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A FIELD EVALUATION OF THE SYSTEM FOR THE EFFECTIVE CONTROL OF URBAN ENVIRONMENT SECURITY ("SECURES™"): FINAL REPORT ON THE DALLAS FIELD TRIAL

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A FIELD EVALUATION OF THE SYSTEM FOR THE EFFECTIVE CONTROL OF URBAN ENVIRONMENT SECURITY ("SECURES™"): FINAL REPORT ON THE DALLAS FIELD TRIAL

EXECUTIVE SUMMARY

- SECURES™ (System for the Effective Control of Urban Environment Security) is described as a technologically advanced acoustic sensing system capable of identifying, discriminating, and reporting gunshots within one second of a shot being fired. The technology was developed by Alliant Techsystems, Inc. through funding by the Department of Defense.

- Alliant Techsystems, Inc. envisioned the SECURES™ technology as a rapid response tool: they suggested the technology could increase police response time by 85 percent, increase the apprehension rate of shots fired offenders by 40 percent, and increase the survivability rate of gunshot victims by 50 percent.

- Approximately 80 pole units are required to cover a one square mile area at a cost of approximately $5,500 per month to lease a system covering one square mile. Pole units cost $1,750 each and the batteries last approximately 2 months. SECURES™ will cost a police department at least $72,480 per 10,000 people to install and use in any one calendar year.

- Oak Cliff, TX, a neighborhood of approximately one square mile, was selected as the experimental test site due to its high incidence of random gunfire. The field test comprised installation of 86 pole units on utility poles. 75 pole units were erected at intersections, 9 were in alleys, and 2 were on streets in the target area.

- The SECURES™ technology "downtime" during the field trial in Dallas, TX was 10,349 minutes of the total running time of 76,740 minutes (11.9 percent of the time). 26 pole unit batteries had to be replaced over the course of the SECURES™ trial phase.

- Citizen calls for random gunfire (signal 6Gs) were considered priority 4 level calls in the Dallas Police Department. Dispatchers had a one hour window to dispatch random gunfire calls for service.

- A new signal code was incorporated into the Dallas CAD system that represented a SECURES™ identified call for random gunfire (signal 6S). This signal code was designed to assist the Evaluation Team in understanding how officers respond to citizen calls for service versus SECURES™ identified calls for service.

- There were 215 alleged gun shots identified by the SECURES™ technology during the trial phase (October 25, 1996 to December 16, 1996). Of the 215 SECURES™ alerts, 23 (10.7 percent) could be matched against a citizen call about a shot fired. This means that either citizens simply do not call the police very frequently about shots being fired and the Dallas Police Department has a large under-reporting rate of shots being fired or the gunshot location system has a very high rate of false positive recordings of shots being fired.

- During our field trial in Dallas, the police responded to 151 SECURES™ alerts and 39 citizen calls about random gunfire. These 190 (151 + 39) police radio runs all took place in the one square mile community of Oakcliff during the two months of field testing. Our study finds that the extra 151 SECURES™ dispatched radio runs over and above the citizen-initiated calls during the two-month field trial represents almost a five-fold increase (190/39=4.87) in the number of police dispatches to random gunfire problems.

- Examination of the Dallas Police Department call data indicated that dispatchers took longer on average to dispatch a SECURES™ identified call (17.88 minutes) than a citizen identified call (13.25 minutes). Officers also took longer to arrive on the scene of a SECURES™ identified call (24.41 minutes) than a citizen identified call (17.78 minutes) about random gunfire.

- We compared response time for random gunfire calls before and during the SECURES™ field trial. Our analysis reveals that random gunfire calls for service (citizen initiated only) were not only dispatched quicker during the pre experimental phase but officers arrived quicker, they spent less time on the call and processed the call more quickly.

- Examination of average response times for random gunfire calls for service prior to SECURES™ testing (citizen initiated only) versus average response times during field testing (citizen and SECURES™ initiated combined) indicated that, while the random gunfire call load increased dramatically, the average amount of time devoted to any one call (citizen or SECURES™) was relatively stable when the pre-experimental phase was compared to the experimental phase.

- Findings from the call data analysis were inconsistent with officer perceptions of speed of response and time spent on 6G versus 6S calls for service. Officers indicated that they believed their responses to 6G and 6S calls were similar. Officers believed they spent the same or less time on a 6S call than a 6G call. The call data indicated that officers spend more time handling a SECURES™ alert than a citizen identified call for random gunfire.

- Officers indicated that they did not believe that the SECURES™ technology would increase apprehension rates or survival rates. A substantial number of officers (79.4 percent) stated that they thought the SECURES™ system would help police focus on random gunfire "hot spots."

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A FIELD EVALUATION OF THE SYSTEM FOR THE EFFECTIVE CONTROL OF URBAN ENVIRONMENT SECURITY ("SECURES™"): FINAL REPORT ON THE DALLAS FIELD TRIAL

I. INTRODUCTION

SECURES™ (System for the Effective Control of Urban Environment Security) is a gunshot location system that is described as a "technologically advanced acoustic sensing system capable of identifying, discriminating, and reporting to the police gunshots within one second of a shot being fired" (Page and Sharkey, 1995). Developed by Alliant Techsystems, Inc. (ATI) through funding by the Department of Defense, SECURES™ was installed in the Oak Cliff area of the Southwest Police Operations Division of Dallas, TX for two months of field testing beginning October 25, 1996.

In August 1996 the National Institute of Justice issued a limited competition for the evaluation of SECURES™. The original goals of the evaluation were to: (1) examine the operational effectiveness of SECURES™; (2) assess the impact of SECURES™ on the police; (3) examine the impact of SECURES™ on community perceptions of safety and fear; (4) document the relationship between the community, the Dallas Police Department, and Alliant Techsystems, Inc. in collaborating to implement SECURES™; and (5) assess the cost effectiveness of SECURES™. In October, 1996 an evaluation team from the University of Cincinnati, headed by Dr. Lorraine Green Mazerolle, was awarded the grant to evaluate SECURES™ under field testing conditions.

We begin this final report with an overview of the gun problem in the United States (Section II) and in Section III we examine a range of police strategies that have been implemented in an attempt to reduce gun problems. Section IV introduces the gunshot location system developed by Alliant Techsystems, Inc. (SECURES™) that was installed in Dallas, TX. Section V then describes the Dallas research site, the project history, and the complexities of installing SECURES™ in Dallas.

Section VI provides an overview of the Dallas Police Department Computer Aided Dispatch System. In Sections VII, VIII, IX, and X we present the evaluation findings: Section VII examines the performance of the SECURES™ system in Dallas and Section VIII discusses the way that the Dallas Police Department used the gunshot location system during the period of the field trial. Specifically, we report how the police responded to shots fired "alerts" from SECURES™ compared to citizen calls about random gunfire. Section IX examines the relationship between random gunfire calls for service and the arrest and offense data. Section X presents an analysis of how SECURES™ technology impacted officer workload. Section XI draws from two sources of data — police officer patrol logs and a patrol officer survey — to compare and contrast police perceptions about responding to citizen-generated versus technology-generated random gunfire calls for service. We conclude our report in Section XII with a discussion of how gunshot location system could be best utilized in law enforcement.

II. GUNS AND CRIME PROBLEMS

The Gun Problem in the United States

Guns impact the lives of thousands of Americans each year in the form of deaths, criminal victimizations, and non-fatal injuries. Robin (1991:1) indicates that firearms are involved in 10,000 murders; 15,000 suicides; and 2,000 accidental deaths each year. In 1995 alone there were 243,900 arrests for weapons offenses. In 1994, more than 10 percent of all violent crimes were committed with a handgun; more than 20 percent of aggravated assaults and more than 40 percent of robberies were committed with a firearm; and 74 percent of workplace homicides were committed with firearms. In 1992, more than 99,000 people suffered a non-fatal firearm-related injury (Maguire and Pastore, 1997).

Guns and Crime

Based on nationally representative survey results, Kleck (1991) reports that about one out of every two households in the United States possesses a firearm (Kleck, 1991:18; see also Wright, 1995). More recently, Cook and Ludwig (1997) report from a nationally representative phone survey of noninstitutionalized adults that 35 percent of households own a gun and about 25 percent of adults own a gun (Cook and Ludwig, 1997).

While Texas as a state is often viewed as having a disproportionately large number of gun owners (Tinsley, 1996), a recent survey conducted by the Office of Survey Research of the University of Texas at Austin reveals that about 52 percent of Texans report that someone in their home owns a firearm (Tinsley, 1996). Based on these survey results, and contrary to popular belief, Texas homes resembles much of the United States, at least in terms of proportion of gun owners reported by Cook and Ludwig (1997).

While guns may be seen as "facilitators" for committing criminal or violent acts (see Clarke, 1992), gun owners report that these are not the intended uses. Most gun owners report that they own guns for recreational purposes, and to a lesser extent for self-protection, not for violence or for criminal purposes (Kleck, 1991). Moreover, Kleck (1991:23) reports that "gun ownership is not consistently higher in places and groups where violence is over-represented."

Notwithstanding the Kleck perspective, there is some evidence to suggest that firearm availability may be linked to the level of firearm use in violent crimes. Reiss and Roth (1993:279) argue that research examining natural variation in firearm availability and violent crime has found that "increased firearm availability is associated with increased firearm use in violent crime." Similarly, McDowall (1991:1096) examined data from Detroit and found these data to be "consistent with the hypothesis and fit a model in which increases in gun density resulted in higher rates of murder within the city."[1] Newton and Zimring (1969:69) also found a relationship between more firearms and more firearm violence in their case study of Detroit as well as in their regional comparisons of gun use in crime and gun ownership across eight cities in the United States.

Other studies have taken a somewhat different approach to examining the relationship between guns and crime. Instead of linking the number of gun owners to the number or rate of crime, some researchers have attempted to estimate the likelihood that guns are used in crime based on the raw number of guns and the raw number of gun related crimes. Current estimates of the number of firearms in the United States hover around roughly 200 million (Wright, 1995).

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[1] It is important to note that these studies explored the relationship between aggregated levels of gun ownership and city levels or rates of crime and thus the results do not provide any information linking individual gun owners and criminal or violent behavior.

Kleck (1991:44) explains that

> "...relative to the number of guns, the number of gun crimes is small. Even if each gun used to further a crime was only used once, thereby spreading crime involvement around to the maximum number of guns, the fraction of guns involved in crime in any one year would be 0.3 percent for all guns, 0.9 percent for handguns, and 0.09 percent for long guns" (see also Kennedy, Piehl, and Braga, 1996a; 1996b).

Random Gunfire Problems

Random gunfire is a significant problem in many large cities throughout the United States (e.g. see Egan, 1996; Kass, 1995). Random gunfire is distinguishable from other types of gunfire incidents and serious shooting problems like urban sniper attacks, gang shoot outs, domestic homicides, and revenge shootings because (1) random gunfire is strictly an outdoor activity; (2) it is not usually part of other criminal activity such as drug dealing, assaults, or robberies; and (3) random gunfire shooters do not fire their weapons to intentionally injure or kill people.

The Dallas Police Department (1993) defines random gunfire as "the indiscriminate discharge of firearms into the air." Random gunfire problems generally occur in one of two contexts: one is when people fire their weapons in celebration of holidays (New Years Eve, 4th of July, Cinco De Mayo), weekends (Fridays, Saturdays, Sundays), or sporting events (e.g. Football Games) and the other is when people fire their weapons for no particular reason, but often in the context of drinking (Dallas Police Department, 1993).

Shooting a gun into the air, even in a celebratory fashion, is a dangerous and potentially violent crime (Dallas Police Department, 1993). Unfortunately no national statistics exist to describe the extent of the random gunfire problem. The Dallas Police Department recorded 12,566 calls for service for random gunfire which represented 1.1 percent of all calls for service citywide.[2]

Based on the guns and crime literature, one would expect that neighborhoods with random gunfire problems could possibly have higher rates of gun ownership. Nonetheless, it appears that other factors could be significant predictors of places with random gunfire problems. For example, some police officers in Dallas suggest that certain groups of people (mainly men; oftentimes Hispanic males) are more likely to fire their weapons in celebratory style than other types of people in a neighborhood. Without further research, however, we can only speculate as to the precipitating factors that lead some neighborhoods to experience more random gunfire problems than others.

[2] There were 1,176,334 calls for service during 1996 excluding prisoner transports. We attempted to compute the proportion of random gunfire arrests between 01/01/96 and 12/18/96. However, there was no code for random gunfire in the arrest database. Tracing calls from the call database which were initiated as 6G (signal code for random gunfire calls) indicated that the arrest charge varied considerably and was seemingly unrelated to the random gunfire event. We could have attempted to overcome the problem by examining charges such as 742s (Miscellaneous charges), YYs (city charges) and 409s (aggravated assault charges); however, these offenses were too inclusive of other behaviors to be useful.

III. POLICE STRATEGIES TO REDUCE GUN PROBLEMS

Initiatives that seek to reduce gun problems in the United States can be classified into five distinct groups: police initiatives that seek to remove guns from the streets; legislative initiatives[3] that seek to reduce gun ownership and availability (e.g. waiting periods, screening, checks on manufacturing of weapons); laws that seek to alter gun uses or storage by restricting carrying, increasing detection or educating the public about safe use and storage of firearms; initiatives that encourage the manufacturing of less lethal weapons; and efforts that seek to change gun allocation through changing licensing requirements, restricting imports or prohibiting ownership

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[3] Legislative initiatives to regulate gun ownership have been attempted at all levels of government (Kleck, 1991). Perhaps the most well-known federal regulation aimed at handgun acquisition is the Brady Bill. Recently, the Brady Handgun Violence Prevention Act has been challenged in the Supreme Court (Manson & Lauver, 1997). The Brady Bill, which took effect in February 1994, requires federally licensed firearms dealers to request a presale check on all potential handgun purchasers. These requests are sent to the Chief Law Enforcement Officer (CLEO) of the jurisdiction where the potential customer resides. CLEOs are required to make a reasonable effort to determine if the purchaser is eligible to purchase a handgun. The firearms dealer must wait five business days to complete the handgun purchase unless earlier approval is received from the CLEO (Manson & Lauver, 1997). The Supreme Court decision in June, 1997, invalidated the background check requirement but did not address the five day waiting period (Greenhouse, 1997). The majority opinion rested on the argument that the federal government cannot require the states to administer a federal regulatory program.

A recent bulletin from the Bureau of Justice Statistics (Manson and Lauver, 1997) reports that an estimated 6,600 firearm purchases per month were prevented by the background checks required by the Brady Bill and that more than 70 percent of the individuals prevented from buying firearms were convicted or indicted felons.

Some scholars would argue however, that legislative initiatives that aim to reduce the absolute amount of firearms will not have much impact, given the vast numbers of guns in homes across the country. Eliminating gun ownership or even markedly reducing it nationwide is not generally considered a reasonable goal in light of the pervasiveness of gun ownership and the vast national stockpile (Kennedy, Piehl, and Braga, 1996a). A recent study which compared guns obtained through gun buy-back programs with guns obtained from adult and juvenile arrestees revealed that "the age of the buy-back guns suggests that outward characteristics--gun type and caliber--notwithstanding, there is actually relatively little overlap between crime guns and buy-back guns" (Kennedy, Piehl, and Braga, 1996a).

(see Reiss and Roth, 1993). In this final report we only focus on *police initiatives* that have been implemented to tackle the random gunfire problem in particular and gun problems in general.

In recent years many police departments have begun to implement enforcement efforts that seek to remove guns from the streets and reduce the incidence of random gunfire in their respective communities. For example, in Boston, Kennedy et al. (1996a) report the results of an initiative where a problem-oriented working group, comprising both academics and practitioners, sought to implement a gun deterrent program. After identifying that over half of the homicides in Boston were gang-related, the working group decided to target violent gangs, not only to reduce gang-related homicide, but gang-related violence in general. The plan that they implemented comprised three elements: the first element was to focus on all possible legal enforcement tactics which could be used against violent gangs; the second element was an effort to communicate to the gangs that violent behavior would trigger "extra" law enforcement attention which would cease when the violence did; and the third element was a deployment of gang mediation specialists and other social service agencies. As the researchers state, "the working group's policy is, in its broadest sense, a classic deterrence approach," (Kennedy et al., 1996a:166).

