseline comparison against which to measure the pre- and post-lighting changes in the target neighborhoods.

Theoretically, a possible strategy would be to examine the possible displacement effects of lighting. Given strong evidence that additional lighting decreased crime in our target areas, we would have hoped to be able to measure the extent to which crime was displaced to adjoining

areas. Based on the level of change measured in our target areas, it would be nonsensical to assess displacement effects.

The data used to measure crime activity was drawn from the Indianapolis Police Department's database. We selected calls for service as our dependent variable rather than arrests as it presents a more valid measure of activity in neighborhoods. From the calls for service run data we created substantively meaningful crime categories (see Appendix B). Our intent was to measure changes in such categories as violent and property crimes as well as vehicular/traffic crimes. Thus, the calls for service database was extracted for the specific areas of study, for particular crimes, and only for crimes occurring at night (the only meaningful time period to use when assessing the impact of lighting).

This study provides an evaluation of the potential impact of additional lighting on crime in urban neighborhoods. The following sections of this report will highlight our findings as well as the obstacles to assessing the impact of lighting separately from the impact of other factors.

II. Review of Literature and Assessment of Issues

Although it is commonly assumed that street lighting deters criminal activity, there are relatively few studies that have scientifically assessed the impact of lighting on crime. Until relatively recently, much of the information concerning the impact of lighting on crime was anecdotal—police, neighborhood organization members, and city planners "felt better" about well-lit neighborhoods.

Theoretically, increased lighting should make areas more visible and thus less attractive to potential offenders. A rational choice model assumes that potential offenders will minimize their risks of apprehension and avoid areas in which the likelihood of identification is higher. Support for this hypothesis would generate findings of decreased CFS after the installation of lighting. Alternatively, unless these potential offenders are afraid of being viewed by residents and police, there could be little deterrent impact of lighting on actual criminal activity (no effect), however, there could still be positive impacts in terms of residents' perceptions of safety. Third, we could find no actual change in offender behavior but still find an increase in CFS from residents after the installation of street lights due to the resident's increased visibility of activity.

According to Evans, et al. (1992),[1] street lighting decreases the incidence of crime and personal harassment while also decreasing peoples' apprehensions about being victimized. Evans found that the level of public confidence, the perception of personal safety at night, and pedestrian traffic flow on the streets and sidewalks all increased with street lighting . Kaplan, et al. (1978),[2] reported that improved street lighting eliminated two of the four intermediate goals of criminal activity, access control strategies and surveillance strategies. This reduces crime in general by making targets more difficult to victimize and enhancing the view of legitimate users of the area.

Some of the effects of street lighting on crime are "crime-specific." In Atlanta (1975)[3] when the city installed new street lights in high crime areas, the number of burglaries diminished. However, no other crime was significantly affected. In a study of the incidence of assault, auto-crime and threats, Painter (1988)[4] tracked these specific crimes six months prior to and six months after increased street lighting. Prior to the installation of lighting, there were 21 incidents and after installation of lighting there were only 3 incidents. Thus, Painter concluded that street lighting reduced the incidence of assault, auto-crime, and threats. He also indicated

---

1 Evans, David J., Fyfe, Nicholas R., Herbert, David T. (1992). Crime, Policing and Place; Essays in Environmental Criminology, Routledge, Chapman and Hall, New York, NY.

2 Kaplan, et al. (1978). Crimg Prevention Thrqugh Environmental Design. Final Report on Commercial Demonstration. Westinghouse Electric Corporation, Arlington, VA.

3 Atlanta, City of (1975). Street Lighting Project: Fin,al Evaluation Report. National Criminal Justice Reference Service. Washington, D.C.

4 Painter, K. (1990). Women's experience and fear of crime and the scope for public lighting as a means of crime prevention. Pape* given to the Leeds City Conference on Crime and Lighting, June 6, 1990.

that the impact of street lighting is much greater on women than it is on men. According to Poyner (1981),[5] the illumination of parking lots is a definite ingredient of success in the reduction of car theft. In a study done by Challinger (1991),[6] the focus was on public telephones placed in daric or quiet areas. When the booth lighting was increased to a level at which the booth was visible and identifiable from 400 meters away, the incidence of vandalism diminished. Other effects of this study included an increase in the use of the previously "dark" phones and increased visibility of the people using them. Challinger concluded that this evidence supported the idea that lighting may make places safer.

Other studies conducted on the effects of street lighting are contradictory to those above. For example, evaluation of the effects of lighting in Kansas City, Wright, et al. (1974),[7] found significant reductions in violent crime and relatively *insignificant* reductions in property crime. Reppetto (1974),[8] compared different levels of street lighting in Boston and reported no correlation between lighting and burglary or robbery. In a study done by Tien, et al. (1977),[9] a review of 40 studies and 15 street lighting programs were analyzed and the results were mixed. Seven studies reported increases in certain categories of crime, three produced increased overall crime levels, and seven found no change in crime. The only definite finding generated by this review was that residents *feel* safer as a result of more street lighting.

At times, some studies attempted to measure the positive effects of street lighting but could not hold one variable constant. Poyner and Webb (1987)[10] did a study intended to reduce the amount of theft from shopping bags in the worst-affected city center markets. They not only increased the lighting by installing a new lighting system, but they also widened the spaces between market stalls in the markets. The result of these two actions *substantially* decreased the amount of theft that occurred in those city center markets. The only problem is that we do not know how much of an impact the increased lighting alone had on the reduction of theft, but we do know that the lighting was a factor in the reduction of theft. Another example of this type of study is a time series analysis done by Griswold (1984)." Focusing on commercial burglary, Griswold concluded that the rates of burglary were reduced by a combination of security surveys

---

5 Poyner, Barry. (1981). Crime Prevention and the Environment: Street Attacks in City Centers. Police Research Bulletin, 37; 10-18.

6 Challinger D. (1991). Less Telephone: How Does It Happen? Security Journal, 2: 11-119.

7 Wright et al. (1974). The Impact of Street Lighting on Crime. University of Michigan, Ann Arbor Michigan.

8 Reppetto, T.A. (1974). Residential Crime. Ballinger, Cambridge, Ma.

9 Tien, J.M., Odonnell, V.F., Barnet, A., Mirchandani, Pitu B. (1977). Street Lighting Projects: National Evaluation Program - Phase I Summary Report. National Institute of Law Enforcement and Criminal Justice, Washington, D.C.

10 Poyner, B. and Webb, B. (1987). Successful Crime Prevention: Case Studies. The Tavistock Institute of Human Relations, London, England.

11 Griswold, D.B. (1984). Crime Prevention and Commercial Burglary: A Time Series Analysis. Journal of Justice^ 12:493-501.

and increased street lighting. Although he admitted that both may be needed to produce the same success in crime reduction, he did state "The public believes in the prevention value of good lighting."

A review of previous literature finds mixed results concerning the impact of lighting on actual crime, in part due to a number of potential contaminating effects on the impact of lighting. First of all, many crimes, particularly domestic crimes occur inside the home and would obviously not be deterred by lighting. One could hypothesize that, unless lighting is actually attached to the particular domicile in question, the impact of deterring rapes, burglaries, vandalisms, etc. may be negligible at best. Thus, assessments of the impact of lighting should create crime categories that are substantively meaningful to the question at hand.

Obviously, enhanced lighting should only function to deter crimes that would have occurred after dark, unless offenders choose to conduct their daytime activities at the same place and the undesirability of a well-lit location at night would also displace possible similar activities during the day.

Additionally, in many areas where residents request additional lighting, this request may be the result of an increase in crime in the area and thus 1) there may be criminogenic elements amidst that are much more powerful than the impact of lighting and 2) in addition to requests for lighting, residents may also request increased police services. In the NESCO area during the same period that street lights were being installed there was a variety of different Indianapolis Police Department (IPD) initiatives in this area that increased police presence and dramatically increased the likelihood of arrest for traffic, gun, and drug offenses. In our analysis, the areas and dates of these intervention programs generally were identified and extracted from the data base to avoid contamination effects. In addition, we carefully watched these categories after the intervention dates and provide a separate analysis of these trends.

One other data issue to consider is how calls for service are generated within the Indianapolis Police Department. Calls for service are almost entirely generated by citizens—approximately 95 percent of police work is reactive. Thus, a small number of calls for service logged into the system are generated by an officer who sees a crime in progress, etc. The complicating factor in regards to the generation of calls for service (CFS) is not so much the "who" but the "where." Calls may originate from the victims* or witnesses' residences and if they do not have the exact location of the incident, it is their address that is logged into the system. Thus, all CFS do not necessarily reflect the exact location of the incident. Also, many residents do not have phones and use convenience store phones located near then-residence—unless the caller gives the dispatcher the location of the incident, the incident will appear to have been at the place of the call rather than the offense.