Another police-initiated gun-intervention strategy was implemented in Kansas City. Based on the premise that gun crimes could be reduced by targeting the reduction of "gun carrying in high-risk places, by high-risk people, at high-risk times," Sherman and Rogan (1995), working with the Kansas City (MO) Police Department, designed an experiment to compare two patrol beats which were matched on the number of drive-by shootings. The treatment in the target beat consisted of a pair of two officer cars patrolling from 7:00 pm to 1:00 am. These officers were freed from answering calls for service and were instead asked to focus on proactive patrol with the goal of gun detection. In the description of the treatment implemented in the target beat, Sherman and Rogan (1995) explain that the directed patrols "issued 1,090 traffic citations, conducted 948 car checks and 532 pedestrian checks, and made 170 state or federal arrests and 446 city arrests, for an average of one police intervention for every 40 minutes per patrol car," (Sherman and Rogan, 1995:680). The actual number of guns seized was small (about 30). Sherman and Rogan (1995) reported a 49 percent decline in gun crimes in the target beat during the experimental intervention. It seems clear from the description of the tactics engaged in by the "treatment" officers and the relatively small number of guns seized that the program's success was due principally to the deterrent effect of the aggressive patrols in the target area.

Another police initiative to reduce gun problems involved the City of Dallas, TX. The police department implemented a random gunfire reduction program in 1993. One of the main themes of the program was "...to let the public know that the Dallas Police Department is serious about identifying and prosecuting shooters" (Random Gunfire Reduction Program, Grant Application, 1993). The Dallas program comprised four components: first, a new signal code for random gunfire calls (Signal 6G) was established to assist the police department in collecting accurate data to allow for more effective response strategies. Second, a public awareness and education campaign was implemented. The campaign involved the distribution of 25,000 flyers and posters in both English and Spanish. Third, public service announcements were broadcast over the radio to educate community residents of the potential danger of random gunfire. The fourth and last component of the gunfire reduction program consisted of roll call training to inform all patrol officers on newly constructed departmental procedures for handling random gunfire calls.

Three years after the initiation of the random gunfire reduction program, the Dallas Police Department was satisfied with the results of their efforts: they reported a 26 percent reduction in random gunfire calls for service between January 1993 and November 1994. Similarly, the department intimated that the newly implemented 6G signal code helped to establish more effective response strategies and improved random gunfire analysis (Random Gunfire Reduction Program, Final Report, 1995).

The role of guns in contributing to the overall crime problem in the United States is a hotly debated and difficult issue to empirically assess. Even more difficult is the implementation and assessment of "what works" in attempts to control crimes that involve weapons. It is against this backdrop that the University of Cincinnati Evaluation Team attempted to assess the effectiveness of a gunshot location system in Dallas, TX. We sought to assess how the Dallas Police Department adopted and used the gunshot location system to tackle a seemingly intractable problem of random shots fired in a clearly delineated neighborhood in Dallas.

IV. THE SECURES™ GUNSHOT LOCATION SYSTEM

The federal government is currently experimenting with a number of technological tools to help police in their efforts to reduce gun problems on the streets of the United States. Concealed weapons detection devices are one important technological tool. Low power radar, X-ray and infrared imaging are being examined as quick and effective devices for identifying and tagging individuals carrying weapons in crowds (National Institute of Justice Journal, June 1997). Gunshot location systems are another family of technological devices that seek to augment police efforts to reduce gun problems. In particular, gunshot location systems allow the police to identify and respond to places with gunfire problems.

The gunshot location system installed in Dallas, TX (SECURES™ or System for the Effective Control of Urban Environment Security) was developed by Alliant Techsystems, Inc.(ATI). SECURES™ seeks to identify the location and time of gunfire in a specified target area through a series of pole units (or acoustic sensor modules). These pole units are small battery powered units mounted on utility poles that comprise an acoustic sensing element, gunshot identification electronics, and a transmitter. The pole units are designed to acoustically identify gunshots and transmit information about the gunshot to a police dispatch center through a network of receivers interfaced to the local phone system.

The SECURES™ software is written in Visual C++ and includes a number of user-definable parameters. For example, the system requires two pole units to detect a gunshot before the system reports the noise as a gunshot; two pole units have to report a "shot fired" within 1.2 seconds of one another before they are considered a "group" and the noise is identified as a shot being fired; each pole unit is checked for being active every 15 minutes; if a pole unit transmits "shots fired" every 5 seconds, then the pole unit is defined as malfunctioning and the pole unit information ignored; periodic status reports from the repeater are transmitted to the base station unit every 6 minutes. If the base station fails to receive a status report from the repeater, the base station will attempt to automatically reconnect to the repeater; every fifteen days the system is automatically programmed to re-boot itself.

The SECURES™ software installed in Dallas reported the location of the first pole unit to detect the shot. ATI claims that future upgrades to SECURES™ software will include a real-time "triangulation" component where the information from pole units that pick up the sound of a shot being fired will be assessed in such a way to pinpoint the precise location from where the shot was fired. ATI claims that this type of "triangulation" procedure will pinpoint 99 percent of shots within a 65 foot radius of the event occurring; 88 percent of shots within 30 feet; 63 percent of shots within 20 feet; and 35 percent of shots within 10 feet (Personal Interview, ATI 10/30/96).

Interviews with ATI personnel report that pole units cost about $1,750 each and that the batteries last about 2 months. They suggest that approximately 80 pole units are required to cover a one square mile area. To lease SECURES™ will cost approximately $5,500 for each square mile covered per month. This cost will cover the lease of 100 pole units, three repeaters, 1 base station, and maintenance on the system. The quoted cost does not cover installation and assumes medium density housing (Personal Interview, ATI, 10/30/96).

ATI claims that SECURES™ will identify shots within one second of the shot being fired; decrease police response time by 85 percent; increase arrest rates of offenders firing shots by 40 percent; increase the survivability rate of gunshot victims by 50 percent (see Alliant Techsystems Proprietary, no date); and improve police problem-solving efforts by providing accurate information about the "hot" places and times of the random shots fired problem (Personal Interview, ATI 10/30/96). ATI further maintains that SECURES™ can identify 88 percent of all gunshots except those whose propagation path to the microphone were directly blocked by a building close by[4] and that the system will not identify any other noise source (e.g. hammers, wind gusts, car horns, hood slams, car backfire) as a gun (Page and Sharkey, 1995). The acoustic data base used to support this claim was collected by ATI during tests conducted at military proving grounds and police test ranges and when weapons were fired in open field environments as well as among building structures (Page and Sharkey, 1995: 162). On the negative side, ATI suggests that SECURES™ will incorrectly identify 20 percent of 1" firecrackers and starter pistol firings as a gun and incorrectly identify 90 percent of small explosives as a gun (see Page and Sharkey, 1995).

The SECURES™ test in Dallas was implemented during the fall of 1996. The field trial comprised installation of 86 pole units on utility poles in the Oak Cliff area of Dallas. Of the 86 pole units erected, 75 pole units were installed at intersections, 9 were in alleys, and 2 were on streets in the target area. The Memorandum of Understanding (MOU; see Appendix I) between the National Institute of Justice, ATI and the Dallas Police Department stated that a minimum of 75 pole units had to be active at any one time during the experimental test period. The test period ran from October 25 to December 16, 1996.

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[4] The gunshot location system tested in Dallas (as with other gunshot location systems) does not identify shots fired indoors. The technology is such that the acoustic sensing devices must have a clear path to the location of where the shot is fired in order for the sound to be detected.

V. DALLAS AS A RESEARCH SITE

The City of Dallas has a population of slightly over 1 million people and covers 378.4 square miles. The city's population is 48 percent white, 29 percent African American, and 21 percent Hispanic origin. The economic base of the city is both large and diversified and the unemployment rate of Dallas is below 6 percent. The poor in Dallas are not concentrated to the degree they are in other major cities: there are pockets of poverty all over the city with hundreds of apartment complexes and thousands of rental houses spread throughout the city offering low cost housing.

The Dallas Police Department employs about 2,700 sworn officers and just over 700 non-sworn civilians. The department is divided into six patrol operations divisions (see Map of Dallas Police Operations Divisions at Appendix II) that collectively fielded 1,613,455 total calls (dispatching 684,121 calls) and handled over 110,000 Part I crimes during 1993. The Police Department operates sixteen police storefronts located around the city in shopping centers and easily accessible office locations. Approximately 425 neighborhood crime watch groups operate in the City of Dallas.

Dallas enjoys a moderate climate during the winter months which was a consideration in the National Institute of Justices' decision to test the gunshot location system in Dallas. ATI personnel indicated that "...we were concerned that an excessively cold climate might damage the hardware components of the technology" (Personal Interview, ATI 10/30/96).

Experimental Site Selection

In early 1996, the National Institute of Justice (NIJ) issued a solicitation to police departments requesting applications to field test the SECURES™ technology. Under peer review conditions, and a competitive bid process, NIJ selected Dallas as the field test location. The Cincinnati Evaluation Team did not participate in the site selection process. Indeed, the NIJ solicitation for evaluating the SECURES™ field trial was issued *after* the Dallas site was already chosen.

The Dallas Police Department proposed to pilot test SECURES™ in eleven reporting areas in a community known as Oak Cliff in the Southwest Operations Division. This community was populated by a predominately poor, Hispanic population. The experimental target area was comprised primarily of residential housing units mixed with light industrial/commercial enterprises. The terrain in the Oak Cliff community was predominately flat and couched between two major commercial corridors with a park and large lake on the north side (see Map of Experimental Test Area at Appendix III). Official data from the Dallas Police Department indicate that these eleven reporting areas were over-represented in total calls for service for random shots fired. While random gunfire calls for service represented 1.1 percent of total calls citywide, they represented 4.6 percent of total calls in the experimental area.

The Dallas Police Department not only selected the experimental test site, but they were also responsible for deciding whether the community would be informed of the gunshot location system testing. The police department decided that residents of the Oak Cliff community would not be informed about the SECURES™ test. The Dallas Police Department withheld all press release and other program details of the field test site until the conclusion of the field trial (see Memorandum of Understanding, Appendix I). The decision by the Dallas Police Department, reflected in the MOU, not to inform the local community about the SECURES™ field trial removed any possibility for the University of Cincinnati Evaluation Team to document the partnership building between the police department and the community in using the technology to tackle the random gunfire problem in the Oak Cliff community.

Implementation of SECURES™ in the Experimental Test Site

In October, 1996 the National Institute of Justice developed a Memorandum of Understanding between the Dallas Police Department, ATI and the National Institute of Justice to guide the field trial of SECURES™ in Dallas (see Appendix I). The MOU sought to document the terms of cooperation between the agencies involved in the field trial of SECURES™. The MOU defined the Dallas Police Department's responsibility as "providing a host site for the SECURES™ technology." Accordingly, the Dallas Police Department agreed to provide the host site, provide open access to relevant data collected during the field test, maintain the level and intensity of routine patrol in the targeted area, provide the necessary manpower and desk space to maintain the monitoring equipment as well as office space and necessary supplies from which the evaluator could coordinate necessary research activities (MOU, 10/17/96). ATI agreed to: (1) set up, install, and maintain sensors on utility poles throughout the test area; (2) strategically locate a rooftop cellular repeater; (3) provide Central Communications Division with the equipment necessary to monitor the system; and (4) provide personnel in a timely manner to respond to malfunctioning equipment.

An implementation team was created to oversee the logistics of the field trial comprising several of the police chief's advisors, ATI personnel, field supervisors from both the Texas Utility Company and AT&T, a representative from the Central Communications Division, and a representative from the Southwest Operations Division. The Southwest Operations Division representative was appointed as the liaison between these coordinating agencies.

The gunshot location system installed in Dallas transmitted gunshot "alerts" to a PC computer ("the base station") installed in the dispatch room of the Central Communications Division. The information about the gunshot was displayed on the base station monitor and service call takers were asked to enter the information about the gunshot alert directly into the Computer Aided Dispatch (CAD) system.[5] The Central Communications Division provided personnel support to implement the critical link between SECURES™ and the police department's CAD system. The Central Communications Division also supported the evaluation teams' request to the Dallas Police Department to create a new "signal code" that differentiated citizen-identified calls about shots fired and SECURES™-identified alerts about shots fired. Citizen calls continued to be entered as a 6G signal code and SECURES™ alerts were entered as a 6S signal code. AT&T provided the phone line interface to enable gunshot information to be relayed from the receiver located in the experimental test area to the dispatch center located in the Central Communications Division.

The Texas Utility Company provided personnel to install the acoustic sensory devices (the pole units). Dallas police officers, in consultation with ATI, spent several weeks working with Texas Utility Company personnel to attach 86 pole units to utility poles in the experimental test area. These pole units were small (8.6 inches in length, 6 inches in height, and 3.6 inches in depth) silver boxes that were attached about three quarters of the way up the utility poles. ATI stated that:

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[5] A direct link from SECURES™ to a local police agency's CAD system would generally be created if the system was installed on a permanent basis. This link would enable automatic and 100 percent transfer of SECURES™ alerts into the CAD system.

"...the pole unit locations need reasonable openness with approximately four feet of clear space (clear of trees, buildings, etc...) around the utility pole for transmission purposes. [Additionally] the pole units need to be placed on poles which do not have transformers and they need to be well away from primary high voltage lines to avoid transmission interference" (Personal Interview, ATI, 10/30/96).

The Memorandum of Understanding (see Appendix I) stated that ATI would set up and install the acoustic sensors on utility poles. However, during the implementation phase of the project, the pole unit installation task became the primary responsibility of the Dallas Police Department with assistance from the Texas Utility Company. The Southwest Operations Division project representative received the sensory devices from ATI, contacted the utility company, and set up dates and times to install the pole units. Originally, the Texas Utility Company was asked to allocate 3 full days to install the pole units (Personal Interview, Texas Utility Company, 11/13/96). However, during the two months of field testing, the utility company was asked repeatedly to provide help with the installation of the pole units. The utility company was asked to assist the Dallas Police Department when units malfunctioned or when batteries needed to be replaced. Of the 86 pole units installed, 45 pole units had 6D cell lithium batteries with 5 months life expectancies and the remaining units had 3D cells with only 2 month life expectancies. Prior to the completion of the field trial 26 of the pole unit batteries had to be replaced.

The Texas Utility Company expressed several concerns about the SECURES™ field trial. One respondent from the utility company commented that "...my personnel are being pulled from their normal shift work, putting them behind schedule" (Personal Interview, Texas Utility Company, 11/13/96). One line officer commented that:

"I find it odd that ATI has given us no direction as to the side of the pole to put the sensor, the particular height or the direction of any of the acoustic sensors....this oversight has forced TU Electric to duplicate their efforts in a number of instances because we have been requested to meet in the test site and correct pole unit locations" (Personal

Interview, Texas Utility Company, 12/03/96).

In addition to the pole units and the PC "base station" located at the Central Operations Division, SECURES™ hardware also comprised a repeater. The repeater is a small compact unit that keys on cellular communication. The repeater was located on the roof of a nursing home less than one quarter mile from the Oak Cliff test site. The nursing home was selected by the Dallas Police Department based on Alliant's specifications for the repeater location:

> "The repeater has to be protected from lightning and power surges and it must be located at a relatively high altitude to ensure a direct transmission path to the various sensory units and the base station located in the Central Operations Division" (Personal Interview, ATI, 10/30/96).

The MOU stipulated that ATI would maintain all system hardware and provide personnel in a timely manner to respond to malfunctioning equipment. ATI claimed that "...all capability for the base station host to reconnect should function sufficiently without a technician onsite. This includes pole unit check-ins, re-setting the repeater and re-setting the base station host" (Personal Interview, ATI, 10/30/96). ATI also indicated that they could perform remote diagnostic tests from Arlington, VA to ensure that the system was operating correctly.

Roles of the Dallas Police Department and Alliant Techsystems Inc.

Implementation of SECURES™ in Dallas led to several tense periods between the Dallas Police Department and ATI. The fundamental source of tension revolved around misunderstandings about the quantity and manner in which resources were allocated to the field trial. The Memorandum of Understanding made it explicitly clear that the Dallas Police Department was committed only to providing the host site, providing open access to relevant data collected during the field test, maintaining the level and intensity of routine patrol in the targeted area, providing the necessary manpower and desk space to maintain the monitoring equipment as well as office space and necessary supplies from which the evaluator could coordinate necessary research activities (MOU, 10/17/96). However, as the project got underway, additional resources and cooperation were demanded of the Dallas Police Department. For example, the appointment of a Southwest Operations Division Third Watch Commander to monitor the SECURES™ technology was an extremely time consuming and demanding task. The Lieutenant-in-Charge of the Southwest Operations Division was required to transfer a portion of his watch commander's departmentally related tasks to other watch commanders on the same shift. Specifically, one Dallas Police Department supervisor remarked: "I had to rethink management issues and divert resources to cover my watch commander's responsibility as he was tied up with the system on a daily basis" (Personal Interview, Dallas Police Department, 12/14/96). At one point, the demands of monitoring the SECURES™ system required so much attention that the watch commander in charge of the system was forced to request assistance from another third watch commander.

The manner in which technology is introduced into a police agency influences the subsequent use of the technology. It is a monumental task for all those involved—from the police department to the vendors of the technology—to introduce a new piece of technology and to encourage police personnel to accept and utilize the technology in an effective manner. As Chatterton (1993:196) suggests:

> "...introduction of technology requires careful preparation, planning and implementation. Integrating technology with operational police work necessitates changes to existing procedures and systems, the introduction of new systems and the provision of adequate resources to support the technology."

Successful implementation of new technology into operational police work also requires informed suggestions as to how it might enhance police operations, continued support from upper level police administration, and integration into a well-designed and effectively administered system of planning and performance review. Interviews with both police department personnel and representatives from ATI suggest that SECURES™ was implemented in Dallas in a manner that was not particularly well planned.

VI. THE DALLAS POLICE DEPARTMENT COMPUTER AIDED DISPATCH SYSTEM

At the time of the SECURES™ field trial, there were four groups of personnel responsible for Dallas Police Department communications: 911 call-takers, service call takers, personnel from the Expediter Unit, and dispatchers. 911 call takers and service call takers were all non-sworn personnel. Personnel from the Expediter Unit and dispatchers consisted of both sworn and non-sworn personnel. The 911 call takers were employed by the Dallas Fire Department, while service call takers, personnel from the Expediters Unit, and dispatchers were employed by the Dallas Police Department. All city communications (e.g. fire, police, sanitation, code enforcement) were brought under collective city communications services in 1995. The basic function of the 911 call takers was to receive phone calls from citizens and transmit the calls to the police dispatchers if the call is an emergency and needs police attention.[6] All incoming calls were screened to ensure the call is properly directed and the appropriate service provided.

The 911 call takers assign all incoming calls for service a "signal code." The signal code represents the type of problem that the caller is describing. For example, calls for service regarding random shots fired are assigned a 6G signal code, calls about disturbances are assigned a 6X signal code, and calls about a shooting are assigned a 19 signal code. Each call for service is designated a unique and sequential "service call number"[7] and each call is automatically prioritized

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[6] If a 911 call taker gets a "hang up" they must make three call backs to the address of the original call. If there is no answer, the call taker assesses the original 911 call as a "hangup" and the dispatcher sends an officer to the scene. The 911 call takers can also reroute Hispanic complainants to Hispanic-speaking 911 operators.

[7] Unfortunately, not all service call numbers are routinely downloaded by the Dallas Police Department for crime analysis purposes. On review of all calls for service initially downloaded, 55,547 of 1,176,334 calls were not downloaded. The "missing" cases included on-view arrests,

within the CAD system depending on the designated signal code. However, a 911 call taker can increase the priority designation of any call by attaching 01 to the end of a selected signal code.

To differentiate citizen-generated calls for service regarding shots fired from SECURES™ identified shots fired alerts, the Evaluation Team requested that the Dallas Police Department create a new signal code for SECURES™ alerts. Citizen-generated calls continued to be tagged as a 6G signal code (as per general practices) and SECURES™ identified shots fired were tagged as a 6S signal code during the evaluation period.

In addition to 911 call takers, the Dallas Police Department employed what they call "service call takers." The service call takers worked 24 hours per day for 7 days of the week and were responsible for non-emergency related tasks. For example, service call takers made "call backs" to companies where a silent alarm has been activated; they placed requests for towing services when officers request assistance at scenes of automobile accidents; they verified warrants; and they placed calls for ambulance services (both air care and ground care).

The service call takers were designated as the entry personnel for the SECURES™ system. The SECURES™ base station was located immediately in their work area and when a shot was detected by the system, the service call takers were expected to enter the alert as a 6S call for service directly into the CAD system.

The Dallas Police Department also has an "Expediter Unit" (akin to a Telephone

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burglar alarms, and other "miscellaneous calls for service" that were n-coded as "disregard" (n-code = 1). Since we could not depict any specific criteria for not downloading the "missing" cases, we requested and subsequently retrieved 55,546 of the 55,547 missing cases. These missing cases were merged with the rest of the Dallas calls for service data. We should note that subsequent to our inquiries about the "missing" data, the Dallas Police Department now routinely downloads all service call numbers.

Reporting Unit) which was designed to save patrol officers from responding to non-urgent calls for service. The Expediter Unit received non-emergency offense incidents from 911 call takers such as property offenses where the suspect had previously left the scene or no suspect was identified. This unit is also responsible for handling calls for runaway persons.

Finally, the dispatchers are the critical link between the officers in the field and the communications division. The dispatchers receive information from either 911 call takers or service call takers and examine all incoming calls for their priority assignment. The priority code for each call is designated in color on their dispatch screen according to seriousness. Based on the priority of the call, dispatchers must attempt to dispatch a call within a pre-defined time frame: priority one calls must be dispatched in less than one minute; priority two calls must be dispatched in less than three minutes; priority three calls must be dispatched in less than eight minutes; and priority four calls must attempt to be dispatched in less than one hour. However, it must be noted that any call can be held over the desired dispatch time if higher priority calls are ahead of lower priority calls or if higher priority calls continue to come in while a dispatcher is holding lower priority calls. Random gunfire calls (both 6G or 6S) were considered priority four calls. As such, dispatchers attempted to dispatch a random gunfire call in under one hour. However, if higher priority calls came in (burglary in progress, shooting, disturbance, etc.) the random gunfire call could be held indefinitely.

We noted earlier that not all calls for service received by the Dallas Police Department are dispatched. In fact, of the 1.6 million calls for service received by the Dallas Police Department in 1993, just under 700,000 were dispatched. Calls for service are not dispatched for a number of reasons: (1) Similar or linkable calls may be referenced or n-coded to the primary call, saving patrol officers from responding to a number of calls that are in reference to one event; (2) 911 call takers and service call takers may receive call backs from citizens no longer in need of assistance; (3) 911 call takers may send a call for service to police dispatch when in fact it is not a police matter (which the police dispatchers will N1 the call and return it to the 911 call taker responsible for the mistake); or (4) calls may be routed to the Expediter Unit which does not require dispatching a patrol unit.

The CAD system in Dallas has two specific characteristics that impacted directly on our use of calls for service data in evaluating SECURES™: the way that the CAD system is designed to accept call-taker entries in the address field and the manner in which dispatchers link up calls for service. The address field in the CAD system had several limitations.[8] We encountered problems with street addresses, such as truncated address fields without prefixes (North, South, East, West) or suffixes (i.e. Rd., Av., Blvd.), misnamed streets such as Elsbeth Ave. for Elsbeth St., and dual entries with and without prefixes confounding counts by address. Intersections posed a major problem for the Evaluation Team. There appeared to be no standardization with respect to the street prefix that was listed first in the CAD address field. For example, one entry (call for service incident) in the address field might read N. Marsalis Ave. and E. 7th St. Another entry representing the same location might be entered as E. 7th St. and N. Marsalis Ave. Lack of standardization in the call data made the validation procedure difficult because we had to be sure that every possible combination of street addresses in the experimental area was written into the

[8] Since the Evaluation Team received downloaded versions of the CAD data in a database format, it is difficult to say whether the limitations in the data result from the original CAD entries or the downloading of the mainframe data into the database manager. In either event, the data used by the Dallas Police Department's crime analysts is the same as the data we received.

validation program. In other words, if we did not know that the dispatchers, on occasion, would enter E. 7th St. and N. Marsalis Ave. as N. Marsalis Ave. and E. 7th St. we ran the risk of ignoring a number of potential cases that could validate the SECURES™ technology. There were similar problems with respect to street suffixes (Rd., Ave., Blvd., etc..): dispatchers would enter Lancaster Rd. and E. Colorado Blvd. as the location of a SECURES™ alert when the correct designation should have been N. Lancaster Ave. and E. Colorado Blvd. While Lancaster Rd. exists in Dallas, it does not intersect E. Colorado Blvd. and it is well outside the three-quarter square mile experimental area.

Exclusion of either street prefixes or suffixes accompanied with the inclusion in some instances of intersections that either did not exist or crossed well outside the experimental area made it difficult to determine the intended location of some calls for service that had been entered into the Dallas CAD system[9].

The second characteristic of the Dallas Police Department CAD system that impacted directly on our evaluation of the SECURES™ field trial was the manner in which dispatchers (and sometimes patrol officers) linked up calls for service. Our collective knowledge of different CAD systems across the United States (for example Jersey City, NJ; Kansas City, MO; Oakland, CA;

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[9] The lack of quality control in the address field created many problems in analyzing the Dallas CAD data. Prior to analysis the address field had to be corrected. Thus, a series of programs checking street names against street numbers were required to identify the prefix and suffix of streets lacking these indicators. A master listing of street names was cross referenced to CAD streets to ensure the names, prefixes, and suffixes matched the master listing and that prefix and suffix fields were accurate for the address ranges. All intersections were cross referenced with north/south and east/west streets to ensure that north/south streets preceded east/west streets to ensure conformity and to avoid confounding counts by identifying single intersections in two different ways. While the procedures for accomplishing these objectives were relatively straightforward, they could be most efficiently accomplished through quality control at the data entry phase.

Boston, MA; Brooklin. MA; Westwood, MA; Redwood City, CA; San Mateo County, CA) reveals that police departments have their own unique systems for linking up calls for service. By "linking up" we refer to the assessments and decisions that are made, generally by dispatchers, that two or more calls for service are calls about the same event and thus require dispatching patrol cars to the call "event" and not to the individual calls for service.

The Dallas Police Department dispatchers, call takers, and patrol officers all contribute to making decisions as to how individual calls for service (each with their own unique service call number) should be linked together. Decisions to link up two or more calls for service are not made through any pre-determined criteria such as geographic proximity of two or more calls, time of calls, or type of calls. For example, two calls for service that are received within seconds of one another could be linked together even if the callers report problems (e.g. fighting) that are several blocks from one another. If the call takers, dispatchers, or patrol officers believe that the calls are about the same incident, then the calls will most likely be linked together. Similarly, if two calls about drug dealing are made 20 minutes apart but are at the same location, then these two calls will most likely be linked together.

The procedure to link up calls for service and dispose of calls in Dallas is through "referencing" and "n-coding" service call numbers. The system includes five n-code categories: N1 — disregard the call (e.g. the dispatcher n-codes a call when another officer contacts the dispatcher and offers to take the call); N2 — dispatcher decides that the new, incoming call is the same event as an earlier call and does not, therefore, dispatch the new incoming call for service; N3 — no complainant is found at the scene so the patrol officer alerts the dispatcher to cancel the call (via N3); N4 — false alarm; N5 — Civil matter. The "referencing" procedure allows dispatchers and patrol officers to specify which call (originating call) a new incoming call (referenced call) will be attached to.

Dispatchers in Dallas tended to link cases across a number of dimensions[10]: (1) Time of call — if the calls are "close" in terms of time, they are most likely to link the cases. Close, however, can mean anywhere from a few seconds apart to more than one hour apart. The longest time period between two subsequently linked calls was four hours and two minutes. Most calls, however, were temporally close with a mode of one minute, a median of two minutes and mean of sixteen minutes;[11] (2) Location of call — if the calls are geographically close, the dispatchers will most likely link the cases. What "geographically close" means, however, is up to the dispatcher; (3) Type of call — if one caller reports a disturbance and another reports shots fired, then the dispatcher will most likely link these two calls together if the time and place of the reported incidents are "close". Once again, it is dispatcher discretion as to which calls get linked together. The combination of these three factors leads dispatchers to link two or more calls for service together. An example may clarify the linking process: if a citizen calls about a gunfire problem at 11:05 am (service call number 83067) and at 11:07 am another citizen calls about shots being fired (service call number 83070), both callers may give different addresses as to where the shots are coming from, but dispatchers recognize that the addresses are "close by." Both of these

[10] We conducted a series of random observations of call takers and dispatchers in Dallas to ascertain their patterns of referencing and linking up calls for service.

[11] In some instances calls are cleared by a supervisor many hours after the call has been completed. This results from a failure of communication between officers and dispatchers. Thus, some calls are not cleared until over twenty hours from when it was received. We made a decision to limit calls in our analysis to five hours to correct for mistakes in the time cleared field and to account for outliers which limit the usefulness of our means analysis.

unique calls have their own unique service call number and signal code designations as 6G (citizen identified random gunfire). The dispatcher would typically reference service call number 83070 to service call number 83067 and then dispatch the 83067 call to a patrol officer.

VII. SECURES™ SYSTEM PERFORMANCE

A mechanical detection device, like SECURES™ is subject to four possible outcomes: Two of these potential outcomes are correct and two constitute errors. When functioning ideally the detection device emits a warning when confronted with the appropriate stimulus (**true positive**) and remains inactive in the absence of the stimulus (**true negative**). Errors occur when the device emits a warning in the absence of the appropriate stimulus (**false positive**) or fails to emit a warning when the stimulus is present (**false negative**).

An example of such a device is a smoke detector designed to warn potential victims. When no smoke is present the device should remain in its neutral state, emitting a warning only when its sensors detect smoke. Thus, when the device is neutral no warning is produced (**true negative**) and no evasive actions taken. When smoke is present the device activates an alarm (**true positive**) and corrective actions taken. A potential danger occurs when the device reacts without the presence of smoke (**false positive**) since evasive action is undertaken needlessly and when it fails to activate when smoke is present (**false negative**) since necessary evasive actions are not taken.

Under perfect operating conditions the SECURES™ system alerts dispatchers with a light, buzzer, and map indicating the location of the shot when a shot is fired. Dispatchers then mobilize and deploy officers to investigate the incident. While SECURES™ is neutral, the dispatcher assumes no shots are being fired. Resources are expended when shots are fired and detected (**true positive**) and conserved when shots are not fired nor detected (**true negative**).

The usefulness of SECURES™ is contingent upon its ability to accurately respond to the appropriate stimulus, since **true positive** and **true negative** responses result in optimum police efficiency. **False positive and false negative** outcomes reduce police efficiency or waste resources. An evaluation of the SECURES™ system, therefore, must attempt to assess the proportion of false positive and false negative outcomes.

Although the ability of SECURES™ to identify gunshots has been assessed in laboratory and other settings (see Page and Sharkey, 1995), its accuracy has not been examined in a major metropolitan area under varied conditions. A major focus of our proposed evaluation, therefore, was to expand the generalizability of findings to urban police settings. Thus, the ratio of **false positive** and **false negative** outcomes under varying conditions in an urban setting was a critical research question in the evaluation.

We originally proposed a controlled field trial of SECURES™ involving shooting blanks from two types of weapons and 1" firecrackers as an innovative way to evaluate SECURES™. Our design would have allowed us to assess the accuracy (time, location, type of shot) of SECURES™ recording system and validate the likelihood that 1" firecrackers will record false positives in 20 percent of cases (see Page and Sharkey, 1995). Our rationale for proposing to fire test shots is outlined below.

Since SECURES™ detects sound waves and ascertains, via an algorithm, whether they represent a discharged firearm, our proposed experimental conditions planned to vary sound, location and time randomly to ascertain the ability of the SECURES™ system to distinguish gunshots. By experimental control of the time, location and sound of discharges, researchers would have been in a position to ascertain an estimate of the four outcomes described above.

Ideally, regardless of time, location or the type of discharge[12] SECURES™ would identify

[12]Blank 38 caliber shot or 1 inch firecracker.

blank shots as **true positives** and firecrackers as **true negatives**. However, if randomly assigned urban acoustics differentially impact the effectiveness of the existing algorithm both **false negative** and **false positive** outcomes could be recorded by the dependent variable — SECURES™. For example, regardless of time and location of discharge, a 1 inch firecracker should not emit a response (**true negative**) by SECURES™. However, if the system detects this sound as a gun shot a **false positive** response will be recorded. Since this response would needlessly require mobilization and deployment an estimate of the unjustified time and costs could be assessed. Similarly, if a 38 caliber blank discharge failed to alert SECURES™ an estimate of **false negative** outcomes can be made. These estimates would allow researchers to qualify any cost benefit analysis by estimating costs accrued by the system (**false positive**) as well as foregoing potential benefits available (**false negatives**).