As previously noted, a more consistent finding concerning the impact of lighting on crime is that residents feel safer with increased lighting. In this regard, we are fortunate to have a measure of resident perception of safety at night in their neighborhoods both before and after the installation of many of the NESCO/IPL lights. The Center for Urban Policy and the Environment has been monitoring perception of public safety in Indianapolis neighborhoods

since the summer of 1995. From this information we can assess how safe residents feel about walking alone in their neighborhood at night in police beats covering the NESCO area (B61, 62, and 63). The first survey was conducted in early summer 1995 and the most recent survey was conducted in August 1996. In police beats B61and 63 there has been no statistically significant changes in the proportion of people reporting feeling safe at night—approximately 40 percent of residents feel safe walking alone at night. However, in B62, there was a significant increase in the percentage of residents who felt safe from 38 to 46 percent. Although we are unable to isolate these findings in terms of the exact location of street lights, there seems to have been at least a stable and in the other case an increased perception of safety at night in the NESCO area.

III. Methodology and Area Descriptions

To examine the effects of additional street lights on CFS, Center staff first required a mapped "plot" of NESCO-leased street lights throughout the NESCO jurisdiction that illustrated light locations. Upon request from the Center, IMAGIS[12] created an electronic, GIS-based map file of the NESCO jurisdiction that contained streets, interstates, railroads, hydrographic features (e.g., rivers and creeks), and, most importantly, parcels or lots with street addresses that could be matched to a list of installed NESCO street lights. The POLIS Center then coordinated efforts with the Indianapolis Department of Metropolitan Development (IDMD) to produce a hard-copy, 35" x 44" printout of the electronic file. Referring to a list of NESCO street lights, organized by address, Center staff then plotted all NESCO lights on this "master" map. After a visual assessment of the map, Center staff determined that while some NESCO lights are widely dispersed throughout the jurisdiction, many NESCO lights are concentrated within relatively small (2-4 block) geographic areas. A decision was then made to identity and isolate a small number of these subareas or "study areas" as spatial units of analysis from which data could be collected.

Initially, four study areas—A, B, C, and D—were formed around agglomerations of NESCO street lights. Areas A and B, separated by only two blocks, are linear "corridors," each consisting of one street bounded at the north and south. Area A is two blocks long, while area B is only one block long. Area C, unlike areas A and B, consists of one north-south block and two east-west blocks. Area D is bounded by five streets and encompasses more area than A, B, or C.

Seven additional study areas were then formed. Two of these—areas A2 and C2—served as "control" groups for areas A and C so that changes in CFS could be examined in areas without NESCO lights, thereby facilitating comparative analyses. Attempts were made to control for other factors such as demographic differences (Areas A and C are located only two blocks from their control groups) and parcel density (according to the master map, areas A and C contain the same number of parcels as their control groups).

Three additional study areas each consisted of a single intersection (INT1, INT2, and INT3). Two final study areas were comprised of groups of individual addresses—each reportedly containing a NESCO light—that were aggregated according to their installation dates. The study area named ADDRESS 1 includes 12 addresses (and 13 lights) and all NESCO lights installed between September 18 and 20, 1995. ADDRESS2 includes 11 addresses (and 11 lights) and all NESCO lights installed between July 25 and August 24, 1995. Altogether, 11 study areas were identified and isolated for analysis. Appendices C1-C4 present excerpted reproductions of the master map, and illustrate the location and spatial configuration of study areas A (and A2), B, C (and C2), and D. NESCO street lights are represented by red circles or "dots." Appendix C5, also reproduced from the master map, depicts intersection study areas INT1, INT2, and INT3.

[12] Indianapolis Mapping and Geographic Infrastructure System

Description of Study Areas

Upon defining study areas, field surveys were made by Center staff to confirm the existence of all documented street lights, including NESCO lights, and to identify any street lights not yet documented. Indianapolis Power & Light (IPL) provided the Center with two key resources: a list of NESCO lights and their accompanying addresses and a set of parcel-based maps, updated January 1996, illustrating all non-alley street lights throughout Center Township (which includes the NESCO jurisdiction).

After canvassing each study area (including all individual addresses in the grouped ADDRESS1 and ADDRESS2 study areas), Center staff were not able to find all NESCO lights: of the 50 NESCO lights (at 48 addresses) presumably located within study areas, only 37 were found. Center staff reported their findings to IPL staff during a September 5, 1996 meeting. IPL staff then conducted field surveys in an attempt to locate the 13 unconfirmed NESCO lights. Referring to codes assigned to and labeled on each street light, IPL staff were able to confirm their existence, acknowledging that they are located either behind houses (Center staff did not canvass study area alleyways) or at different addresses (yet presumably within the same study area).

Upon locating all NESCO lights and all non-NESCO street lights plotted on IPL-produced maps, Center staff were able to quantify the total number of street lights located within each study area. The following table summarizes the results of the study area canvass.[13] The total number of lights in each study area does *not* include non-NESCO lights in alleyways.

Study Area	Number of NESCO Street Lights	Number of Other (Non-NESCO) Street Lights	Total Number of Street Lights
A	6	3	9
B	3	7*	10
C	6	8	14
D	7	10	17
A2 (control)	0	6	6
C2 (control)	0	16*	16
INTERSECTION 1	2	0	2
INTERSECTION	1	0	1
INTERSECTIONS	1	0	1
ADDRESS 1	13	0	13
ADDRESS2	H	0	11
Totals	50	50	100

* Area B contains a restaurant in its northwest corner that has two parking lot lights. Area C2 contains a used car dealer in its southeast corner that has 11 parking lot lights.

[13] In areas C, C2, and D street lights located on the outer portion of study area boundaries were included. We assumed that persons residing in the inner portion of these study area boundaries would be affected by street lights located across the street.

Altogether, the 11 study areas contain 100 street lights, 50 of which are leased by NESCO. Of Areas A through D (including control groups), only Area A contains more NESCO lights than non-NESCO lights. Excluding intersections, Control Area A2 has the fewest total street lights (6). Area D, which comprises the greatest total area relative to other study areas, contains the most street lights (17).

Data Collection and Analysis

While field surveys of study areas were being conducted, Center staff obtained CFS data for each of the 11 study areas from the Indianapolis Police Department's (IPD) RUNINFO database. IPD CFS data provide analysts with information that can be used to examine police call volume at the neighborhood level within the IPD jurisdiction. To generate CFS data, the RUNINFO programmer utilized by the Center specified each study area's geographic boundaries and relevant time frames. The 11 original datasets (corresponding to the 11 study areas) included numerous information, much of which was eliminated from subsequent analysis.[14]

Each of the 11 datasets collected from RUNINFO was converted into a spreadsheet-based format. From here, Center staff performed the following tasks:

- Complaint types not relevant to the study were removed. A list of retained complaint types is provided in Appendix B.
- Complaints that occurred during daylight hours were removed. Sunrise and sunset estimates were obtained from WTHR-TV meteorological personnel.
- Duplicated complaints were removed. The need for this task stemmed from data input methods of IPD: each on-scene officer/unit is required to report the complaint.

Next, each dataset was reformatted for use with statistical software.[15] Four additional variables were created to support statistical analyses:

1. The WEEKSEQ variable reflects the time frame in which the data were collected and assigns numeric values to the weeks (in sequence) in which complaints occurred. For example, CFS data from December 6, 1994, to June 30, 1996, were compiled for Area A. The week of December 6-12, the first week of this dataset, was assigned a value of one (1) for this variable. Similarly, the week of June 24-30, the last week of this dataset, was

[14] IPD's RUNINFO database includes the following information for each complaint or record: complaint type (e.g., holdup in progress; residential burglary; domestic disturbance); patrol car number; number of patrol cars at scene; number of minutes at scene; address and street at which the complaint occurred; date of complaint; time of arrival at scene; time of departure at scene; beat number; quadrant; north-south and east-west geographical coordinates of complaint location; complaint number; complaint description (where applicable); and whether or not a report was filed (yes or no).

[15] Center Staff conducted all statistical analyses with SPSS for Windows (release 5.0.1a).

assigned a value of 82 (as this dataset contains 82 weeks). The WEEKSEQ variable served as a means of distinguishing between pre- and post- installation periods, which required equal numbers of weeks.

2. Based on NESCO street light installation dates, the LIGHTING variable assigns each complaint to one of three groups: pre-installation, installation period, or post-installation. This variable allowed for a comparison of CFS volumes before and after NESCO lights were installed in each study area. Installation periods were excluded from statistical analysis.[16] Despite the absence of NESCO lights, this method also applied to control groups A2 and C2, thus creating uniform time frames for comparative analyses.

3. The COMPCAT variable classifies each of the 66 complaint types into one of 11 complaint categories, thereby simplifying the analysis of CFS data and the subsequent presentation of results. The 11 complaint categories include accidents, burglaries, disturbances, drug-related offenses, gun-related offenses, surveillance and other miscellaneous offenses, crimes against persons, robberies, traffic violations, vandalism, and vehicular offenses.

4. The PLACE variable indicates whether a particular complaint occurred inside or outside the study area in question. The need for this variable is the result of a database idiosyncrasy: when specifying a geographic boundary of 200 N, for example, IPD's RUNINFO database provides all complaints up to and including 299 N. In addition, RUNINFO includes complaints that occur at intersections from one to two blocks away. Center staff referred to the address-based master map to identify and exclude all complaints that occurred outside study area boundaries. ADDRESS 1, ADDRESS2, and all intersection study areas did not require a PLACE variable, as all complaints contained within these datasets, by definition, occurred within the study areas.