False negative outcomes, to some extent, do not present a major problem for policing. **False negatives** occur when a non-detected shot is fired. Prior to installation of the SECURES™ system, a discharged firearm was detected by police or reported by a citizen. If neither the police nor citizen detected and reported a shot, no activity was initiated by the police. The failure of SECURES™ to detect a shot, in the absence of police or citizen detection, would place police in no worse situation than before the installation of the system. Even in situations where citizens or police detected a shot which SECURES™ did not, police response would be unaffected by the installation of SECURES™; although variations in program algorithms to enhance the system's usefulness may be appropriate.

False positive outcomes, on the other hand, require the needless mobilization and deployment of police resources which would not otherwise be deployed and thus poses a much greater problem for policing than the possibility of false negatives. False positives both increase the costs for police and potentially diverts police attention away from other problems. Thus knowledge of the **false positive** rate is essential to estimating the effectiveness of the system.

Thus, a field experimental design, which allows for random manipulation of the time, location and type of discharge is essential to evaluating the effectiveness of the SECURES™ system. By providing estimates of **true positive, true negative, false positive** and **false negative** rates the overall usefulness and cost effectiveness of the system in an urban police setting can be most effectively evaluated.

The evaluation team, with help from the National Institute of Justice, spent many weeks requesting that the Dallas Police Department permit test shots to be fired, under controlled field trial conditions. We asked the Dallas Police Department to set parameters of the test (e.g. one week of testing, one day of testing, types of blank rounds to be fired, number of rounds to be fired per test shot, total number of shots to be fired). Indeed, from the evaluation team's perspective, our preference was to go forward with even a handful of test shots fired, so that we would have had some estimate of the false positive and true positive rate of SECURES™ detection.

Unfortunately, the Dallas Police Department could not allow any test shots to be fired. As Chief Click stated in a letter dated December 13, 1996 "...in the best interest of the Department the shots should not be fired."

Our inability to fire test shots significantly impinged on our ability to assess SECURES™ rate of accuracy in reporting shots fired. As such, we were forced to develop other methods for evaluating the performance of SECURES™. One method that we proposed was to place a civilian observer in the experimental area at hot spot locations and have them listen for shots being fired.

The goal of this method was to identify the rate of false negatives and false positives. There are many problems, however, with this type of method: (1) a shot could be fired but the observer does not hear the shot (missing data); (2) we expected a low base rate of shots being fired and therefore very little chance of the observer actually hearing a shot when a shot was fired; (3) the inability of the observer to pinpoint the location of the shot; and, (4) we were concerned as to observer safety. As such, we did not employ this assessment method.

A second method that we proposed was to examine police investigations of SECURES™ identified shots fired. With this method, patrol officers were to complete a Miscellaneous Incident Report (MIR) each time they responded to a SECURES™ identified shot-fired call for service during a one week period. This method sought to locate citizens who may have heard the shot fired but did not report the shot. However, the problems with this method include: (1) citizens could fail to recall hearing a shot fired; (2) they could mistake a similar sound for a random gunshot; or, (3) they could make a mistake identifying the correct location of the sound they heard. Subsequently, it is an unreliable method to determine whether, in fact, a shot was fired. Nonetheless, the Dallas Police Department agreed to employ this method during the final week of the experimental test period. We report these results below.

Starting December 11 and ending December 16 the Deputy Chief of the Southwest Operations Division ordered all officers responding to 6S calls for service to generate Miscellaneous Incident Reports (MIR). This required officers to stop at the dispatched location, search for witnesses as well as evidence of random gunfire. Over the six day period a total of 21

6S incidents were followed up with MIRs.[13] The MIR data indicated that the majority of 6S incidents occurred during third watch.[14] Similarly, officers indicated that most incidents were believed to be located on public streets or intersections. The department's 6 day effort of completing MIR's uncovered 1 event out of a total of 21 that could attest to the ability of the system to detect sounds similar to gunfire. Specifically, on December 16 an officer was dispatched on a signal 6S call to a location where juveniles were releasing "champagne poppers" (firecrackers with .25 grams of gun powder). Upon arrival at the scene, the officer noticed the juveniles were located directly beneath an acoustic sensor. The responding officer stated that he believed the pops from the firecrackers were setting off the SECURES™ system.[15]

The final method used to assess the performance of the SECURES™ technology entailed matching Dallas CAD data (namely citizen calls for random gunfire - signal 6G) against SECURES™ alerts for random shots fired (signal 6S). This method is useful to determine true positive alerts, but not appropriate for detecting false positive rates.

ATI identified N = 215 gunshot events during the experimental test phase. These were the total number of shots that were picked up by SECURES™ system either in Dallas, TX or in Alexandria, VA. Not all of these shots necessarily were entered by the service call takers as 6S

[13] There were actually 27 6S calls dispatched during this period. These 27 calls comprised 25 events. Thus, MIR reports were gathered for 78 percent of this total and 84 percent of the events.

[14] The third watch accounted for roughly 49 percent of the 188 6S calls during the experimental period.

[15] A search of the offense report database failed to reveal an offense report for this event. Since no information was available on the size of the firecrackers used, no assessment of the 20 percent false positive rate for firecrackers could be estimated.

shots.[16] We examined this full list of data, however, to allow for the fairest test possible and to minimize the false negative possibilities of SECURES™ (when a citizen hears a shot but SECURES™ fails to detect the shot). By including all sources of data from ATI that could identify a shot being fired we seek to give SECURES™ the greatest chance of validation.

Not only do we include all sources of information in this validation procedure, but we also include the "triangulated" address of the shot if indeed ATI was able to provide the triangulated location of the shot (29 percent of the time ATI provided triangulated locations).[17] As we have discussed earlier in this report, the gunshot location system that was installed in Dallas during the test period did not triangulate the incoming data in such a way that the precise location of the shot could be identified on a real-time basis. ATI stated that they had developed the procedures to triangulate the shot locations, but that they did not have time to modify the SECURES™ software to include the triangulation routines.[18] As such, in Dallas, the location of the shot was identified as the pole unit location that first identified a shot being fired. Since the pole unit locations were

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[16] 188 (87.4 percent) of 215 ATI identified shots were entered into the Dallas CAD system. Two primary reasons could account for oversight on the part of the service call takers. First, they may have disregarded the SECURES™ alert, and cleared the call without entering the information into the CAD system. Second, and more likely, the system may have been down in Dallas and therefore, the information was not readily available at the time the incident occurred (System was down in Dallas 11.9 percent of the time).

[17]Throughout this discussion we speak of triangulated shots based on Alliant's claim that some shots were triangulated. We did not assess the ability of Alliant to accurately and reliably identify such a triangulated position. This ability is based in part on algorithms of delay times for acoustic waves to reach spatially distant sensors. Acoustic properties were not tested in the Dallas urban environment by the University of Cincinnati or to our knowledge by ATI. Thus, for this report, we take at face value such claims.

[18]While utilized here for their purported increase in accuracy, the triangulated locations did not provide immediate or long term crime analysis benefit to the police.

fixed locations, the system would report the pole unit location as the "shot fired location." Obviously, this pole unit location was oftentimes not the true location of where the shot was fired. As such, there was an error rate in the system that could reduce the possibilities for many of the shots identified by SECURES™ when these shots were being confirmed by citizen generated calls about shots being fired.

An example should clarify the way SECURES™ identified "shots": a person fires a shot at 345 E. 6th St that is about half way down on the north side of the face block between two intersections (N. Patton Av. and E. 6th St. and N. Denver St. and E. 6th St.). The person fires the shot at 11.03 am. The pole unit located at N. Patton Av. and E. 6th St. "hears" the shot as does the pole unit at N. Denver St. and E. 6th St. The N. Patton Av. and E. 6th St. pole unit reports the shot first into the SECURES™ system. The SECURES™ system, based on predetermined parameters, validates that the sound wave was indeed a shot. The technology then alerts the service call taker (via a beeping noise at the SECURES™ computer) that a shot has been fired. The location of the shot being fired is reported to the service call taker as N. Patton Av. and E. 6th St. A citizen also hears the shot and reports the shot to the police. By the time the citizen listens to the sound, goes to the phone and reports the shot to the police, 5 minutes have lagged. The citizen says that he heard the shot at about 205 E. 5th St, which is on full block Northeast and caddie corner to the location of the shot identified by SECURES™. This shot is recorded as a 6G call for service in the Dallas Police Department CAD system as 205 E. 5th St. at 11.08. While it can be seen that there was a minimal time lag between the SECURES™ alert and the citizen call for random gunfire (5 minutes) there is a clear distinction between the location reported by the technology and the citizen report. This makes it difficult to determine whether or not both reports of random gunfire refer to one incident, given uncertainty in both the system's and citizens ability to pinpoint the shot location. Efforts to assess the performance of the technology using calls from citizens is complicated by the occurrence of random shots similar to the above example.

ATI identified 215 shots. Of these, 131 shots (60.9 percent) were identified as being at a pole unit and were not triangulated, 51 (23.7 percent) were identified as being at a pole unit and were able to be triangulated by ATI. Twenty shots (9.3 percent) were identified as being at a pole unit located in an alley and were not triangulated, and thirteen of the shots (6.0 percent) were provided to the evaluation team as triangulated locations of shots fired in Dallas during the test period but were not recorded in the Dallas-based SECURES™ system as pole unit alerts. These 13 shots were most likely shots that were identified when SECURES™ was temporarily shut down in Dallas, but were recorded in the Alexandria, VA based system. All told, there were 151 shots identified that were not triangulated (70.2 percent) and 63 shots identified that were triangulated (29.3 percent) to a more precise location.[19] For those shots identified that were triangulated, we use the triangulated location as the validation address. We believe that the triangulated location would have a greater chance of being validated than the non-triangulated location. As such, our decision to use the triangulated location provides the fairest test of SECURES™ performance.

For each of the 215 ATI shots, we mapped the locations of where they identified the shot being fired. We then geocoded and mapped all of the Dallas Police Department calls for service

[19]Given our previous discussion this could either be more or less precise depending on the accuracy and reliability of the alogarithms. In either event these issues relate to an assessment of the technology per se, rather than its usefulness to the police. If the system is down or software development is incomplete the systems usefulness to the police is curtailed.

data that could reasonably be related to a "shot fired" call for service. The signal codes included 6S (SECURES™ shots entered into the CAD system), 6G (citizen identified shots), 6X (disturbance calls), and 19 (shootings). We then created three unique radius searches (300 feet, 600 feet and 1,000 feet) for each of the 215 SECURES™ identified shots. A boundary search was conducted for each of the 215 SECURES™ identified shots. As such, calls from the CAD system could fall into multiple boundaries. We allowed for calls to fall into multiple boundaries because we did not want to make a decision a priori as to which shot the CAD-identified shot fired call should be linked to. Moreover, we wanted to give each SECURES™ identified shot the best chance of being confirmed that we could. We report only the search results from the 1,000 foot radius analysis. We suggest that the 300 feet and 600 feet radius searches are too restrictive for our purposes. Since a 300 foot search radius only spans out about one block and a 600 foot search radius only spans out about two blocks, we were concerned that if a citizen called about a shot and reported an address three blocks from the pole unit, then it would be missed in our assessment process. Moreover, since the majority (70.2 percent) of the SECURES™ identified shots were not triangulated, we knew there would be an added error rate and that the more liberal 1,000 foot radius search would be more forgiving than the more restrictive 300 or 600 foot radius searches.

For each SECURES™ identified shot and for the 1,000 feet radius search we examined all calls for service that were received within 30 minutes of ATI detecting the shot being fired. Originally, we planned to use 5 minute, 10 minute, 15 minute, 20 minute, 25 minute, and 30 minute cut-off periods. However, we suggest that using a 30 minute cut-off period provides the best possible chance of confirmation. As such, we focus on all calls matching up to the

SECURES™ identified shots that came within 30 minutes of the ATI detected shot.[20]

An example may clarify the process involved: a SECURES™ alert occurred on 10/27/96 at 01:15 as recorded by ATI. It was identified and transmitted to the dispatcher who initially dispatched a 6S call at 01:16. This was immediately followed by a citizen call at 01:17 and a second citizen call from the same address 21 minutes later at 01:41. The initial SECURES™ alert is identified as a green icon and the 6S call is displayed as a red icon. The two 6G calls overlapping based on the same address are depicted in blue. Since all calls are within the 30 minute limitation imposed and within the 1000 foot radius they are identified as confirming shots for the initial alert at 01:15.

Our technique for assessing the performance of SECURES™ using calls for service data is significantly flawed. As discussed above, there are four outcomes of a SECURES™ identified alert of random gunfire: (1) true positive — when a shot is fired and SECURES™ identifies the shot (2) true negative — when SECURES™ does not identify a "shot" and there is truly no shot fired (3) false negative — when SECURES™ fails to identify a shot when in fact a shot has been fired (under-reporting) and (4) false positive — when SECURES™ identifies a shot when in fact a shot has not been fired (over-reporting). Our assessment method only partially addresses these issues, and the method introduces several error possibilities that are impossible to disentangle. For example, our assessment system has to assume that citizens accurately identify and report actual gunfire. Arguably, both the citizens and the gunshot location system could be wrong in their

[20] We would not expect any calls for service being made prior to SECURES™ identified detected shots because the technology picks up the sound of the shot and relays the information to the system within 1 second of the shot being fired. We have no reason to expect that a citizen could hear a shot, dial 911, and report a shot being fired in less than one second. As such, we only examine the "post-period" after Alliant has detected the shot being fired.

identifications of a shot being fired: a citizen may hear a car backfire and mistakenly report it as a shot fired. Similarly, the gunshot location system could mistakenly report the car backfire as a shot fired. Our technique would count this case as SECURES™ accurately reporting a shot fired. Our assessment system is also reliant on citizens actually reporting an incident, yet we expect that there is a low reporting rate of shots fired incidents. Moreover, we have no way of knowing the rate of non-reporting. Therefore, we cannot estimate the reporting incidents against SECURES™ identified shots.

With these extensive limitations in mind, Table 1 provides the results of our assessment method where ATI-identified shots are validated by CAD system events that fall within a 1,000 foot radius of the ATI identified location and within 30 minutes of ATI identifying the shot being fired.[21]

Table 1: Number and Percent of SECURES™ Identified Shots Validated by CAD Calls

	Validation by Signal Code			
Total SECURES™ Alerts	**N 6S**	**% 6S**	**N 6G**	**% 6G**
215	174	80.9	23	10.6

This table shows that of the 215 ATI identified shots fired, 174 of the shots (80.9 percent) were validated by at least one 6S call for service entered into the CAD system. This means that 80 percent of the shots that SECURES™ identified (either in Dallas or in Alexandria, VA) were entered into the CAD system by a service call taker. The 20 percent of SECURES™ identified

[21] Appendix IV provides additional computer output and documentation for the 1000 foot radius validation.

shots that did not get entered into the CAD system could be for one of two reasons: service call takers did not bother to enter the shot and "cleared" the system alert without entering the call into the CAD system or the SECURES™ system was "down" in Dallas and thus the shot was not reported in a timely manner to the service call takers.[22] Obviously, the percent of ATI identified shots entered as 6S calls into the CAD system does not serve to validate the system. It merely illustrates the compliance rate of service call takers in entering the SECURES™ alerts into the CAD system.

Of the 215 ATI identified shots, only 23 (10.6 percent) could be matched against a citizen call about a shot fired. Recalling that these matches are within 1,000 feet of the ATI identified call and within 30 minutes of the shot being identified, we suggest that an 11 percent match rate is very low. This means that either citizens simply do not call the police very frequently about shots being fired and the Dallas Police Department has an enormous under-reporting rate of shots being fired, or the gunshot location system has a very high rate of false positive recordings of shots being fired. With this latter explanation, if the gunshot location system significantly increases the workload of the police (in terms of the number of calls for service that the police are dispatched to as a result of installing SECURES™ -- see Section X) and if a high percentage of these dispatched calls are in response to false reports of shots fired, then the police would expend huge amounts of resources in responding to false alarms with the installation of a gunshot location system such as the one installed in Dallas by ATI.

The former explanation, however, is that the gunshot location system could be uncovering

[22] During the test period ATI reported that 10,349 of 76,740 minutes (11.9 percent) were recorded as "downtime."

a much more serious problem of random gunfire than what the police had previously known about. Without test shots being fired in the field to validate the gunshot location system, we have no reliable method for assessing whether the system is a potential source of increasing unnecessarily the workload of police or providing valuable information about a serious and largely unknown problem.

VIII. RESPONSE TIME ANALYSIS

The Dallas Police Department was free to use the SECURES™ technology in any way wanted: they could leave their response policies intact and respond to gunfire calls in the same priority manner as before; they could use the technology as a problem-solving tool; or they were free to advertise the technology to the community and implement a community awareness campaign. The University of Cincinnati Evaluation Team provided suggestions to the Dallas Police Department regarding the variety of operational uses of the gunshot detection technology. But it was the police departments prerogative in how they would use the technology during the field trial.

Gunshot Location Systems as a Rapid Response Tool

SECURES™ was heavily marketed by ATI as a technological tool to help the police respond more rapidly to random gunfire. Literature from ATI suggests that SECURES™ can decrease the response time of police by 85 percent and increase the arrest rate of people firing weapons by 40 percent (see Alliant Techsystems Proprietary, no date). From Alliant's perspective, SECURES™ was originally envisaged as a tool to get the police to the scene of a shooting quicker than what they could if they were dependent on citizens calling to let police know about shots being fired. As such, principal performance indicators provided by ATI claimed that the system could lead to a 85 percent decrease in response time and a 40 percent increase in arrests of persons firing their weapons. This "rapid response" application of gunshot location systems fits within a traditional policing model. Indeed, rapid response to calls for service is the cornerstone of traditional policing and is based on the assumption that decreased police response time to citizen calls for service will increase the likelihood that an arrest will occur and therefore reduce crime (Goldstein, 1990; Sparrow, Moore, and Kennedy, 1990).

Rapid response, although it seems to make intuitive sense as a strategy to apprehend criminals, is not without its critics (see for example Manning, 1992; Sherman, 1989; Sparrow et al., 1990). The first criticism of rapid response policies is that for the majority of calls to the police, rapid response is simply not necessary (Manning, 1992; Sherman, 1989; Sparrow et al., 1990). Most calls for service are just that: calls for *service* not calls for law enforcement related activities. Research indicates that citizen requests for police services are crime related in only 10.3 percent to 19.2 percent of cases (Gilsinan, 1989; Scott, 1981; Wilson, 1976). Even when a call is crime-related, Sparrow et al. (1990), reporting from a study in Kansas City, found that only two percent of the city's serious crime calls actually required a rapid response. Whether the police are able to respond quickly, then, does not appear to be relevant for the vast majority of calls for service.

A second criticism of rapid response policies relates to the effectiveness of rapid response when a criminal event has occurred. In these cases, at least, the police could hypothetically respond quickly and apprehend a criminal. Manning (1992:377) indicates that "reduced response time does, under certain circumstances, minimally increase the likelihood of an arrest." Sherman (1989:157) however concludes that "rapid response by police makes little contribution to the apprehension of criminals or the prevention of victim injury in the overwhelming majority of calls." Overall, rapid response can be effective in apprehending criminals or reducing injury, but only under limited conditions.

A third criticism, and a specific problem with marketing gunshot location systems as a rapid response tool, draws from what we know about the way police have, in the past, responded to technological alerts about possible crime events. We suggest that police response to burglar alarms is perhaps the closest analogy to gunshot location system alerts of shots fired. The police, while not physically present at the location of the alarm system, can receive vital information about activities occurring. In effect, the ability of the police to monitor, respond to, and possibly deter criminal activity is extended with the introduction of technology. Unfortunately, however, burglar alarms often detect burglars when none are present (false positives). In a review of the use of burglar alarms in Dallas, Dixon and Stallo (1996) found that an average of 7.6 burglar alarm calls are received for every one "true" burglary: ranging from a low of 3.2 alarms to a high of 18.1 alarms in some parts of the city (Dixon and Stallo, 1996:5). The utility of rapid response (or any type of response) to burglar alarms is minimized as the rate of false alerts increase.[23] We explore the issue of "false alerts" with gunshot location systems in Section XI of this report.

The fourth criticism with rapid response policies generally in policing concerns the way crime events become known to the police. If it is not technology that is alerting the police to a problem, more often than not it is citizens that are calling the police about a problem. Spelman and Brown (1984), in a study of citizen reporting of criminal events, echo earlier findings concerning the necessity of rapid response, and argue that citizen reporting may be part of the problem. Even for what they term "involvement crimes," in which the offender is still at the scene when the victim calls the police, the likelihood of response-related arrest is low (Spelman and

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[23] Many police departments across the United States have implemented policies that assess fees and fines to residences and businesses that generate a substantial number of false burglar alarms annually. In Dallas, TX the department has tried to recover lost revenue as a result of responding annually to numerous false burglar alarms by assessing residences a $25 fee and businesses a $50 fee for every false burglar alarm they respond to after the fifth one (Telemasp Bulletin, April 1996).

Brown, 1984). The principal reason for a low likelihood of arrest is because of citizen delays in reporting offenses. The delay of only a few minutes usually results in the offender leaving before the police respond. When citizens delayed for five minutes, they might as well have delayed for an hour because the chances of arrest were about the same (Spelman and Brown, 1984).

Traditional police response to random gunfire is dependent on citizens calling the police. Citizen reporting of a shot being fired is dependent on (1) the citizen hearing the shot, (2) the citizen being able to discern the noise as gunfire, (3) the citizen making the decision to call the police within seconds (or within a "reasonable" time frame) of the shot being fired, and (4) the citizen being able to tell the police exactly where the shot was fired from. For the citizen report to result in an arrest, the police would need to dispatch a patrol car to the location depicted by the citizen, the reported location would have to be the true location of the shot, and the person who fired the shot has to remain at the scene. For crime events, like random gunfire, the dependency on these types of factors makes it highly unlikely that the gun shooter will be arrested.

Gunshot location systems, if defined as a rapid response tool, removes many of the citizen-dependent contingencies outlined above, assuming for now that the technology is in fact an accurate alert system. Gunshot location systems are not dependent on citizens hearing the shot, they are not dependent on citizens knowing if what they heard was indeed a shot being fired, they do not require citizens to report random gunfire, and they are designed to pinpoint the location of the shot. With a one second delay in the system reporting the incident, one could argue that the police would have a much better chance of apprehending a suspect than if they were reliant on citizens reporting the gunshot event.

Police departments that seek to tackle random gunfire problems using rapid response strategies may identify gunshot location systems as an important tool. In Dallas, however, the dispatchers responded to random gunfire calls for service as a priority four call (low priority) where they had to dispatch the call within one hour of the call being received. For an agency like Dallas that does not place high priority on responding quickly to random gunfire alerts (and did not change the random gunfire response priority during the field trial), the implementation of a gunshot location system will not likely change the response time to shots fired alerts nor improve the chances of arrest without modification to their priority dispatch system.

ATI was particularly disturbed to learn that the Dallas Police Department did not place high priority on responses to reports of "shots fired." Moreover, the lack of a rapid response policy to a "shots fired" call for service significantly changed the manner in which SECURES™ could be evaluated in Dallas. For instance, using reduced response time and increases in arrest rates as performance measures of the system would not provide a fair test of SECURES™.

Response Time Analysis

Our response time analysis of SECURES™ draws from the Dallas Police Department calls for service data. All calls for service data from January 1994 through December 1996 were gathered from the Dallas Police Department. In total there were 1,176,334 calls for service citywide from January 1, 1996 to December 18, 1996. There were 12,566 calls for random gunfire during 1996, representing 1.1 percent of all calls for service in the city. The citywide rate for random gunfire, however, is substantially lower (1,266 per 100,00 people) than the rate for random gunfire in the experimental test area (4,119 per 100,000 people).[24]

[24] These data are based on the 1992 census utilized by the Dallas Police Department in the block and track census data. The census reports a citywide population of 992,493 and a population for the experimental area of 11,192.

For our evaluation purposes, we defined the experimental test area as every intersection in the test zone with a SECURES™ pole unit and the adjoining blocks to that intersection. In total there were 80 intersections and 170 face blocks in the experimental test area. The experimental boundary for evaluation purposes[25] was East Colorado Boulevard to the North, North Bishop Avenue to the West, East Jefferson Boulevard to the East, and West Davis St/East Eighth Street to the South (see Appendix III). To assess the way that the Dallas Police Department responded to random gunfire calls for service we carefully selected two control areas to compare against possible changes in the way police responded to random gunfire in the experimental test area. These control areas were selected based on the following criteria: extent of random gunfire problems, total size of population, demographics of the population, type of housing, mixture of residential and commercial uses of property. Based on these criteria, we identified two areas in Dallas that were adequate matches to the experimental test area: one located in the Central Operations Division and the other located in the Southwest Operations Division less than ½ mile from the experimental test area. Table 2 below summarizes some of the basic information for the study areas.[26]

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[25] The original boundaries of the field trial had to be adjusted because of a lack of pole units to adequately cover the entire area. This lack of pole units altered the boundary of the experimental area as follows: the Northern boundary streets were Neches St., Eldorado St., Fifth St. and E. Colorado Blvd. The Eastern boundary was E. Jefferson Blvd. and N. Ewing St., the Southern boundary was E. Eighth St. and E/W Davis St. and the Western boundary was N. Bishop Ave. For our analysis, we extended the boundaries by one face block, since for the most part, the boundaries were marked by pole units at intersections and we wanted to make sure we did not inadvertently missed any possible linking cases. ATI assumed no responsibility for identifications beyond the boundaries noted above.

[26] We decided to examine fluctuations in random shots fired in two control areas for several reasons. First, Control Area I provided the best match to the experimental area outside the Southwest Operations Division. However, the match in Control Area I was not as good as the

Table 2: Comparison of Experimental and Control Areas

Experimental	**Control I**	**Control II**
Southwest	*Central*	*Southwest*
11 reporting areas	16 reporting areas	7 reporting areas
11,192 people	15,975 people	11,658 people
75% Hispanic	58% Hispanic	65% Hispanic
422 shots annually per 10,000 people	213 shots annually per 10,000 people	330 shots annually per 10,000 people

The experimental area had the highest rate of random gunfire (422 shots per 10,000 people) and the largest proportion of Hispanic people (75 percent) compared to the two control areas. The closest match for comparison purposes was Control Area II. With approximately 400 more people than the experimental area, Control Area II had a similar proportion of Hispanic residents (65 percent as compared to 75 percent) yet a slightly lower rate of random gunfire incidents over a one year time period. This is not surprising, however, as Control Area II and the experimental area were within one half mile of each other and both under the jurisdiction of the Southwest Operations Division.

To assess the impact of SECURES™ on police response time we examine calls for service data from the Dallas Police Department during 1996 in the three study areas. Table 3 compares the mean response times for citizen initiated calls for random gunfire between the experimental

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match in Control Area II. The problem, however, with Control Area II is that the geographic proximity to the experimental test area had the potential to confound the results of the field trial. That is, if there was a displacement or diffusion of benefits effect of the gunshot location system then changes in random gunfire in Control Area II could have been the result of the technology.

and control areas (both I and II) prior to SECURES™ testing.

Table 3: Mean Response Times (in minutes) for Citizen Initiated Shots Fired Calls Prior to SECURES™ Testing — Experimental and Control Areas I & II

	Time Call Received to Time Call Dispatched	**Time call Received to Time Officer Arrived**	**Time Officer Arrived to Time Call Cleared**	**Time Call Received to Time Call Cleared**
Experimental Area				
6G (N = 236)	20.28	24.98	14.39	39.38
Standard Dev.	31.08	32.68	17.81	36.02
Minimum	0.00	0.00	0.00	1.00
Maximum	196.00	203.00	129.00	213.00
N of cells	165	165	165	165
Control Area I				
6G (N = 278)	10.71	13.86	15.94	29.27
Standard Dev.	17.69	17.88	17.26	24.01
Minimum	.00	.00	.00	.00
Maximum	110	114.00	99.00	175.00
N of cells	189	189	189	189
Control Area II				
6G (N = 265)	19.00	22.50	16.84	39.34
Standard Dev.	25.69	25.08	30.64	36.61
Minimum	.00	1.00	.00	1.00
Maximum	135.00	138.00	186.00	202.00
N of cells	187	187	187	187

* Cell counts standardized by listwise deletion of missing data.

As Table 3 shows, the time afforded random gunfire calls for service prior to SECURES™ testing was quite similar in both the experimental area and control area II.[27] The

[27] Two nuances of the call data are worth noting. First, the time between a random shot being fired and notification of the police dispatcher is obviously a critical period of interest. While theoretically we have a record of that time period for SECURES™ calls we do not have a corresponding record for citizen initiated calls. If citizens report the time that they heard the shot to the service call taker, that information is not included in the call data. Consequently we will

largest notable difference, a difference of no more than 2.55 minutes, occurred once an officer arrived on scene: prior to the field trial officers in the experimental area were slightly faster handling random gunfire calls for service than their counterparts in control area II.

The processing of random gunfire calls for service in the experimental area and control area I, however, indicates that dispatchers and officers in the Southwest Operations Division (experimental and control area II) uniformly processed their calls for random gunfire quicker than officers in the Central Operations Division (control area I) prior to SECURES™ testing. Across virtually every response category, with the exception of time spent by officers on scene, control area I officers (from the Central Operations Division) spent less time on random gunfire calls for service than their counterparts from the Southwest Operations Division.

While Table 3 above shows that the Southwest Operations Division and the Central Operations Division responded differently to random gunfire calls for service prior to the SECURES™ field trial, we also wanted to examine the way officers responded to random gunfire calls from citizens during the field trial. Table 4 presents the citizen initiated call comparisons.

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examine the SECURES™ time period at a later point in this report. As such, we lack comparative data for citizens on this critical time frame and cannot attest to differences between citizen and SECURES™ initiated time periods. A second critical period for which we have both citizen and SECURES™ data is the temporal period between when the call was received and when it was dispatched. Since SECURES™ existed only during the experimental period (10/25/96 - 12/16/96), it is not possible to assess whether its performance was increased before and after the experimental period. We are able, however, to compare citizen and SECURES™ initiated calls during the experimental period within the experimental area.

Table 4: Mean Response Times (in minutes) for Citizen Initiated Shots Fired Calls During SECURES™ Testing — Experimental and Control Areas I & II

	Time Call Received to Time Call Dispatched	Time call Received to Time Officer Arrived	Time Officer Arrived to Time Call Cleared	Time Call Received to Time Call Cleared
Experimental Area				
6G (N = 49)	13.25	17.78	11.91	29.69
Standard Dev.	25.86	26.23	12.44	27.57
Minimum	1.00	1.00	.00	1.00
Maximum	134.00	137.00	50.00	146.00
N of cells	32	32	32	32
Control Area I				
6G (N = 59)	20.61	25.73	16.09	41.82
Standard Dev.	36.68	37.36	16.94	43.29
Minimum	1.00	3.00	.00	7.00
Maximum	150.00	150.00	73.00	173.00
N of Cells	33	33	33	33
Control Area II				
6G (N = 61)	16.61	21.55	21.37	42.92
Standard Dev.	18.48	18.34	1.91	42.79
Minimum	.00	0.00	.00	6.00
Maximum	67.00	78.00	255.00	261.00
N of Cells	38	38	38	38

• Cell counts standardized by listwise deletion of missing data.

Table 4 shows that officers in the experimental test area responded quicker to citizen initiated random gunfire calls for service than officers in both control areas across every response category during SECURES™ testing. Officers in Control Area I (from the Central Operations Division) responded slowest across all response categories. Indeed, officer response time in Control Area I increased by approximately ten minutes across all response categories except time spent on the scene (comparing response times from Table 3 and Table 4) during the SECURES™ field trial. Conversely, officers in Control Area II spent approximately the same amount of time processing calls prior to and during SECURES™ testing.

It is difficult to speculate as to why response times increased so dramatically in Control Area I and remained stable in Control Area II. It is possible that a treatment effect occurred in Control Area I as officers became aware that their behavior was being monitored.[28]

Table 4 also shows a decrease in response time for citizen initiated calls for service across all categories in the experimental area during SECURES™ testing. Comparing response times to citizen calls about random gunfire in the experimental area before and during the SECURES™ field trial (Table 3 and Table 4) shows that dispatch time decreased by seven minutes, officers arrival time decreased by approximately seven minutes, and they processed calls from citizens nearly ten minutes faster during SECURES™ testing.

While officers in the adjacent patrol beat (Control Area II) seemed relatively unaffected by the field trial, officers in the experimental area may have reduced the time spent on citizen calls for random gunfire in order to handle the increase in calls for service generated by the SECURES™ technology. Table 5 examines this supposition by comparing the mean response times for citizen initiated calls for random gunfire before and during the field trial (October 25 through December 16, 1996) with SECURES™ generated calls for service.