[16] For example, NESCO lights in Area A were installed between October 6 and December 5, 1995. Yet to ensure that prc- and post- installation periods consisted of equal numbers of weeks, the installation period was modified, and all complaints occurring between July 1 and December 5, 1995, were excluded.

IV. Raw Count Analysis, NESCO Street Lights

Area A and Control Area A2

Area A is comprised of two linear blocks on Eastern Avenue from 10th Street south to St. Clair Street. Six NESCO lights were installed in this segment between July 1, 1995, and December 5, 1995. To examine what crime was being reported in another area that did not receive NESCO lights, a control area was established that was similar to Area A but did not have enhanced street lighting. Control Area A2 is located one block to the west on Tacoma Avenue from 10th Street south to St. Clair Street. Low volumes of CFS indicate both areas exhibit low crime levels, which makes it difficult to discern any clear impacts from enhanced lighting. Comparative raw counts of calls for service are reported in Table 1.

Area A had 10 calls for service before NESCO lights, but the CFS volume increased to 21 calls after installation. Most of this increase was the result of the disturbance category, which doubled from 7 to 14 CFS. Excluding the disturbance category results in a change of 3 CFS to 7 CFS from the pre-installation to the post-installation period.

During the same periods, CFS volume in control Area A2 declined from 20 to 16, which is also accounted for largely by a decline in the 'disturbance' category. If disturbances are excluded, Area A2 exhibited a slightly higher volume of CFS than Area A, with 8 CFS and 10 CFS in the pre- and post-installation periods, respectively.

Based on the raw counts of CFS in Area A and A2, the NESCO lighting installation in the Eastern Avenue street segment does not appear to have had a noticeable effect on CFS volume. In any event, the very low volumes of reported CFS indicate that both these areas exhibited low crime levels in the first place, which makes it difficult to discern any clear impacts from enhanced lighting.

Area B

Area B is comprised of a single block on Eastern Avenue from Michigan Avenue south to New York Avenue. Three NESCO lights were installed in this segment between July 1, 1995, and December 5, 1995, No control area was used as a comparison. Comparative raw counts of calls for service in Area B are reported in Table 2.

Total calls for service dropped from 33 in the pre-installation period to 24 after the NESCO lights were installed. Most of this decline (5 CFS) was in the disturbance category. While there were no or only minor changes in most of the other CFS categories, the vandalism category dropped from 3 CFS before the NESCO lights to no CFS after installation.

Based on the raw counts of CFS in Area B, the NESCO lighting installation in this Eastern Avenue street segment might have had a slight effect on CFS volume, due to the reduction in disturbance calls and vandalism.

Table 1
Raw Counts **of Calls for** Service (CFS)

Area A (NESCO Lighting)

Complaint Categories	Pre-Installation	Post-Installation	**Total**
Accidental	0	1	**1**
Burglary	0	2	***2***
Disturbance	7	14	**21**
Drugs	0	0	0
Gun	**1**	2	**3**
Surveillance	**2**	0	**2**
Person	**0**	0	**0**
Robbery	**0**	**1**	**1**
Traffic	**0**	**1**	**1**
Vandalism	**0**	0	**0**
Vehicular	**0**	0	**0**
Total	**10**	21	**31**

Area A2 (Control) (No NESCO Lighting)

Complaint Categories	**Pre-Installation**	**Post-Installation**	Total
Accidental	0	**1**	1
Burglary	0	**0**	0
Disturbance	12	**6**	18
Drugs	0	**0**	0
Gun	2	**2**	4
Surveillance	1	**2**	3
Person	2	**0**	2
Robbery	0	**1**	1
Traffic	3	4	7
Vandalism	0	0	0
Vehicular	0	**0**	0
Total	20	**16**	36

Pre-Installation = 12-6-94 to 6-30-94. Post-Installation = 12-6-95 to 6-30-96. Excludes addresses outside area. Does not exclude IPD intervention dates, per determination that the majority of intervention CFSs occurred during installation period (already excluded).

Table 2
Raw Counts of Calls for Service (CFS)

Area B (NESCO Lighting)

Complaint Categories	**Pre-Installation**	Post-Installation	Total
Accidental	**1**	0	1
Burglary	**4**	4	8
Disturbance	**17**	12	29
Drugs	**0**	1	1
Gun	**1**	1	2
Surveillance	**1**	0	1
Person	**2**	2	4
Robbery	**0**	0	0
Traffic	**3**	4	7
Vandalism	3	0	3
Vehicular	**1**	0	1
Total	**33**	24	57

Pre-Installation = 12-6-94 to 6-30-95. Post-Installation = 12-6-95 to 6-30-96. Excludes addresses outside study area. Does not exclude **IPD** intervention dates, per determination that the majority of intervention CFSs occurred during installation period (already excluded).

Area C and Control Area C2

Area C is comprised of a multi-block area bounded on the north by Ohio Street, on the east by Hendricks Place, on the south by Washington Street, and on the west by Randolph Street. Six NESCO lights were installed in this multi-block area between July 1, 1995, and September 1, 1995. Control Area C2 is located approximately one-and-one-half blocks to the east in an area bounded on the north by the mid-block addresses (approximately 217 north) between Jefferson and Beville Avenues, on the east by Beville Avenue, on the south by Washington Street, and on the west by Jefferson Avenue. The mid-block northern boundary of the control area was necessary to insure a similar number of parcels in Areas C and C2, Comparative raw counts of calls for service are reported in Table 3.

Observations about Areas C and C2 are considered in two ways because the **IPD** was engaged in special public safety interventions during some of the time periods under analysis here. Therefore, one analysis of C and C2 ignores any possible effects of the special interventions, while the second analysis specifically excludes the dates of the interventions.

Table 3
Raw Counts of Calls for Service (CFS)

Area C (NESCO Lighting)

Complaint Categories	Pre-Installation	Post-Installation	Total
Accidental	4	4	8
Burglary	14	14	28
Disturbance	92	95	187
Drugs	2	3	5
Gun	9	24	33
Surveillance	12	12	24
Person	9	4	13
Robbery	5	3	8
Traffic	9	49	58
Vandalism	3	1	4
Vehicular	3	1	4
Total	162	210	372

Area C2 (Control) (No NESCO Lighting)

Complaint Categories	Pre-Installation	Post-Installation	Total
Accidental	0	1	1
Burglary	4	3	7
Disturbance	21	35	56
Drugs	0	0	0
Gun	- 1	5	6
Surveillance	6	**4**	10
Person	2	3	5
Robbery	0	2	2
Traffic	7	**24**	31
Vandalism	0	**0**	0
Vehicular	1	**1**	2
Total	42	**78**	120

Pre-lnstallation = 9-2-94 to 6-30-95. Post-Installation = 9-2-95 to 6-30-96.
Excludes address outside study area. IPD intervention dates are included.

Including IPD Intervention Dates (see Table 3)

Area C exhibited a high volume of CFS in both the pre-installation and post-installation periods. Total CFS increased from 162 to 210 (48 CFS or +29.6 percent). However, two CFS categories, traffic and guns, accounted for all of this change, increasing by 53 CFS between the pre-lighting and post-lighting periods. As shown below, these were some of the targets of the special IPD initiatives. If the traffic and gun categories are *excluded,* the total CFS in Area C declined slightly between the pre- and post-lighting periods, from 144 to 137 CFS.

.Control Area C2 exhibited a smaller volume of CFS than Area C, but it also showed an increase in call volume between the two periods (36 CFS or +85.7 percent). This was a considerably greater increase than in Area C. As in Area C, much of the pre-to-post change is explained by traffic and guns, which accounted for an increase of 21 CFS. If these two categories are excluded from the control area counts, the CFS volume in Area C2 still shows an increase from 34 to 49 calls. Thus, in terms of total CFS, if traffic and guns are excluded, control Area C2 *increased* by 44 percent from the pre-installation to the post-installation period, while CFS volume in Area C (with additional NESCO lighting) *decreased* by 4.9 percent.

In comparing the raw counts of CFS in Areas C and C2, enhanced street lighting may be having some effect, as reflected in the different volumes and percentage changes in CFS, but because of the confounding effects of the concurrent IPD public safety initiatives it cannot be concluded that the lights caused such changes.

Excluding IPD Intervention Dates

The IPD interventions targeted all sorts of crime in addition to traffic and gun violations, so other complaint categories could have been affected due to the increased police presence within the beats during the intervention efforts. This can mask the effects, if any, of enhanced street lighting. Accordingly, another method of accounting for special police initiatives is simply to exclude the dates of the initiatives from the analysis. The following observations are based on an analysis of Areas C and C2 *without* the CFS that were made during the dates of IPD interventions in the relevant police beats. Please note that the same weeks were excluded in the pre-installation period in order to maintain equal numbers of weeks in the pre- and post- periods. These are shown in Table 4.

When the CFS from the intervention dates are excluded, the remaining CFS volume in Area C still increased by nearly one-third (+32.4 percent) from the pre-installation to the post-lighting period. This is compared to just a 20.7 percent increase (from 29 to 35 CFS) between the same two periods in control Area C2,

However, traffic and guns still reflect in Area C a substantial part of the increase (35 more CFS for these two offenses during the post-lighting period). If the traffic and gun categories are excluded from the pre- and post-lighting periods in Areas C and C2, the CFS

volume in Area C remained stable (95 CFS in each period), while the volume of CFS in control Area C2 increases from 25 to 30 between the two periods.