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[28] We have no specific reason to believe, however, that officers knew their behavior was being monitored. The Evaluation Team conducted ride-alongs (see Appendix V for ride-laong protocol) in the Southwest and Central Operations Divisions, but we do not believe these ride-alongs could have impacted the way officers responded to random gunfire calls.

Table 5: Mean Response Times (in minutes) for Citizen Initiated Calls (6G) Before and During Field Trial Compared to SECURES™ Initiated (6S) Shots Fired Calls — Experimental Area

	Time Call Received to Time Call Dispatched	**Time Call Received to Time Officer Arrived**	**Time Officer Arrived to Time Call Cleared**	**Time Call Received to Time Call Cleared**
Experimental Area				
6G Before (N = 236)	20.28	24.98	14.39	39.38
Standard Dev.	31.08	32.68	17.81	36.02
Minimum	0.00	0.00	0.00	1.00
Maximum	196.00	203.00	129.00	213.00
N of cells	165	165	165	165
Experimental Area				
6G During (N = 49)	13.25	17.78	11.91	29.69
Standard Dev.	25.86	26.23	12.44	27.57
Minimum	1.00	1.00	.00	1.00
Maximum	134.00	137.00	50.00	146.00
N of cells	32	32	32	32
Experimental Area				
6S (N = 188)	17.88	24.41	19.39	43.80
Standard Dev.	27.28	28.60	21.58	33.92
Minimum	.00	.00	.00	1.00
Maximum	151.00	159.00	152.00	173.00
N of Cells	155	155	155	155

• Cell counts standardized by listwise deletion of missing data.

As Table 5 shows, dispatchers seem to take somewhat longer to dispatch a SECURES™ identified call (17.88 minutes) than a citizen generated call (13.25 minutes). It also takes officers longer to arrive on the scene for a SECURES™ identified call (24.41 minutes) than a citizen generated call (17.78 minutes). Overall, a 6S call takes approximately three quarters of an hour on average to clear (43.80 minutes), whereas a citizen generated call takes only about one half an hour (29.69 minutes) to clear ($p<.05$).

Table 5 also shows that the response times for 6S calls more closely resemble the response times for citizen initiated calls (6G) prior to SECURES™ testing. Closer examination of Table 5 reveals two noteworthy points: officers spent more time on 6S calls than 6G calls during the test phase across all four response categories; and they spent more time on the scene and afforded more time to 6S calls for service than they did 6G calls prior to the SECURES™ field trial.

Based on these data, it appears that police processing time is extended rather than reduced by introducing the SECURES™ system. One explanation is that officers tended to adjust to the dual demands of citizen and technology alerts in responding to random gunshots. That is, police may simply be apportioning their time in dealing with random gunfire given other equally pressing calls.

To provide clarity on this issue a comparison was made between how random gunfire calls were handled prior to the test phase (examining 6G calls only) and how they were handled during the test phase (6G and 6S calls combined). Table 6 provides this comparison by combining the mean response times for 6G and 6S calls for service during SECURES™ testing and comparing these respective categorical times to those mean response times for 6Gs prior to the SECURES™ field trial.

Table 6: Mean Response Times (in minutes) for Random Gunfire Calls for Service Prior to SECURES™ Testing (6G only) and During SECURES™ Testing (6G and 6S Combined) – Experimental Area

	Time Call Received to Time Call Dispatched	**Time Call Received to Time Officer Arrived**	**Time Officer Arrived to Time Call Cleared**	**Time Call Received to Time Call Cleared**
6G (N = 236)				
Mean	20.28	24.98	14.39	39.38
Standard Dev.	31.08	32.68	17.81	36.02
Minimum	0.00	0.00	0.00	1.00
Maximum	196.00	203.00	129.00	213.00
N of cells	165	165	165	165
6G/6S During (N=237)				
Mean	17.09	23.27	18.11	41.39
Standard Deviation	27.02	28.25	20.48	33.28
Minimum	0.00	0.00	0.00	1.00
Maximum	151.00	159.00	152.00	173.00
N of cells	187	187	187	187

* Cell counts standardized by listwise deletion of missing data.

The time required to dispatch a random gunfire call for service (combining 6G and 6S response times during the experimental time period) was very close to the time it took to dispatch a citizen call prior to SECURES™ testing (mean difference of approximately 3 minutes). Similarly, the time it took an officer to arrive on the scene of a random gunfire call for service (combining 6G and 6S response times) during the test period was nearly identical to the time it took to arrive on the scene of a citizen call prior to SECURES™ testing (mean difference of less than 2 minutes). Most importantly, for our purposes here, the overall time processing calls for random gunfire between the two time periods were relatively equal (41 minutes versus 39 minutes respectively).

These results suggest that officers handled random gunfire calls in about the same amount of time during the SECURES™ field trial as what they had prior to the field trial simply by reducing the amount of time afforded citizen calls. As such, we suspect that officers modified the way they handled citizen-generated calls about random gunfire when they were aware that the SECURES™ system had not identified a shot.

In summary, the response time analysis indicates that officers spent more time processing 6S calls for service than they did 6G calls for service both prior to and during the SECURES™ field trial. As such, ATI's hypothesized reduction in response time of 85 percent was not observed in these data. In fact, response time increased in virtually every response category examined. These differences were consistent when we compared both citizen initiated calls with SECURES™ initiated calls during the experimental period as well as citizen initiated calls prior to the experiment with SECURES™ initiated calls during the experiment. Only by combining citizen and SECURES™ initiated calls did we observe some stabilization in response time.

Given the amount of time officers afford random gunfire calls for service on a regular basis our analysis suggests that officers reduced the time they would normally spend on citizen calls for random gunfire to free themselves up for handling newly identified calls for random gunfire – SECURES™ alerts. In other words, officers seemed to spend no more time on random gunfire calls for service during the field trial, but they broke up the time they spent among two types of random gunfire calls for service (6G and 6S).

IX. RELATIONSHIP OF RANDOM GUNFIRE CALLS TO ARREST AND OFFENSE DATA

ATI claimed that SECURES™ could significantly enhance response times which would lead to more apprehensions and greater victim assistance. If this claim is true, we would expect that the rates of arrest and offense reports associated with random gunfire calls would significantly increase after the introduction of the system. Table 7 examines the number of arrests deriving from citizen-initiated and SECURES™ initiated alerts for before and after the field trial, for both the experimental and control areas (I and II).

Table 7: Number of Arrests Before and After Field Trial by Call Code and Test Area

	Experimental Area		Control Area I		Control Area II	
SIGNAL	BEFORE	DURING	BEFORE	DURING	BEFORE	DURING
6S	0	0	0	0	0	0
6G	2	1	0	0	0	0
TOTAL	2	1	0	0	0	0

As this table shows, there is no evidence to suggest that there was an increased probability of arrest given the introduction of the SECURES™ system. In fact there were no arrests which originated from the SECURES™ system during the experimental period.

Table 8 examines the number of reported offenses deriving from citizen-initiated and SECURES™ initiated alerts for before and after the field trial, for both the experimental and control areas (I and II). (see Table 8).

Table 8: Number of Offense Reports Before and After Field Trial by Call Code and Test Area

	Experiment Area		Control Area I		Control Area II	
SIGNAL	**BEFORE**	**AFTER**	**BEFORE**	**AFTER**	**BEFORE**	**AFTER**
6S	0	2	0	0	0	0
6G	1	0	1	0	3	1
TOTAL	1	2	1	0	3	1

Table 8 shows that in two instances the SECURES™ system resulted in an offense report. In both these instances, the offense code was classified as recovered property. For both control areas and the experimental area there were just six offense reports generated as a result of citizen calls for random gunfire.

The most striking result from these data is that random gunfire calls for service rarely end in either an arrest or offense report. No SECURES™ calls resulted in arrests during the experimental period. Moreover, while citizen initiated calls for random gunfire ultimately led to two arrests before SECURES™ testing and one after, the arrest types were classified as miscellaneous, not random gunfire related.

In summary, there is no evidence in these data to support an increased probability of arrest given the introduction of the SECURES™ system. In fact, as noted, there were no arrests which originated from the SECURES™ system during the experimental period.[29]

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[29] We note that the prioritization of calls did not change in Dallas. Whether quicker responses would increase arrests is unknown but a plausible hypothesis. The arrests we were able to track in these data, however, indicated the 6G calls tied to arrests in the experimental period had arrival times of one, ten and thirty-one minutes respectively. This finding may cast some doubt as to the importance of rapid response in these types of calls.

X. IMPACT OF SECURES™ ON OFFICER WORKLOAD

Workload Analysis

One of the most important features of police dispatch systems (CAD systems) is the manner in which dispatchers (and sometimes call takers) link two or more calls for service together and dispatch the calls as one event. Section VI described the Dallas Police Department's system for dispatching calls for service. Of particular importance for our purposes is the way that random gunfire calls get linked together. As part of our evaluation of SECURES™, we spent a considerable amount of time tracking all random gunfire calls for service (either 6G or 6S) from when the call was received through to the final disposition of the call for the 53 days of the field trial. Figure 1 presents the case flow for 235 calls for service that were (at some stage in the process) linked to a random gunfire call.

Figure 1

Flow Chart of Calls for Service in the Experimental Test Area
October 25 to December 16, 1996

Total number of incoming calls tracked (N = 235)

Incoming 6S calls (SECURES) N = 182	Incoming 6X calls (Disturbance) N = 3	Incoming 06 calls (Shootings) N = 1	Incoming 6G calls (Citizen calls re random gunfire) N = 49

1. 6S disposed of as a single 6S call event --->142 events of 1 call = 142 calls and 142 6S events
2. 6G disposed of as a single 6G event ---> 26 events of 1 call = 26 calls and 26 6G events
3. 6S linked with one other 6S call and disposed of as a 6S ----------------------------> 8 events of 2 calls = 16 calls and 8 6S events
4. 6S linked with 3 other 6S calls and disposed of as a 6S ------------------------------> 1 event of 4 calls = 4 calls and 1 6S event
5. 6S linked to three 6G and disposed of as a 6G ---> 1 event of 4 calls = 4 calls and 1 6G event
6. 6S linked to 2 6G calls and disposed of as a 6G ---------------------------------------> 2 events of 3 calls = 6 calls and 2 6G events
7. 6S linked to one 6G and disposed of as a 6G ---> 5 events of 2 calls = 10 calls and 5 6G events
8. 6S linked to a 6G and a 6S and disposed of as a 6G -----------------------------------> 1 event of 3 calls = 3 calls and 1 6G event
9. 6S linked to a 06 call and disposed of as an 06 --> 1 event of 2 calls = 2 calls and 1 06 event
10. 6S linked to a 6G and a 6S and disposed of as a 6S ----------------------------------> 1 event and 3 calls = 3 calls and 1 6S event
11. 6S linked to 2 6S and 2 6G and disposed of as a 6G ---------------------------------> 1 event and 5 calls = 5 calls and 1 6G event
12. 6S linked to 3 6G and 1 6X and disposed of as a 6X----------------------------------> 1 event and 5 calls = 5 calls and 1 6X event
13. 6G linked to a 6X and disposed of as a 6X --> 2 events and 2 calls = 4 calls and 2 6X events
14. 6G linked to a 6S and disposed of as a 6S ---> 1 event and 2 calls = 2 calls and 1 6S event
15. 6G linked to two 6S and disposed of as a 6S ---> 1 event and 3 calls = 3 calls and 1 6S event

Total number of events tracked (N = 194)

6S events	6X events	06 events	6G events
N = 151	N = 3	N = 1	N = 39
(1,3 and 4)**	(12 and 13)	(9 only)	(2,5,6,7,8,10,11,14, and 15)

** Includes ONLY those events that had no linkage to a citizen call for service.

As Figure 1 shows, there were fifteen different ways during the field trial that random gunfire calls were received and ultimately dispatched. In the majority of cases, dispatchers simply took a solitary call and dispatched the call to a patrol officer (e.g. 142 6S calls for service which resulted in 142 6S responses and 26 6G calls for service which resulted in 26 6G responses). At other times, dispatchers referenced two or more calls together. For example, there were eight events where two identical signal codes were referenced together and dispatched as one event (16 6S calls for service resulting in 8 6S events). There were also five events where two different signal codes were referenced and dispatched as one event.

Figure 1 shows that SECURES™ generated 151 call events that had no linkage to a citizen call and that the police were dispatched to as a random gunfire call for service. There were, however, just 39 call events for citizen initiated calls about random gunfire. These 190 (151 + 39) police radio runs all took place in the one square mile community of Oakcliff during the two months of field testing. The number of citizen calls during the two month field trial was similar to the average number of citizen calls to the police about random gunfire incidents prior to the field trial. As such, our study finds that the extra 151 SECURES™ dispatched radio runs over and above the citizen-initiated calls during the two-month field trial represents almost a five-fold increase (190/39=4.87) in the number of police dispatches to random gunfire problems.

Cost Analysis

The substantial increase in officer workload undoubtedly raises questions about the associated costs incurred by the department as a result of introducing SECURES™ technology. Questions raised include: how much will it cost the department to dispatch patrol officers to

SECURES™ identified calls for random gunfire? what additional costs would be incurred annually by the Dallas Police Department if the SECURES™ technology was purchased? and how many minutes, hours, and days would be committed to responding to 6S calls for service that are not linked in any way 6G calls for service?

The estimated cost of dispatching a patrol unit on a random gunfire call for service during the SECURES™ trial phase (both citizen identified and SECURES™ identified) is based solely on average patrol officer salary.[30] It is departmental policy that random gunfire calls for service require two officers to handle each call; either one two person unit or two one person units. It is also departmental policy that at least one responding officer must be a Senior Corporal. Similarly, it is most likely that one Senior Corporal (average annual salary $64,700) and one patrol officer (average annual salary $50,000) would respond to a random gunfire call for service. Disaggregating the salary of each officer down to cost per minute (Senior Corporal $.52 per minute and patrol officer $.32 per minute) and multiplying each figure by 12 minutes (median time to handle a 6G call for service)[31] results in an average cost of $10.08 ($3.84 patrol officer per call + $6.24 Senior Corporal per call) per 6G radio run. Given there were 39 6G events (see Figure 1) over the two month test period in the experimental area, it can be projected that there would be 240 events annually in the Oak Cliff test area (about 20 events per month). As such, we estimate that it currently costs the Dallas Police Department approximately $2,420 annually (240 6G

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[30] These estimates are extreme underestimates as they do not include costs associated with dispatch personnel salaries, maintenance and operation of the dispatch center, administrative costs, vehicle maintenance, vehicle fuel, or system installation and operation. The Dallas Police Department could not release these data to the Evaluation Team.

[31] The median (12 minutes) value for time call dispatched to time call cleared was used rather than the mean (23 minutes) value because the mean was heavily effected by outliers.

events * $10.08) in officer salary to respond to citizen calls for random gunfire in Oak Cliff.

Conversely, using the same formula but substituting a median time of 20 minutes for handling a SECURES ™ identified call for random gunfire, it can be estimated that it would cost the Dallas Police Department approximately $15,120 annually in officer salary to handle random gunfire calls in Oak Cliff identified by the gunshot location technology.

Moreover, given the annual cost of $66,000 ($5500 * 12 months) to lease the SECURES™ technology, an additional $81,120 ($66,000 + $15,120) annually would have to be reallocated from the Dallas Police Department's fiscal budget to handle the influx of calls in the three-quarter square mile experimental area. As such our estimates suggest that SECURES™ would cost a police department at least $72,480 per 10,000 people to install and use in any one calendar year.

The introduction of SECURES™ technology also impacts the workload of Dallas Police officers. Figure 1 shows that there were 39 6G events in the experimental area over the two month test period. This breaks down to approximately 20 random gunfire events per month. If the median time spent on 6G calls for service equals 12 minutes, then approximately 144 minutes (20 6G events * 12 minutes) per month or approximately 1¼ day per year would be devoted to responding to citizen calls about random gunfire in the three quarter mile square test area of Oak Cliff.

Figure 1 also shows that SECURES™ technology increased the number of random gunfire radio runs by 151. This translates into an additional 75 events per month in officer workload over the experimental period. Given that the median time spent on 6S calls for service during the SECURES™ trial phase was approximately 20 minutes, 1500 minutes per month or

- 12½ days per year would be devoted to responding to citizen calls about random gunfire assuming all other factors (priority of random gunfire calls, dispatch policies, the problem of random gunfire, etc...) stay the same.[32]

[32] It must be noted that these figures are based on an area with a high prevalence of random gunfire; one that is not representative of the gunfire problem in the City of Dallas. Similarly, these estimates are figured for one small area that is patrolled by the Southwest Operations Division of the Dallas Police Department. One could easily argue that random gunfire calls for service are handled differently in different areas of the city (see Tables 3 and 4). Therefore, these estimates may not be accurate for other areas of the city where the gunshot location technology could be installed.

XI. POLICE OFFICER PERCEPTIONS OF THE RANDOM GUNFIRE PROBLEM AND THE EFFECTIVENESS OF SECURES™

Police response to random gunfire as identified through the calls for service data is one way to examine the differences between police response to citizen versus technologically identified problems. Nonetheless, the calls for service data do not provide insight as to how police officers perceived responding to random shots fired call events identified by citizens or technology. In this section, we use two sources of data to assess police officer perceptions of the random gunfire problem and their perceptions of the SECURES™ technology: patrol logs and a patrol officer survey.

Patrol Log Analysis

Officers in the Southwest Operations Division (experimental test area) completed a patrol response protocol (or patrol log for short) (see Appendix IV) after each response to a shot fired call event that they were dispatched to during the experimental time period. These patrol logs were completed both when an officer was dispatched to a citizen initiated call (6G) and when an officer responded to gunfire identified by the SECURES™ system (6S).

The objective of the patrol logs was to collect call-event specific information. Officers were asked about activities taken in response to a shots fired call event, the outcomes of their activities such as the type of evidence found (if any), whether an arrest was made or not, and their perceptions of the ability of the SECURES™ system to identify gunshots and the location from which the shot occurred. In addition, data were collected concerning the characteristics of the gunfire, such as where the gun was believed to be fired from, weather conditions, and time of day. A total of 542 patrol logs was completed across the entire Southwest Operations Division (a substantially larger area than the Oak Cliff experimental test area).

Consistent with the calls for service event data presented in Section VI above, in this section we provide results from the patrol logs for both the citizen initiated and SECURES™ initiated call events during the test period solely in the experimental test area (n = 194 call events). Of the N = 194 random shots fired events, patrol officers completed patrol logs for N = 158 call events (81.4 percent compliance) that they responded to. In total we report responses from N = 160 patrol logs (N = 2 events had two patrol log forms completed per event).

Of the 160 patrol logs analyzed, 82.5 percent (132 events) were 6S events and N = 28 were 6G events. Of these call events, 88 percent (N = 141) were single calls for service; nine call events had two linked calls; six call events had three linked calls; 3 events had four linked calls, and one event had five linked calls.[33] We are unsure whether and how many responding officers knew if there had been multiple-calls for that one dispatch event. Based on our ride-alongs and observations of call-takers and dispatchers, we suspect that the dispatchers generally let the officers know if there was more than one call about an event to which they were being dispatched.[34]

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[33] We know the originating, linking, and disposition status for each call event from Figure 1. Each of these call event histories were linked to the police patrol logs that were completed during the experimental period by matching calls for service reference numbers.

[34] We make our supposition about the way dispatchers functioned based on a series of on-site observations of dispatchers during the course of the field trial. In total 315 minutes of dispatch observations (21 separate observations of 15 minute observation periods) were conducted over the experimental test period. During these observations the on-site research coordinator sat at the channel 4 dispatch station (the test area was assigned to this channel) and observed the dispatch procedures. In the majority of instances observed when similar calls were linked it was the dispatchers who were making the linkages. Dispatchers would generally examine calls that appeared to be from the same area, during the same time frame, or of similar nature to the initial call and link the calls into one unique event or leave them as separate events. While officers would on occasion inform dispatchers that calls needed to be linked, it was generally the case that officers would act as verification for decisions rendered by dispatchers (see Appendix

In total 65 percent (N = 103) of the patrol officer dispatches were to intersections, reflecting two factors: most of the call events were for 6S calls and the pole units were generally erected at intersections and since SECURES™ did not triangulate the shots to an address, the call takers were simply notified of the address where the pole unit was situated. Since 75 out of the 86 pole units were erected at intersections, we expected a dominance of intersections in dispatch locations. There were 19 call events dispatched to alleys and 13 calls events dispatched to face blocks.

In nearly three quarters of the dispatched call events (N = 116), the responding patrol officer reported that the weather conditions were clear. Rain (N = 29 events) and freezing rain (N = 5 events) were recorded much less frequently.

In the overwhelming majority of dispatched call events, the patrol officers reported that "nothing was discovered" (N = 154). In these cases, the officer most often would "n-code" the event as an "N3" (N = 109 or 72 percent of "nothing discovered" events were n-coded as a 3), clearing the event from further follow-up. In one case an injured person was at the scene, in one other case a weapon was found, and in one case a suspect was interviewed at the scene. A total of 33 incident reports were generated by the responding patrol officers. Other actions taken included checking houses/properties (N = 20), checking vehicles (N = 6), and speaking to witnesses (N = 8).[35]

Not surprisingly patrol officers responded to call events most often on the second (7:00

VII).

[35] These responses do not add up to 160 because officers could report more than one action taken at the call event.

am to 3:00 pm and 8:00 am to 4:00 pm) and third watches (3:00 pm to 11:00 pm; 4:00 pm to 12:00 am; and 5:00 pm to 1:00 am). Officers on all four watches reported that they believe they responded quicker to a SECURES™ generated call event than to a citizen call event. But we know from our response time analysis that this perception by officers is inconsistent with the CAD records: our results suggest that not only do citizen calls about random gunfire get dispatched quicker, but officers get to the scene quicker and they clear the call in less time than for SECURES™-generated calls.

Police Officer Survey Results

This section examines officer perceptions of the impact of SECURES™ on their work routine, officer confidence in the technology to report incidences of gunfire, and perceptions of the ability of SECURES™ to improve police effectiveness in handling random shots fired occurrences. Written questionnaires were administered to officers in both the Experimental (Southwest) and Control (Central) Area I (see Appendix VIII and IX respectively). The questionnaires were quite similar in that they both contained identical questions concerning the extent and nature of random gunfire in each area. Further, both questionnaires requested information concerning the standard operating procedures of officers when responding to shots fired incidents. Responses to identical questionnaire items allowed an assessment of whether officer perceptions of gunfire incidents and officer behavior in response thereto in the treatment area differs from the control area.

In order to assess the impact of SECURES™ on officers in the treatment area, the written questionnaire administered to officers in the Southwest Operations Division contained questions that did not appear on the survey instruments used in the control area. These additional questions pertained to officer perceptions of the impact of SECURES™ on their work routine, officer perceptions of the value of SECURES™ in investigating and solving shots fired incidents, officer confidence in the technology to accurately report both the occurrence of gunshots and their locations, and officer preference of citizen reporting versus SECURES™ notification of an incident.

All officers who could possibly be dispatched to shots fired incidents in the treatment and control areas were requested to complete a questionnaire. A total of 339 officers received questionnaires (N = 208 from the Southwest Operations Division and 131 from the Central Operations Division). The questionnaires were distributed through the Dallas Police Department's mail system with the cooperation of the watch commanders in each division. Questionnaire distribution occurred approximately two weeks before the end of the experimental period.[36]

A total of 183 completed questionnaires were returned. Of these, 120 questionnaires were completed by officers assigned to the Southwest Operations Division (57.7 percent response rate) and the Central Operations Division officers completed 63 surveys (48.1 percent response rate). The overall response rate was 54.0 percent.

Table 9 shows the total response rate for the Southwest Operations Division. This table

[36] A detailed list of all officers in the Southwest and Central Operations Divisions was secured by the on-site coordinator. Each survey instrument then received a unique identifying number that corresponded to an officer to be included in the study. The questionnaire was then placed in a gray envelope that contained a letter explaining the purpose of the survey and a promise of confidentiality. Officers were also asked to complete the survey within three days and return it to the collection box placed in both Divisions' detail rooms. During the next ten days, the on-site research team coordinator attended roll calls to provide an overview of the SECURES™ evaluation and answer questions about the survey. Officers that failed to return the questionnaire received a follow-up letter from their respective Watch Commander requesting that they complete the survey as soon as possible which was followed by another questionnaire.

also displays the response rates by officers' gender, present rank, and by shift assignment.

Table 9: Southwest Operations Division Response Rate

	Questionnaires Distributed	Questionnaires Received	Response Rate (percent)
Total	208	120	57.7
Gender			
Male	178	104	58.4
Female	31	10	32.3
Present Rank			
Police Officer	166	87	52.4
Corporal	42	28	66.6
Shift			
First	44	22	50.0
Second	56	28	50.0
Third	108	68	63.0

As Table 9 shows, for female officers, slightly less than one-third (32.3 percent) completed the questionnaire. The response rate for the other officer categories however either approaches or exceeds the overall response rate. In other words, at least 50 percent of the Southwest Operations Division officers broken down by present rank or shift assignment completed the questionnaire.

Table 10 displays the response rates for Central Operations Division officers. The response rate for the Central Operations Divisions officers was 48.1 percent. Unlike the response rates for officers in the Southwest Operations Division, female officers in the Central Division were more likely than male officers to complete the survey. Similarly, corporals in both divisions were more likely to complete the questionnaire than were patrol officers.

Table 10: Central Operations Division Response Rate

	Questionnaires Distributed	Questionnaires Received	Response Rate(percent)
Total	131	63	48.1
Gender			
Male	116	53	45.7
Female	15	9	60.0
Present Rank			
Police Officer	87	39	44.8
Corporal	44	23	52.3
Shift			
First	41	18	43.9
Second	32	18	56.2
Third	58	27	50.0

Table 11 contains the demographic characteristics of officers that completed the written questionnaire. In general, the Southwest and Central officers are quite similar in the areas of officer gender, level of education, and job assignment. There are some differences however between the officers in the two divisions. First, Southwest officers appear to be somewhat younger. Specifically, slightly less than 45 percent of these officers are between the ages of 23 and 29, while only 16.1 percent of the Central officers are in this age category. At the same time, 27.4 percent of the Central officers are over forty years old, with only 17.2 percent of the Southwest officers in the over forty age group ($p < 0.05$).

Table 11: Demographic Characteristics of Officers in the Sample

	Southwest Division		**Central Division**	
	N	%	N	%
Gender				
Male	108	91.5	53	85.5
Female	10	8.5	9	14.5
Age*				
23-29	50	43.1	10	16.1
30-39	46	39.7	35	56.5
40-49	15	12.9	16	25.8
50+	5	4.3	1	1.6
Ethnicity*				
African-American	24	20.3	5	8.3
Caucasian	58	49.2	42	70.0
Hispanic	25	21.2	4	6.7
Mexican-American	2	1.7	1	1.7
Asian-American	0	0.0	1	1.7
Other	9	7.6	7	11.7
Education				
High School/GED	0	0.0	1	1.6
Some College	37	31.4	18	29.8
Associate's Degree	29	24.6	12	19.4
Bachelor's Degree	44	37.3	27	43.5
Some Graduate	5	4.2	3	4.8
Advanced Degree	3	2.5	1	1.6
Rank				
Police Officer	87	73.1	39	62.9
Corporal	28	23.5	23	37.1
Sergeant	3	2.5	0	0.0
Captain	1	0.8	0	0.0
Normal Assignment				
Patrol	93	81.6	52	83.9
Other	21	18.4	10	16.1

* $p < .05$, two-tailed test

The second characteristic where there is substantial difference involves officer ethnicity. The sample of Southwest officers is more heterogeneous (Table 11) with the differences statistically significant at the .05 level. While white officers comprise almost fifty percent (49.2 percent) of these officers, 20.3 percent of the officers are African-American, and 21.2 percent are Hispanic. In contrast, 70 percent of the Central officers are white and fifteen percent of the officers are either Hispanic (6.7 percent) or African-American (8.3 percent).

Several of the questionnaire items on the surveys administered to the Southwest and Central officers were identical to allow a comparison of officer perceptions of the nature of gunfire in their areas. These questions tapped beliefs about the types of offenders that fired weapons, the days of the week when gunfire was most likely to occur, whether certain holidays were more likely to have incidences of gunfire, the types of weapons commonly used, and the locations of gunfire. The following analysis examines whether the nature and extent of gunfire in the two areas are similar.

The age of offenders believed to be involved in random shots fired incidents is quite similar across the two divisions. More specifically, a majority of offenders in both areas are believed to be between the ages of 18 and 22 (Table 12). Officers in both divisions said that they believed the next most likely age of offenders was between 23 and 27 years old, with older individuals being much less likely to be involved in these incidents.

In order to examine when shots were most likely to occur, questions asked officers to stipulate the day of the week, whether certain holidays were more likely to have gunfire, and the hour of the day when they thought gunshots were likely to be fired. As expected, Friday and Saturday were the days identified as those most likely to have gunfire occurrences. Sunday was the third most likely day to be identified by the officers with the remaining days of the week being mentioned by only a limited number of officers (Table 12). New Years Day and July 4th holidays were viewed by officers in both divisions as the holidays most likely to generate shots fired calls. New Years Eve and Cinco De Mayo were the third and fourth most mentioned holidays. Officers also agreed that the hours of the day between 6:00 pm and midnight were when shots were most likely to be fired, with the six hour period after midnight being the next most likely time for guns to be fired (Table 12). Officers in both divisions noted that the weapons used in most instances are handguns. Finally, officers overwhelmingly noted in both divisions that in less than ten percent of the gunfire incidences are there injuries to people.

Table 12: Nature of Gunfire Problem in the Experimental and Control Areas

	Experimental Area		**Control Area**	
	N	%	N	%
Age of Offenders				
8-12	5	3.0	0	0.0
13-17	33	20.4	11	11.7
18-22	67	41.3	41	44.6
23-27	33	20.4	24	26.1
28-33	14	8.6	10	10.9
34-40	7	4.3	6	6.5
over 40	3	1.8	2	2.2
Day of the Week				
Monday	8	2.9	4	2.9
Tuesday	8	2.9	3	2.1
Wednesday	7	2.6	3	2.1
Thursday	11	4.0	8	5.7
Friday	90	33.0	48	34.3
Saturday	107	39.2	53	37.9
Sunday	42	15.4	21	15.0
Holidays				
Thanksgiving	0	0	1	.1
New Years Eve	44	17.9	24	17.3
New Years Day	70	28.6	34	24.5
July 4th	87	35.5	47	33.8
Cinco De Mayo	15	6.1	18	9.5
Other Days	29	11.8	15	10.8

Table 12: (Continued)

	Experimental Area		Control Area	
	N	%	N	%
Shot Locations				
Street Corner	24	10.1	9	5.6
Street in Front House	54	22.7	25	15.5
Outside House	69	29.0	44	27.3
In Parking Lot	31	13.0	35	21.7
In Alley	36	15.1	32	19.9
In Park	18	7.6	8	5.0
Other	6	2.5	8	5.0
Hours of the Day				
6 am - Noon	2	1.0	1	1.6
Noon - 6 pm	106	51.0	53	85.5
6 pm - Midnight	99	47.6	8	12.9
Midnight - 6 pm	1	0.5	0	0.0
Weapon Type				
9MM	22	15.2	10	13.5
Rifle	8	5.5	1	1.4
Pistol/Handgun	85	58.6	42	56.8
Automatic Weapon	12	8.3	4	5.4
380S	10	6.9	8	10.8
Other	8	5.5	9	12.2
How Common an Injury				
Less than 10%	107	87.7	49	79.0
11 to 25%	13	10.7	9	14.5
26 to 50%	2	1.6	4	6.5

Officers were also questioned about their beliefs as to the location from which most guns are fired. Outside a house was mentioned by more officers in both divisions than any other location. On the street in front of a house, in a parking lot, and in alleys were the locations that were the next most likely to be mentioned by officers (Table 12).

In order to assess officer confidence in the ability of SECURES™ to identify incidences of random gunfire, officers were asked about their confidence in the ability of SECURES™ to identify actual gunfire. The data presented in Table 13 highlights several features about the impact of experience with SECURES™ on officer confidence in the system.