Thus, *if the* enhanced NESCO lighting installed in Area C actually influenced the volume of CFS, the impact is slight, and only in comparison to control Area C2.

Table 4
Raw Counts of Calls for Service (CFS)

Area C (NESCO Lighting)

Complaint Categories	Pre-InstaUation	Post-Installation	Total
Accidental	**3**	2	5
Burglary	**11**	12	23
Disturbance	**58**	63	121
Drugs	**2**	3	5
Gun	**8**	18	26
Surveillance	**8**	10	18
Person	**6**	2	8
Robbery	**3**	I	4
Traffic	**5**	30	35
Vandalism	**3**	1	4
Vehicular	**1**	1	2
Total	108	143	251

Area C2 (Control) (NESCO Lighting)

Complaint Categories	**Pre-Installation**	Post-Installation	Total
Accidental	0	1	1
Burglary	3	3	6
Disturbance	15	21	36
Drugs	0	0	0
Gun	1	2	3
Surveillance	5	0	5
Person	**2**	2	4
Robbery	**0**	2	2
Traffic	**3**	3	6
Vandalism	**0**	0	0
Vehicular	**0**	1	1
Total "1	**29**	35	64

Pre-Installation = 9-2-94 to 6-30-94. Post-Installation = 9-2-95 to 6-30-96.
Excludes addresses outside study area. IPD intervention dates are excluded.

Area D

Area D is comprised of a multi-block area formed by the intersections of Nowland Avenue and Newman Avenue on the northwest, Commerce Street and Nowland Avenue on the northeast, 12th Street and Sterling Avenue on the southeast, and 12th Street and Newman Avenue on the southwest. Seven NESCO lights were installed in this multi-block area between July 1, 1995, and November 20, 1995. Area D is examined by itself, without another control area. Comparative raw counts of calls for service are reported in Table 5.

Observations about Areas D are also considered in two ways because the IPD was engaged in special public safety interventions during some of the time periods under analysis here. Therefore, one analysis of D ignores any possible effects of the special interventions, while the second analysis specifically excludes the dates of the interventions.

Including IPD Intervention Dates

Area D showed a reduction in CFS volume (47 to 39 CFS), from the pre-lighting to the post-lighting period. This reflects a decrease of 17 percent in total CFS volume. These reductions occurred in the burglary (8 to 5 CFS) and disturbance (25 to 17 CFS) categories, both of which might be expected to decline if street lighting is enhanced. Another complaint area likely to be reduced by more street lights is vandalism, which indeed declined from 2 CFS in the pre-installation period to no reported incidents after additional NESCO lighting was installed.

Excluding IPD Intervention Dates

IPD intervention activity occurred within Beat 63, which includes all of Area D, between May 1, 1996, and June 30, 1996. These dates can be excluded on the basis that such initiatives will confuse identification of possible lighting impacts; these dates are also eliminated in the pre-lighting period in order to equalize the number of dates in the pre-installation and post-installation periods.

When this is done, a reduction in the CFS volume of Area D still is measurable in the post-lighting period. Total CFS falls from 33 prior to the NESCO lighting additions, to 25 after lights are installed. Most of the decline is explained by a reduction in the number of reported disturbances, from 17 to 11 CFS. In addition, the burglary category dropped by 50 percent (6 to 3 CFS) after the NESCO lights were installed.

Thus, based on the raw counts, Area D offers some evidence that a substantial increase in street lights could be associated with a reduction in the total number of calls for service.

Table 5
Raw Counts of Calls for Service (CFS)

Area D* (NESCO Lighting)

Complaint Categories	Pre-Installation	Post-Installation	Total
Accidental	1	2	**3**
Burglary	8	5	**13**
Disturbance	25	17	**42**
Drugs	0	0	**0**
Gun	3	5	**8**
Surveillance	3	2	**5**
Person	**1**	5	**6**
Robbery	1	0	**1**
Traffic	2	3	**5**
Vandalism	2	0	**2**
Vehicular	**1**	0	**1**
Total	47	39	**86**

Area D (NESCO Lighting)**

Complaint Categories	**Pre-Installation**	Post-Installation	**Total**
Accidental	1	2	3
Burglary	6	3	9
Disturbance	17	11	28
Drugs	0	0	0
Gun	2	1	3
Surveillance	2	2	4
Person	0	3	3
Robbery	1	0	**1**
Traffic	2	3	5
Vandalism	1	0	1
Vehicular	1	0	1
Total	33	25	58

Pre-Installation = 11-21-94 to 6-30-95. Post-Installation = 11-21-95 to 6-30-96. Excludes addresses outside study area.
***IPD intervention dates are included.**
****IPD intervention dates are excluded.**

Individual Address Groupings

Another approach to measuring the possible impact of enhanced lighting is to take individual addresses that installed a NESCO light, and examine the CFS volume for each address prior to and after installation of the new lights. Two sets of addresses were examined in this matter: one group of 12 addresses, and another group of 11 addresses. As with the previous areas, two time periods (before and after the NESCO lights) are examined. One problem with this approach, as shown below, is the extremely low volumes of CFS reported for these addresses in either period. Because of this low volume, we are not presenting separate tables for the address groupings and are instead simply explaining the basic findings.

ADDRESS1. This grouping of 12 addresses reported six CFS incidents before lights were installed, and no incidents afterwards. For these addresses, it is interesting that all three categories of CFS that make up the 6 incidents (1 burglary, 3 disturbances, and 2 acts of vandalism) are clearly the types of crime that enhanced lighting is designed to stop. This offers some evidence that, for individual addresses at least, enhanced street lighting can be associated with a reduction in calls for service *at that particular address.*

ADDRESS2. This grouping of 11 addresses that installed NESCO lights presents a similar situation, once the existence of a disturbance "hot-spot" (i.e., an address that has an extraordinarily high level of reported criminal activity) is recognized. The raw count shows CFS volume increased from 2 to 13 after lights were installed. However, the entire increase is explained by the disturbance CFS in the post-lighting period. But out of the 11 disturbances, 10 of them are at a single address, and all but one of the incidents are *domestic* disturbances. Thus, if the disturbance hot spot at that address is eliminated, the total reported CFS volume for ADDRESS2 only increased from 2 to 3.

Intersections

One final grouping of street-light enhancements was the analysis of three separate intersections that had NESCO lights installed. As with all the other target areas, a pre-installation and a post-installation period was defined for each intersection, and an analysis of the raw counts of total calls for service was performed. As noted below, each of the three intersections exhibited a *decline* in total CFS, although the extremely small number of incidents (only 23 CFS for all three intersections throughout a period encompassing *80 weeks)* prevents any generalized conclusions about the deterrent effects of intersection lighting enhancements.

(Because of the small number of CFS, no tables are used to present our findings on intersections. Instead, a narrative format is used.) All three intersections reduced total CFS after the NESCO street lights were installed. One dropped from 5 CFS to 1; another from 5 CFS to 2; and the third from 6 CFS to 4 CFS in the post-installation period. These data provide some additional evidence that the NESCO lights may be associated with a drop in CFS, in particular at intersections.

VI. Analysis of Average Weekly Calls for Service, NESCO Street Lights

Another way of searching for the potential effects of enhanced lighting is to examine changes in the *average weekly calls for service* (CFS) before and after the installation of NESCO street lights. The traditional way this is done is to test for a "significant statistical" difference between the pre-installation average weekly CFS and the post-installation average weekly CFS. Statistical testing is appropriate because there is a wide variation in mean (average) weekly CFS in the target and control areas under analysis. Hence, differences between the average CFS may be part of the normal variation in crime reporting from week to week. A statistical test known as an F-ratio can tell us whether the differences in mean CFS between the pre- and post-installation periods is simply due to chance (i.e., part of the routine weekly variation of crime reporting) or instead due to a change that is greater than you would expect to see based on average weekly variation in CFS.

In reviewing these findings, two considerations should be kept in mind. First, these data reflect the actual changes in mean weekly calls for service after NESCO street lights are installed. These are real changes in the mean rate, based on the universe of CFS for each area during the pre-installation and post-installation periods. Second, the use of statistical testing such as the F-ratio usually pre-supposes a *random sample* was used to generate the units of analysis, and that users of the analysis wish to generalize to a broader population of units similar to the random sample. **No such generalization can be made here because the target areas and the time series of data used for the analysis were not random, and cannot be used as a basis for conclusions about the impact of street lights in other areas not examined in this study.** Therefore, the F-ratio results are reported here to give users of this report an idea about the relative magnitude of changes in the four main target areas only (Areas A, B, C, and D), rather than as a basis for drawing inferences about other neighborhood lighting initiatives.

Average weekly CFS in the pre-installation period and post-installation period are analyzed for Areas A (and A2), B, C (and C2), and D in two ways. First, all crime categories are grouped together to obtain one single weekly mean CFS, and we determine whether a significant statistical change occurred after NESCO street lights were installed. Following this, we examine whether changes in certain broad categories of CFS were associated with enhanced street lighting. To do this, total CFS is broken down into three categories: (a) violent (i.e., robberies, crimes against persons, and gun violations); (b) property (i.e., vandalism, burglary, and vehicular), and (c) miscellaneous (i.e., miscellaneous surveillance, accidents, disturbances, and traffic violations). Pre- and post-installation periods for these categories are then analyzed. Both sets of analyses (total CFS, and CFS by category) are shown in Tables 6 through 13.

Area A: Changes in Average Weekly CFS

Area A received NESCO street light additions, while Control Area A2 did not. These two areas exhibit some difference in their mean weekly CFS for all crime categories, but no significant differences when CFS are examined in terms of three broad crime categories. Tables 6 and 7 report the findings for Area A and Control Area A2.

In Area A, which had NESCO lights installed, average weekly CFS doubled, from 0.35 CFS before enhanced lighting to 0.72 after the installation of lights (Table 6). This was a significant statistical change. Control Area A2 experienced a statistically insignificant decline from 0.69 to 0.55 weekly CFS.

After NESCO lights were installed in Area A, all three broad categories of crime (violent, property, miscellaneous) increased, but all the changes were within the average weekly variation in CFS (see Table 7). There were no statistically significant changes. Likewise, Control Area A2 experienced slight, but statistically insignificant, reductions in violent, property, and miscellaneous categories of CFS.

Table 6
Average Weekly Calls for Service (CFS)

	Pre-Installation	Post-Installation	F-Ratio
Area A (NESCO Lights) (sd)	.35 (•55) n=29	.72 (.80) n=29	4.43*
Area A2 (No NESCO Lights) (sd)	.69 (.76) n=29	.55 (•83) n=29	.44 ns
F-Ratio	3.90*	.65 ns	

Note:
sd = standard deviation
n = number of weeks
* = significant at .05 level
ns = not significant

Table 7
Average Weekly Calls for Service (CFS)

	Violent			Property			Miscellaneous		
	Pre-Install	Post-Install	F-Ratio	Pre-Install	Post-Intall	F-Ratio	Pre-Install	Post-Intall	F-Ratio
Area A (sd)	.03 (.19) n=29	.10 (.31) n=29	1.05 ns	.00 -- n-29	.07 (-26) n=29	2.07 ns	.31 (.54) n=29	.52 (.69) n=29	1.62 ns
Area A2 (sd)	.14 (-44) n=29	.10 (-31) n=29	.12 (.73)	0 --	0 --	-- —	.45 (-69) n=29	.31 (.60) n=29	.66 ns
F-Ratio	1.35 ns	--		—	2.07 ns		.72 ns	1.48 ns	

Note:
sd = standard deviation
n = number of weeks
* = significant at .05 level
ns = not significant

Area B: Changes in Average Weekly CFS

Area B was also the target of additional NESCO street lights in the near-eastside area. Table 8 indicates that mean weekly CFS in Area B declined from 1.14 before the street lighting enhancement to 0.83 after the installation of NESCO lights. Because of the routine variation in weekly CFS within Area B during the 58 weeks that were analyzed, this decrease was not statistically significant.

Similarly, there were no statistically significant declines in the average weekly CFS for the three broad categories of crime, although both property and miscellaneous CFS exhibited absolute drops in weekly averages after NESCO lights were installed, as shown in Table 9. Property crime CFS declined by one-half (0.28 CFS per week to 0.14 per week), and miscellaneous CFS such as disturbances dropped from 0.66 prior to installation to 0.45 afterwards.

However, in considering these findings for Area B, it should be noted here that Area B *did* exhibit a decline in its average CFS after street lights were installed, some of which could be attributed to improved lighting. In other words, a lack of statistical significance in this case does not necessarily mean street lights were not a factor in the reduction of average weekly calls for service.

Table 8
Average Weekly Calls for Service (CFS)

	Pre-Installation	Post-Installation	F-Ratio
Area B (NESCO Lights)	1.14	.83	1.06
(sd)	(1.19)	(1-10)	ns
	n=29	n=29	

Note:
sd = standard deviation
n = number of weeks
* = significant at .05 level
ns = not significant

Table 9
Average Weekly Calls for Service (CFS)

	Violent			**Property**			**Miscellaneous**		
	Pre-Install	**Post-Install**	**F-Ratio**	**Pre-Install**	**Post-Intall**	**F-Ratio**	**Pre-Install**	**Post-Intall**	**F-Ratio**
AreaB	**.10**	**.10**	--	**.28**	**.14**	**1.67**	**.66**	.45	.92
(sd)	**(.31)**	**(-31)**		**(-45)**	**(-35)**	**ns**	**(.90)**	(.74)	ns
	n=29	n=29		n=29	n=29		n=29	n=29	

Note:
sd = standard deviation
n = number of weeks
* = significant at .05 level
ns = not significant

Area C and Control Area C2: Changes in Average Weekly CFS

Area C (which received NESCO lights) and Control Area C2 (which did not) present evidence of a very different nature. The differences in their respective average weekly CFS are reported in Tables 10 and 11.

In terms of average weekly CFS for all crime categories (shown in Table 10), both C and C2 experienced statistically significant *increases* when comparing the pre-installation to the post-installation periods. Area C, with NESCO lights, increased its weekly average to 4.77 CFS, up from 3.77 CFS in the pre-installation period. However, Control Area C2 also experienced a significant increase (0.98 to 1.81), so the increase in weekly rates was occurring both with and without improved street lighting.

But the increases did not occur in all categories of CFS. As noted in Table 11, the increase in average weekly CFS was largely a result of *violent* categories of crime. Both Area C and Control Area C2 exhibited substantial (though statistically insignificant) increases in violent categories. However, this category is not theoretically assumed to be affected by lighting.

On the other hand, *property* crime, as measured by average weekly CFS, declined from 0.46 to 0.35 in Area C, but only from 0.11 to 0.09 in Control Area C2. Similarly, the *miscellaneous* CFS category did not change at all in Area C after NESCO lights were installed, but Control Area C2 (with no added lighting) experienced a sizable (but statistically insignificant) increase from 0.62 to 0.93. While none of these observed changes was statistically significant, the proportionally larger decline in Area C's weekly average CFS for property crimes and the stabilization of miscellaneous CFS (compared to the control area's increase) might conceivably be associated with the enhancements to street lighting provided by the NESCO initiatives.

Table 10
Average Weekly Calls for Service (CFS)

	Pre-Installation	Post-Installation	F-Ratio
Area C (NESCO Lights) (sd)	3.77 (2.33) n=43	4.77 (2.46) n=43	3.75*
Area C2 (No NESCO Lights) (sd)	.98 (1.21) n=43	1.81 (1.71) n=43	6.90*
F-Ratio	48.73*	41.88*	

Note:
Includes IPD intervention dates.
sd = standard deviation
n = number of weeks
* = significant at .05 level
ns = not significant

Table 11
Average Weekly Calls for Service (CFS)

	Violent			Property			Miscellaneous		
	Pre-Install	Post-Install	F-Ratio	Pre-Install	Post-Intall	F-Ratio	Pre-Install	Post-Intall	F-Ratio
Area C (sd)	**.53 (.80) n=43**	**.70 (.80) n=43**	**.89 ns**	**.46 (.59) n=43**	**.35 (.61) n=43**	**.80 (.37)**	2.56 (1.99) **n=43**	2.58 **(1.78) n=43**	**,00 ns**
Area C2 (sd)	**.07 (.25) n-43**	**.23 (-61) n=43**	**2.59 ns**	**.11 (.32) n=43**	**.09 (.29) n=43**	**.12 (•73)**	**.62 (.84)**	**.93 (1.37)**	**1.52 ns**
F-Ratio	13.25*	**9.14***		**11.49***	6.09*		34.21*	**23.31***	

Note:
Includes IPD **intervention dates.**
sd = standard deviation
n = number of weeks
*** = significant at .05 level**
ns = not significant

Area D: Changes in Average Weekly CFS

From the pre-installation period to the post-installation period, Area D demonstrated a slight decline in average weekly CFS, from 1.52 to 1.23 (shown in Table 12). The drop was not statistically significant but, as noted above for other target areas, it represented an absolute decline in the weekly rate.

In the context of the three broad categories of crime as shown in Table 13, Area D exhibited the same characteristics as Area C: CFS for violent crime increased, while average weekly CFS for property and miscellaneous crime decreased (absolutely, but not statistically). Thus, evidence from Area D also suggests a possible link between improvements in street lighting and a decline in the weekly rate of CFS for non-violent criminal activity.

Table 12
Average Weekly Calls for Service (CFS)

	Pre-Installation	Post-Installation	F-Ratio
AreaD (NESCO Lights)	1.52	1.23	1.02
(sd)	(1.21)	(1.05)	ns
	n=31	n-31	

Note:
sd = standard deviation
n = number of weeks
* = significant at .05 level
ns = not significant

Table 13
Average Weekly Calls for Service (CFS)

	Violent			**Property**			**Miscellaneous**		
	Pre-Install	**Post-Install**	**F-Ratio**	**Pre-Install**	**Post-Intall**	**F-Ratio**	**Pre-Install**	**Post-Intall**	**F-Ratio**
Area D	**.16**	**.32**	1.87	**.35**	**.16**	2.62	**.94**	**.65**	1.54
(sd)	**(.37)**	**(-54)**	**ns**	**(55)**	**(-38)**	**ns**	(1.03)	**(.80)**	**ns**
	n=31	n=31		**n=31**	n=31		n=31	n=31	

Note:
sd = standard deviation
n = number of weeks
* = significant at .05 level
ns = not significant

VI. Conclusions

The evaluation of selected street lighting initiatives in the NESCO area was designed to discern impacts, if any, that the installation of added street lighting has had on the number of crimes in a sample of eastside neighborhoods. The study measured crime in terms of calls for service (CFS) to the police. Two different approaches were used to assess the impact of lighting. The findings of both approaches are summarized in Table 14, which reports (1) whether the *raw count of CFS* increased or decreased from the pre- to the post-installation period in all of the selected target and control areas, and (2) whether the *average weekly CFS* increased or decreased after the installation of the NESCO street lights in areas A through D.

In the first approach, changes in the raw count (i.e., total calls for service) of CFS before (pre) and after (post) the installation of additional lights were examined in each of the nine target areas that received NESCO lights and in the two control areas that did not. The findings of the raw count analysis were mixed, but even so some potential impacts associated with enhanced lighting can be identified.

Of the nine target areas that received NESCO lighting, six showed evidence of lower CFS volumes after lighting was installed. All three intersections examined showed a reduction in CFS after street lights were installed. One of the two multi-address groupings showed a reduction in CFS volume. Results were very mixed, however, for the two multi-block areas that were compared against control areas that did not obtain NESCO lights. In one target area/control area group, CFS volume in the better illuminated neighborhood *increased* while CFS volume in the control area *decreased*, which, of course, is counter to expectations. The other target area/control area grouping reflected high CFS volumes both before *and* after street lights had been installed in the target area.

The second approach that we used to assess the impact of lighting was a comparative analysis of the average (mean) weekly CFS in the pre-installation and post-installation periods. If lighting had a deterrent effect, we would expect to see evidence of lower CFS volumes as measured by the average weekly CFS after NESCO lights were installed. In our analysis, this was done for the four multi-block areas that received NESCO lights and the two control areas that received no NESCO lights.

These findings, too, are mixed, but there is some evidence that street lights are associated with reductions in CFS volume. Two NESCO-lighted areas had a lower mean weekly CFS after installation than before, which is consistent with expectations about the impact of lights. One target area/control area was contrary to expectations: average weekly CFS increased post-installation in the lighted area, but decreased in the less illuminated control area. However, with regard to this area, the more illuminated target area experienced a greater reduction in average CFS for *property* and *miscellaneous* crime than did the control area. While none of these differences were statistically significant changes, they are nonetheless suggestive of the expected deterrent influence of enhanced street lighting.

Table 14
Summary of Findings

	Analysis of Raw Counts of CFS		Analysis of Average Weekly CFS	
Area	Increased	Decreased	Increased	Decreased
A	❖			
A2		❖		❖
B		❖		•
C	•	• (Excluding traffic, guns)	❖	• Property ••• Miscellaneous
C2	❖		❖	
D		❖		❖
Address 1		❖		
Address2	❖			
Intersectionl		❖		
Intersection!		❖		
Intersections		❖		

Overall, the findings of this study are consistent with the mixed reports of other previous work on the deterrent potential of lighting. The analysis of the NESCO target areas suggests that enhanced street lighting in particular neighborhoods is sometimes associated with concurrent reductions in reported crime. It is possible that many street lights have a real deterrent effect on *the individual address,* but the diffusion of positive deterrent effects to other adjacent or nearby parcels may be very limited. This is suggested by the findings that the most clearcut decline in CFS occurred at intersections (all three that were analyzed), less clearcut when examining groupings of different addresses receiving lights (one of the two groups analyzed), and extremely mixed when a group of addresses both with and without new street lights are analyzed together (neither of the two multi-block target areas showed clear decreases).

Although we believe this to be the most vigorious scientific assessment of the impact of lighting on crime to date, disentangling the potential effects of neighborhood social disorganization, police initiatives, and victim/offender behavior patterns separate from the impact of lighting is beyond the scope of this work and potentially all work in the area of physical environment and crime.

Appendix A

NESCO Lights Installed During 1995

NRSCO Lights Installed During 1995

September 5, 1996

Light Number	Address	Date Installed	Study Area/ Dataset
1	1929 N. LaSalle	7-14	n/a
2	1918 N. LaSalle	7-14	n/a
3	20 Hendricks PI.	7-14	AREAC
4	45 Hendricks PI.	7-14	AREAC
5	24 Hendricks PI.	7-14	AREAC
6	1333 E. 11th St.	7-25	ADDRESS2
7	1019 N. Arsenal	7-25	ADDRESS2
8	1008 N. Parker	8-2	ADDRESS2
9	1329 N. Oxford	8-2	ADDRESS2
10	2816 E. 11th St.	8-21	ADDRESS2
11	1116 N. Rural	8-21	ADDRESS2
12	1214 N. Rural	8-21	ADDRESS2
13	2821 E. 13th St.	8-21	ADDRESS2
14	735 Woodruff PI. E. Dr.	8-22	ADDRESS2
15	1025 N. Arsenal	8-24	ADDRESS2
16	1531 Steele	8-24	ADDRESS2
17	10 N. Randolph	8-30	AREAC
18	37 N. Randolph	9-1	AREAC
19	32 N. Randolph	94	AREAC
20	908 N. Oakland	9-6	n/a
21	1302 Tecumseh	9-13	n/a
22	310 N. Summit	9-18	ADDRESS 1
23	1026 N. Tacoma	9-18	ADDRESS 1
24	1130 N. Arsenal	9-18	ADDRESS 1
25	1120 N. Keystone	9-18	ADDRESS 1
26	1121 N. Tacoma	948	ADDRESS 1
27	1126 N. Tacoma	948	ADDRESS 1
28	208 N. Summit	9-18	ADDRESS 1
29	237 N. Arsenal	9-18	ADDRESS 1
30	242 N. State	9-18	ADDRESS 1
31	1316 Tecumseh	9-18	ADDRESS 1
32	2030 N. LaSalle	9-19	ADDRESS 1
33	1818 Brookside (2 lights)	9-20	ADDRESS 1
34	2038 N. Colorado	9-25	n/a
35	541 Tecumseh	9-28	n/a
36	539 Jefferson	9-28	n/a
37	939 N. Beville	9-28	n/a
38	664 N. Beville	9-28	INTERSECTION
39	E. 11th & Keystone (SE corner)	10-5	n/a
40	301 N. Arsenal	10-5	n/a
41	1601 Nowland	10-6	AREAD
42	1228 N. State	10-6	AREAD
43	721 Dorman	10-6	n/a
44	734 Dorraan	10-6	n/a
45	1309 Polk St.	10-6	n/a
46	1922 Glenridge Dr.	10-6	n/a

Light Number	Address	Date Installed	Study Area/ Dataset
47	1614 N. Temple	10-6	n/a
48	1626 N. Temple	10-6	n/a
49	1220 N. State	10-6	AREAD
50	1110 E. 9th St.	10-6	n/a
51	932 Eastern Ave.	10-6	AREA A
52	1011 E. St. Clair	10-11	n/a
53	1132 N. Beville	10-12	n/a
54	1527 E. Market	10-12	n/a
55	1629 N. Temple	10-16	n/a
56	555 Eastern Ave. (2 lights)	10-16	INTERSECTION 1
57	948 Eastern Ave.	10-18	AREA A
58	633 N. Rural	10-27	n/a
59	919 Eastern Ave.	11-8	AREA A
60	1219 Polk St.	11-15	n/a
61	601 N. Rural	11-15	INTERSECTION
62	420 Eastern Ave.	11-15	AREAB
63	1806 E. 12th St.	11-15	AREAD
64	1236 Windsor St.	11-15	AREAD
65	847 Eastern Ave. (2 lights)	11-15	AREA A
66	1241 Windsor St.	11-16	AREAD
67	827 Tecumseh	11-17	n/a
68	1818 E. 12th St.	11-20	AREAD
69	1926 N. Euclid	11-21	n/a
70	2029 N. Euclid	11-21	n/a
71	427 Eastern Ave.	12-5	AREAB
72	327 Eastern Ave.	12-5	AREAB
73	815 Eastern Ave.	12-5	AREA A
74	1818 E. 11th St.	12-6	n/a
75	1102 Roosevelt	12-7	n/a
76	616 Hamilton	12-21	n/a
77	644 Hamilton	12-21	n/a

NOTES:

1. The total number of lights in study areas A-D were determined during site visits.

Appendix B

Crime Categories

IPL/IEA PROJECT CODES

MISCELLANEOUS/SURVEILLANCE
- 212-PERSON DRUNK
- 214-PERSON EXPOSING
- 234-PROWLER
- 250-VEH SUSPICIOUS
- 251-SUSPICIOUSVEH
- 268-PERSON SUSPICIOUS
- 286-TREPASS
- DIS-ALL KIND

ROBBERY
- U2-HOLDUP-PROG
- 236-PURSE GRAB
- 238-ROBBERY-BSN
- 240-ROBBERY-PERSON
- 241-ROB PERSON-PROG
- 264-ROBBERY-BUSN-PROG
- 265-ROBBERY PROG
- 280-ROBB-RES
- 282-ROBB-RES-PROG

PERSON
- 120-PERSON SHOT
- 121-PER-BATTERED
- 122-PER STABBED
- 128-RAPE REPORT
- 129-RAPE ATT
- 200-ASSAULT/BATT
- 201-PERSON ASS
- 262-PERSON BEATEN/PG

TRAFFIC
- 252-TRAFFIC STOP
- 266-TRAFFIC ARREST
- 548-DIRECT TRAFFIC
- 561-TRAFFIC ARREST
- 562 TRAFFIC HAZARD
- 563-DIRECT TRAFFIC*
- 564-WRECKER

VANDALISM
- 136-VANDAUSM/PROG
- 233-DAMAGE TO PROP
- 256-VANDALISM
- 618-DAMAGE TO PROPERTY

BURGLARY
- 104-BURGLARY/PROG
- 202-BURGLARY-BSN
- 204-BURGLARY-GARAGE
- 206-BURGLARY-RESID
- 207-BURGLARY-ATT
- 270-BURGLARY OTHER

VEHICULAR
- 132-VEH STRIPPING
- 138-VEH THEFT-PROG
- 224-VEH LARCENY
- 248-VEH STRIPPED
- 292-VEH THEFT-ATT

GUN
- 124-PERSON W/GUN
- 130-SHOTS FIRED
- 142-PERW/WEAPON

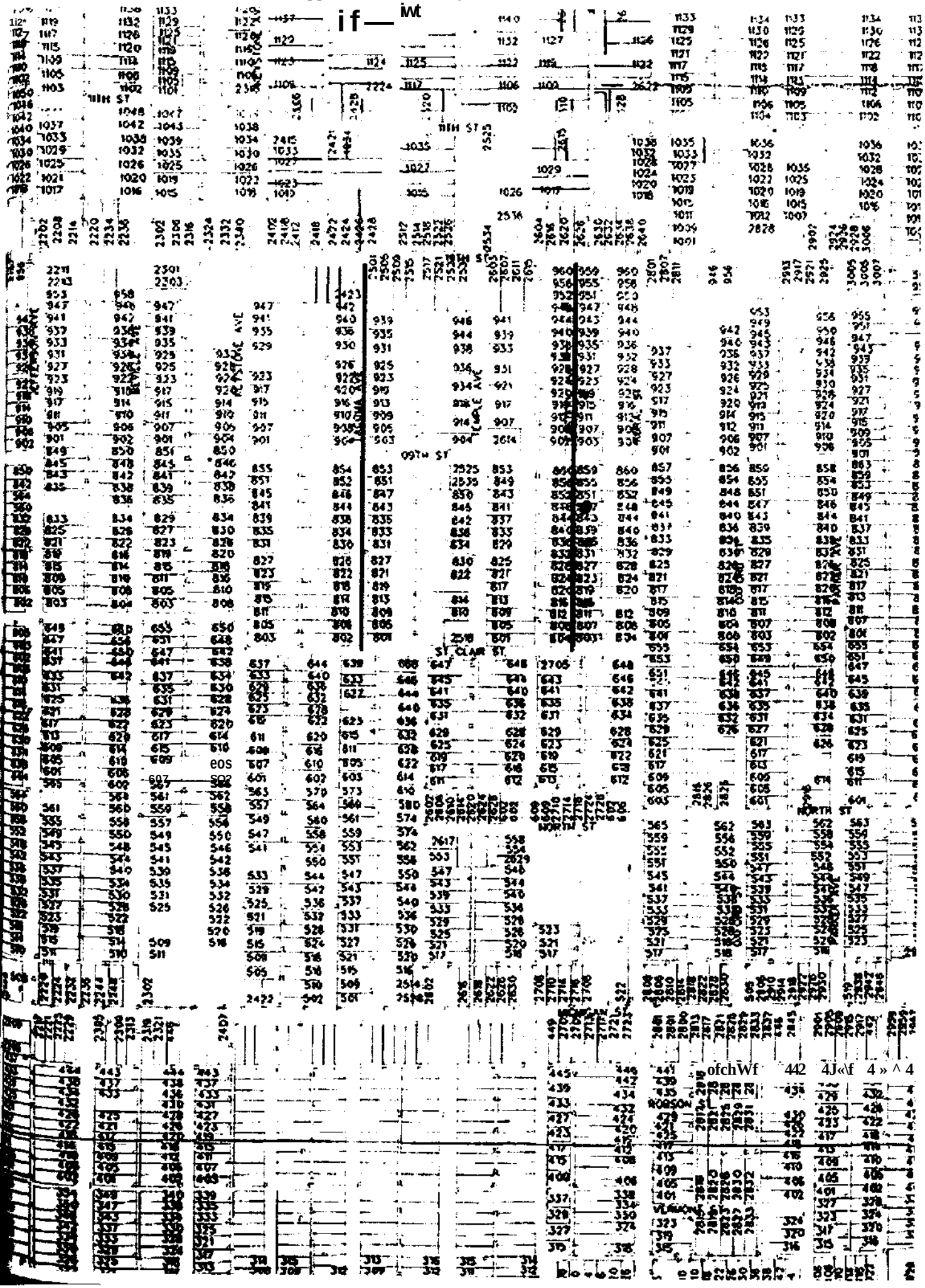
ACCIDENTAL
- 600-ACC NO INFOR
- 602-ACC PD
- 604-ACC PD CITY PROP
- 606-ACC PD HITRUN
- 608-ACC PI
- 610-ACC PI CITY PROP
- 612-ACC PI HITRUN
- 614-ACC POSS/FATAL
- 616-ACC-PIPRIVPROP
- ACC

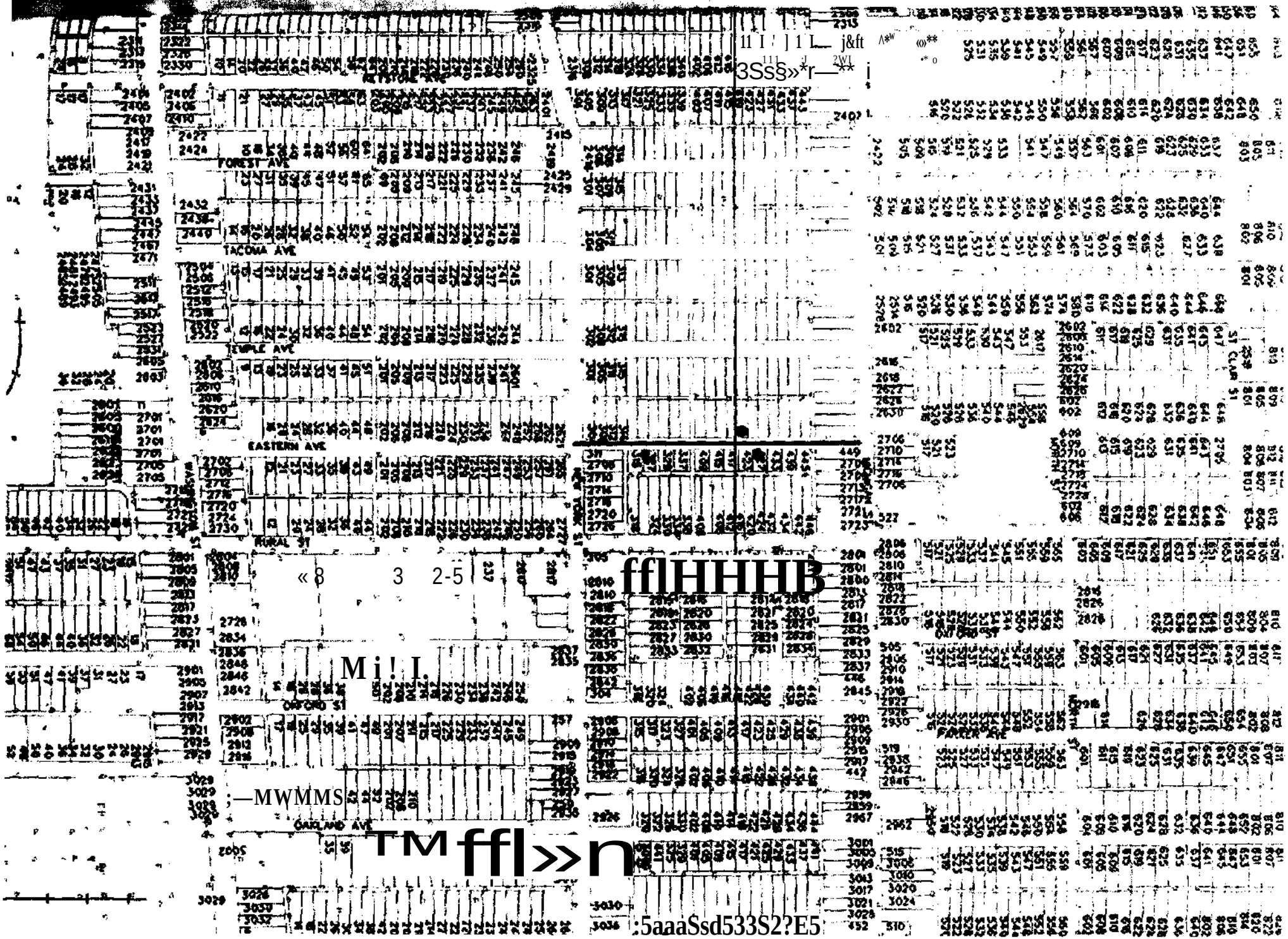
DISTURBANCE
- 400-DISTURBANCE
- 402-DIST/DOM
- 404-DISTAVEPN
- 514-CHECK PREMISES
- 546-SUBJECT STOP

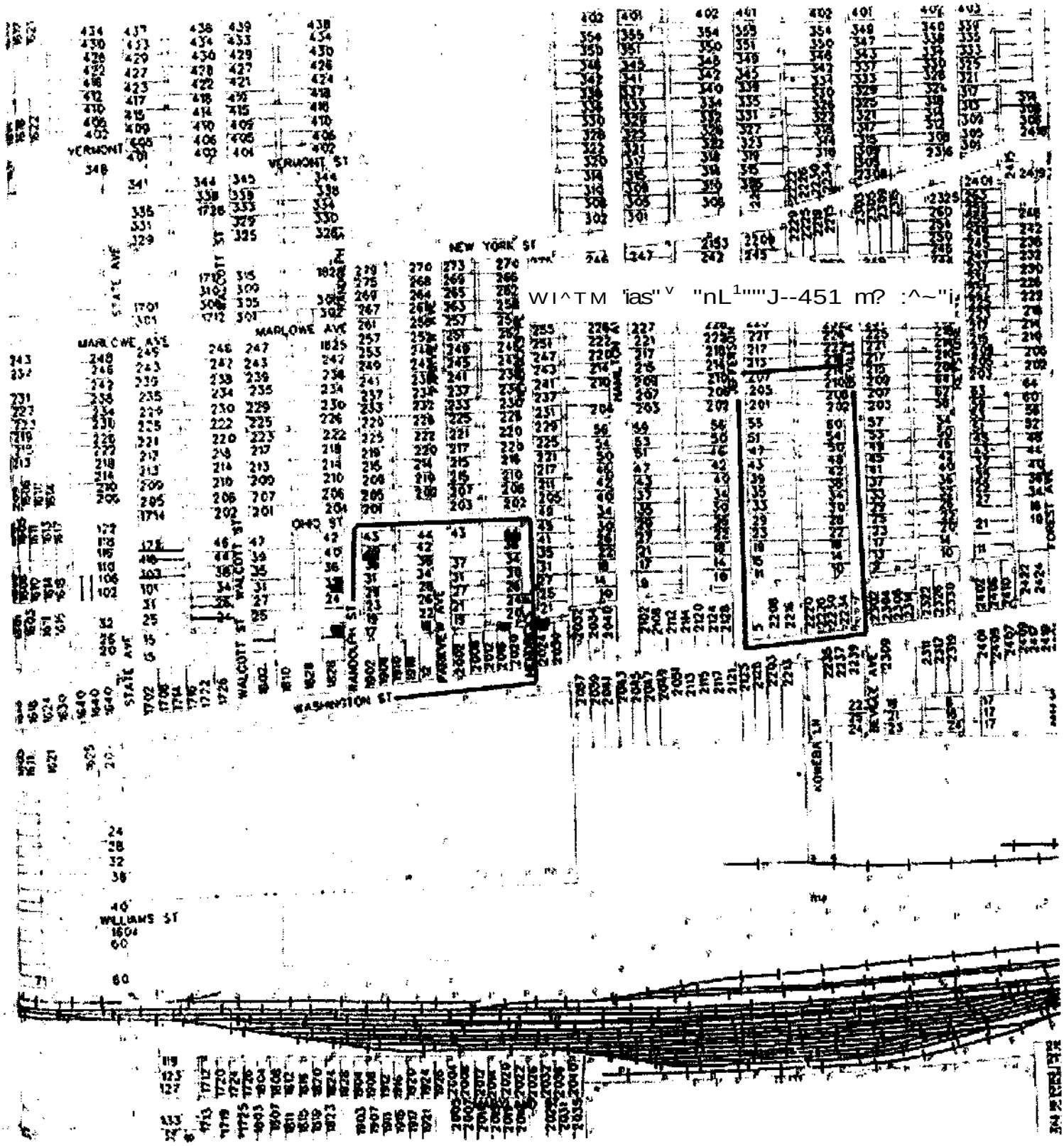
DRUGS
- 228-NARC INV
- NAR

Appendix C

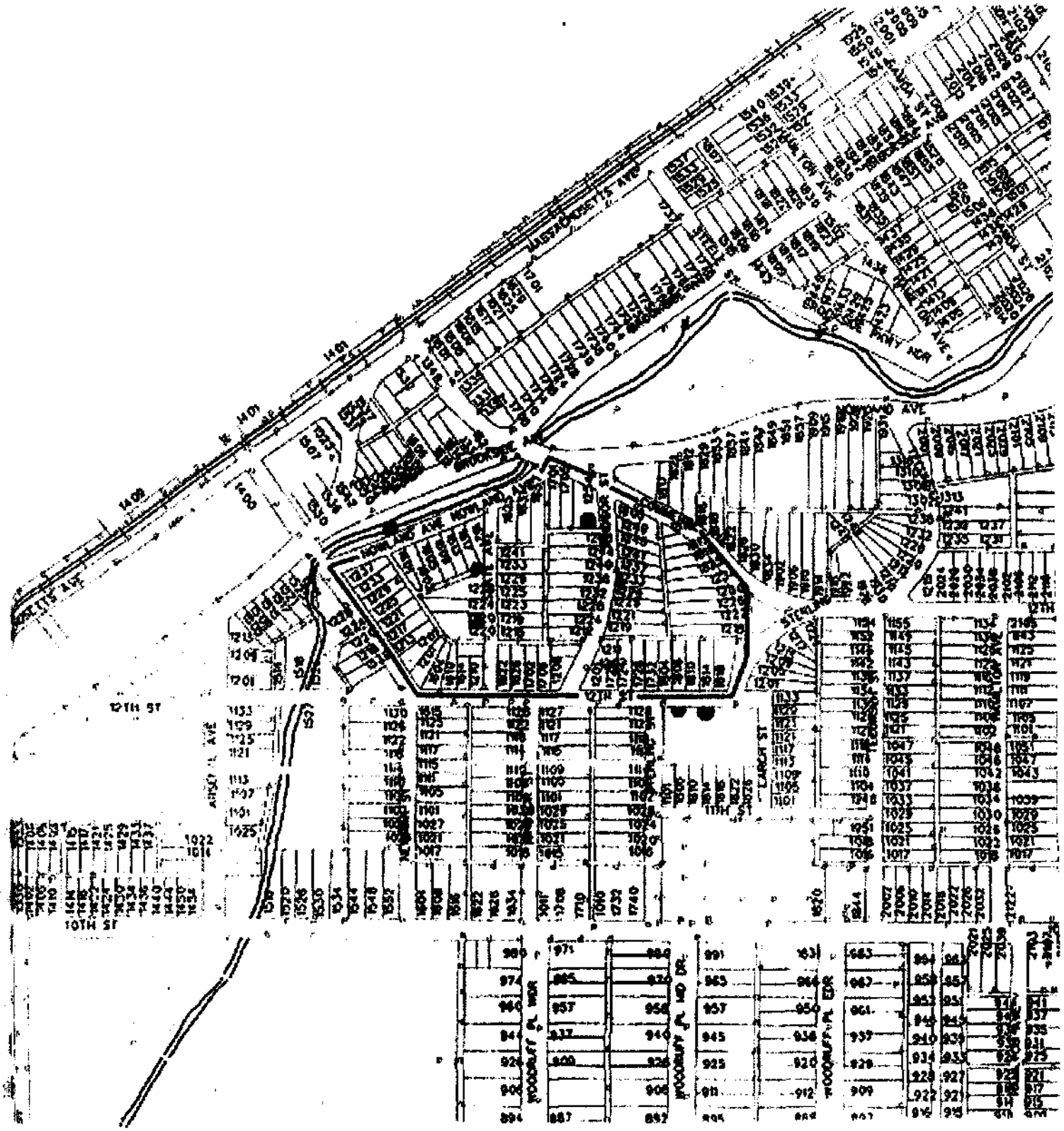
Study Areas


if—
iwt
11TH ST
9TH ST
ST. CLAIR ST.
NORTH ST
ofchWf
442
4J«\f
4 » ^ 4


FOREST AVE
TACOMA AVE
TEMPLE AVE
EASTERN AVE
RURAL ST
OXFORD ST
OAKLAND AVE
ST CLAIR ST


NEW YORK ST
MARLOWE AVE
VERMONT ST
STATE AVE
WALCOTT ST
OHIO ST
WASHINGTON ST
WILLIAMS ST

Appendix C4: Study Area D



Appendix C5: Intersections 1, 2, 3