As this table shows, officers that had no experience with the system expressed the lowest levels of confidence in the ability of the system to identify gunshots. Slightly more than fifty percent (51.7 percent) of these individuals said they had "no confidence" in the system's ability to recognize a shots fired incident. Second, officers that had responded to three or more SECURES™ calls had the most confidence in the system as 19 percent of these individuals noted that they had a "great deal of confidence" in the system. The same trend, however, is not as evident when we asked officers about their confidence in the ability of SECURES™ to identify the <u>location</u> of the gunshot. Specifically, the greatest proportion of individuals expressing "no confidence" in the system were officers who had responded to three or more 6S calls (41.5 percent)

Table 13: Officer Confidence in Ability of SECURES™ to Identify and Locate Gunshots

	Levels of Confidence		
	None	Some	Great Deal
	N %	N %	N %
How much confidence do you have in the ability of SECURES™ to identify actual gun shots?			
Responded to no SECURES™ calls	15 (51.7)	11 (37.9)	3(10.3)
Responded to 1 or 2 SECURES™ calls	11 (32.4)	20 (58.8)	3 (8.8)
Responded to 3 or more SECURES™ calls	14 (33.3)	20 (47.6)	8(19.0)
Chi-Square significance level = .275			
How much confidence do you have in the ability of SECURES™ to identify the specific location of a gun shot?			
Responded to no SECURES™ identified calls	10 (35.7)	16 (57.1)	2 (7.1)
Responded to 1 or 2 SECURES™ shots	13 (39.4)	19 (57.6)	1 (3.0)
Responded to 3 or more SECURES™ shots	17 (41.5)	18 (43.9)	6 (14.6)
Chi-Square significance level = .418			

Our survey of officers suggests that experience with the system may cause officers to question the ability of SECURES™ to identify the location of random gunfire. Further the percent of officers reporting a great deal of confidence in the system's ability to both identify gunfire and locate gunfire was substantially less than for the other response options. It must be noted however, that even though the frequencies evidence some differences, they are not significantly different.

One impact on officer handling of SECURES™ identified incidents may be that officers do not have as much information as they would have if an incident of gunfire had been reported by a citizen. In order to address this issue, officers were asked whether they had less, more, or about the same amount of information when they respond to a 6S versus a 6G call. As can be seen in Table 14, officers not having experience handling 6S calls believed that they would have either the same amount (60 percent) or less information (40 percent). Officers that responded to one or two 6S calls overwhelmingly noted (74.3 percent) that they had the same amount of information they had available as when they responded to a 6G call.

Table 14: Officer Perception of the Level of Information Associated with 6S Calls

	Amount of Information			
	Less	Same	More	
	N %	N %	N	%
Amount of information available when respond to a 6S versus 6G call				
Responded to no SECURES calls	8 (40.0)	12 (60.0)	0 (0.0)	
Responded to 1 or 2 SECURES calls	8 (22.9)	26 (74.3)	1 (2.9)	
Responded to 3 or more SECURES calls	15 (35.7)	22 (52.4)	5(11.9)	
Chi-Square significance level = .132				

As this table shows, officers that handled three or more SECURES™ gunfire calls were more distributed across the three response options. For example, 35.7 percent of these officers said they had less information when responding to a 6S call, while 52.4 percent noted that they had about the same amount of information. Thus, 88.1 percent said that they did not have more information to work with when responding to a SECURES™ initiated call.

Similar responses were observed when officers were asked about the amount of time they expended investigating 6S versus 6G calls. Most of the officers said that they spent the same amount of time on both types of calls. In fact, at least two-thirds (66.7 percent, 78.0 percent, and 85.7 percent) of the officers in each category selected this response option. Of the remaining officers, only a limited number, were more likely to state that they spent less time investigating SECURES™ cases than 6G incidents (Table 22).

When officer perceptions of the time spent investigating 6S calls is compared to the actual time spent on the call as indicated in the call data (see Table 5), officer perceptions and officer behavior in response to shots fired calls are not consistent. Namely, while officers believed that they spend the same amount or less time investigating 6S calls when compared to 6G calls, the call data suggest otherwise. Specifically, officers spent almost two-and-a-half times (2.39 times) as much time once they arrived on the scene of a 6S call versus a 6G call.[37]

Table 15: Officer Perception of the Time Spent Investigating 6S versus 6G Calls

	Time Spent on Investigation		
	Less	Same	More
	N %	**N %**	**N %**
Amount of time spent investigating 6S call versus 6G call.			
Responded to no SECURES™ calls	6 (33.3)	12 (66.7)	0 (0.0)
Responded to 1 or 2 SECURES™ calls	3 (8.6)	30 (85.7)	2 (5.7)
Responded to 3 or more SECURES™ calls	6 (14.6)	32 (78.0)	3 (7.3)
Chi-Square significance level = .166			

Finally, the fact that a dispatched call is SECURES™ identified appears to not influence the quickness of the response. The patrol log responses indicate that in 87.9 percent of the 6S gunfire incidents, officers said that they responded at about the same speed as they do for all calls (Table 16). Only in 12.1 percent of the situations did officers note that their response to the 6S call was quicker than normal. It should be stated that officers appear to believe that they respond to all calls in a normal fashion (see responses after being dispatched to a 6G).

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[37] Similarly, the call data indicates that officers spent about 44 minutes on a 6S call for service before clearing the call as compared to approximately 30 minutes on a 6G call for service.

Table 16: Officer Perceptions of Response Time (Patrol Log Data)

	Perceived Response Time by Call Type			
	6G		6S	
	N	%	N	%
Quicker Response	59	(15.4)	17	(12.1)
Same Response	323	(84.6)	23	(87.9)

The findings from the patrol log data are confirmed by the data collected in response to the questionnaire item asking whether the officers believed they responded quicker or at about the same speed to 6S versus 6G calls. All 34 officers dispatched to one or two SECURES™ identified calls said that they did not believe they responded quicker to a 6S call than a 6G shots fired incident (Table 17). Similarly, 92.9 percent of the officers that responded to three or more 6S calls claimed that they did not believe they respond quicker to these calls than other gunshot calls. However, the call data (see Table 5) shows that officers actually respond somewhat slower to 6S calls than citizen generated 6G reports (average response time for 6S call is 24½ minutes versus almost 18 minutes for 6G calls).

Table 17: Officer Perceptions of Response Time (Officer Survey Data)

	True		False	
	N	%	N	%
I respond quicker to 6S shots fired incidents than I do 6G calls?				
Responded to 1 or 2 SECURES™ calls	0	(0.0)	34	(100.0)
Responded to 3 or more SECURES™ calls	3	(7.1)	39	(92.9)
Chi-Square significance level = .230				

Patrol officer responses from the questionnaire as well as patrol log data pertaining to speed of response both indicate that officers believe that they respond no quicker to a SECURES™ identified call (6S call) than a citizen identified call (6G call). Conversely, the call data (Table 5, page 47) indicates that officers actually respond somewhat slower to 6S calls than citizen generated 6G reports

The last battery of questions from the patrol officer survey assessed officer perceptions of the impact of SECURES™ on officer work routine and police outcomes. Questionnaire items addressed whether officers believed they were more likely to talk to citizens when responding to a SECURES™ versus a citizen initiated call, whether officers thought that SECURES™ would increase the likelihood of arrest and whether officers perceived SECURES™ to increase the survival rate of shooting victims. These issues were premised on the belief that the SECURES™ technology was to improve the effectiveness of police officers in handling random gunfire incidents.

Regarding the amount interaction with citizens when responding to 6S and 6G calls for service, more than three-fourths of the sample that responded to one or two SECURES calls (76.5 percent) noted that they are not more likely on 6S calls to interact with citizens (Table 18). An even greater percent (88.1 percent) of the officers that responded to more than two SECURES™ identified calls provided the same response.

Table 18: Likelihood of Interaction with Citizens

	True N %	False N %
I am more likely to talk to citizens when I respond to a 6S call than when on a 6G call.		
Responded to no SECURES™ calls	9 (25.0)	27 (75.0)
Responded to 1 or 2 SECURES™ calls	8 (23.5)	26 (76.5)
Responded to 3 or more SECURES™ calls	5 (11.9)	37 (88.1)
Chi-Square significance level = .276		

Officers completing the written questionnaire were requested to state whether they agreed with statements concerning the ability of SECURES™ to improve the handling of shots fired calls. Table 19 displays the distribution of officer responses to these statements.

Table 19: Officer Perceptions of the Effectiveness of SECURES™

	True N %	False N %
The SECURES™ system will increase the likelihood someone will be arrested.		
Responded to no SECURES™ calls	8 (23.5)	26 (76.5)
Responded to 1 or 2 SECURES™ calls	9 (27.3)	24 (72.7)
Responded to 3 or more SECURES™ calls	7 (16.7)	35 (83.3)
Chi square significance level = .528		
The SECURES™ system will help the police focus on shots fired hot spots.		
Responded to no SECURES™ calls	27 (79.4)	7 (20.6)
Responded to 1 or 2 SECURES™ calls	25 (73.5)	9 (26.5)
Responded to 3 or more SECURES™ calls	27 (64.3)	15 (35.7)
Chi square significance level = .334		
The SECURES™ system has made me more effective when handling shots fired incidents.		
Responded to no SECURES™ calls	6 (25.0)	29 (82.9)
Responded to 1 or 2 SECURES™ calls	7 (20.6)	27 (79.4)
Responded to 3 or more SECURES™ calls	9 (22.0)	32 (78.0)

The SECURES™ system will increase the likelihood that the victim of a shooting will survive.		
Responded to no SECURES™ calls	2 (5.7)	33 (94.3)
Responded to 1 or 2 SECURES™ calls	7 (20.6)	27 (79.4)
Responded to 3 or more SECURES™ calls	8 (19.0)	34 (81.0)
Chi square significance level = .160		
I prefer using the SECURES™ system over just using citizen calls.		
Responded to no SECURES™ calls	13 (37.1)	22 (62.9)
Responded to 1 or 2 SECURES™ calls	8 (24.2)	25 (75.8)
Responded to 3 or more SECURES™ calls	6 (14.6)	35 (85.3)
Chi square significance level = .077		

Several patterns are evident in the distribution of responses reported in this table. Examination of all questions indicated that officers did not generally believe SECURES™ will make them more effective in their handling of shots fired calls. For example, between 82.9 percent and 78.0 percent of the officers, depending on the level of shots fired calls handled, disagreed with the statement that they believed the system has made them more effective.

Moreover, the responses to two of the statements indicate that officers with more experience handling SECURES™ generated calls voiced the least positive perceptions of the system. Specifically, 83.3 percent of the respondents that each handled 3 or more 6S calls said the statement that the SECURES™ system "will increase the likelihood someone will be arrested" was false. About three quarters (72.7 percent) of the officers with less experience (handled less than 3 calls) also disagreed with this statement. A similar pattern was observed with the responses to the statement, "I prefer using the SECURES™ system over just using citizen calls." Namely, a greater proportion of officers (85.3 percent) that responded to three or more 6S calls disagreed with the statement asking their preference, than did officers with less SECURES™ experience

(75.8 percent) or no experience (62.9 percent).

The statement that garnered the least agreement, and by implication the least support for SECURES™, pertained to the ability of SECURES™ to "increase the likelihood the victim of a shooting will survive." For each level of experience with 6S calls almost 80 percent or more of the respondents indicated that the above statement was not correct (Table 19). More specifically, 94.3 percent of the officers that did not handle a 6S call, 81 percent of those individuals that responded to one or two calls, and 79.4 percent of the officers dispatched to three or more SECURES™ identified calls noted disagreement with the belief that the system will increase the likelihood that victims of random gunfire will survive. Finally, only in response to one of the statements did a majority of officers state support for the SECURES™ system. Namely, a substantial number of officers (from 64.3 percent to 79.4 percent) stated that the SECURES™ system "will help the police focus on shots fired hot spots" (Table 19).

Summing Up Officer Perceptions

In summary, an examination of the patrol log and officer questionnaire data raise two issues concerning officer perceptions of the SECURES™ technology. The patrol log and questionnaire data suggest that officers lack confidence in the ability of the SECURES™ technology to identify a gunshot and the location of the gunshot incident. More specifically, about one third of the officers handling 6S calls responded on the patrol logs that they had confidence in the ability of the SECURES™ system to dispatch to the location of the shots fired incident. Similarly, about thirty percent of the officers handling 6S calls stated that they were confident that the system had identified a shot fired incident (Table 13).

Officer questionnaire responses confirmed these findings. Namely, 39.2 percent of the officers had no confidence in the ability of the system to identify the specific location of a gunshot, while only 8.8 percent of the officers had a "great deal" of confidence in the technology. Furthermore, 38.1 percent said that they had no confidence in the ability of the system to identify a shots fired occurrence (Table 13).

The officer responses also indicate a lack of confidence in the ability of SECURES™ to improve officer effectiveness in handling gunshot calls. Only 22.0 percent of the officers believe that SECURES™ will increase the likelihood of arrest, 15.3 percent believe that it will increase the likelihood that the victim will survive, and 20 percent said the system will improve officer effectiveness. Slightly less than one-fourth (24.8 percent) of the officers noted that they prefer using SECURES™ over just using citizen calls (Table 19). Only in response to one questionnaire item did officers voice support for the shots fired technology. In this instance, 71.8 percent of the officers said that they believe that SECURES™ will help officers focus on shots fired hot spots. Overall, our survey findings tend to suggest that Dallas police officers question the usefulness of gunshot location technology as an effective tool in dealing with random gunfire problems.

Finally, there are discrepancies between officer perceptions of the time involved in handling a SECURES™ generated shots fired call (6S) and the Dallas Police Department call data. Specifically, officers noted on both the patrol logs and questionnaires (Tables 16 and 17) that they do not respond quicker to a 6S than a 6G call and that their responses to both types of calls are in fact similar. However, the findings from the call data (Table 5) indicate that the average time spent from dispatch to arrival at the scene of a shots fired call is longer for 6S than 6G calls. In addition, the average time from receipt of a call to dispatch and the time spent investigating calls are also longer for 6S than 6G calls.

XII. CONCLUDING COMMENTS

Our study of the SECURES™ system focused on answering several key questions: Is the SECURES™ system reliable and valid? How was the system implemented in Dallas? What was the relationship between the Dallas Police Department and Alliant Techsystems, Inc. in collaborating to implement SECURES™? What was the impact of SECURES™ on the police? What do the police think of the system? What was the cost effectiveness of SECURES™ ? The Dallas field trial of the SECURES™ technology offers some important insights into the use of technological devices in law enforcement. Many aspects of the field trial, however, limited our ability to answer some of the most important questions. We begin our concluding comments by summarizing what we know and what we still don't know about the SECURES™ system. We then examine what we think might provide some alternative uses of gunshot location systems in law enforcement.

The SECURES™ field trial provides numerous examples of the difficulties encountered when new technologies are introduced into law enforcement agencies. Important aspects of the software were not ready (most notably the triangulation capacity of the system) and the transmission of gunfire information was occasionally compromised (e.g. the computer system was down, the pole units malfunctioned, and the batteries ran out). From an operational perspective, the Dallas Police Department maintained a low priority response policy for random gunfire events during the field trial, which hampered our ability to assess the effectiveness of the SECURES™ system to decrease response times and increase the likelihood of arresting people. Moreover, our evaluation could not accurately assess the reliability and validity of the system because we were unable to implement any controlled testing of the system in real-life conditions: firing weapons, firecrackers and other stimuli was disallowed in Dallas.

The Dallas field trial thus posed many challenges. However, we also learned much about random gunfire problems and how the police use the technology in tackling the problem of shots fired. Implementation of the technology in Dallas revealed rather large citizen under-reporting rates of random gunfire problems. We also learned that the way the technology was implemented in Dallas led to large increases in the workloads of police officers, particularly because the police department chose to dispatch a patrol unit to every technological alert of possible gunfire. We also learned that gunshot detection systems are not likely to lead to more arrests of people firing weapons in urban settings because it is highly unlikely for offenders to stay at a gunshot scene long enough for the police to arrive. Overall, our evaluation of the SECURES™ system implemented in Dallas clearly shows the shortcomings of using gunshot location systems as a rapid response tool, especially in those departments where gunshot incidents like random gunfire are dealt with as low-priority events. We propose, therefore, two alternative uses of gunshot location systems for law enforcement purposes.

Gunshot Location Systems as a Problem-Solving Tool

Problem-oriented policing requires the police to scan an area (police beat, city, suburban area) for problem hot spots, analyze the dimensions of the problem, develop responses to tackle the problem, and then assess the impact of the responses (see Eck and Spelman, 1987; Goldstein, 1990). For problems like random gunfire, gunshot location systems could be very useful in pinpointing the exact locations of recurring problems (scanning). If gunshot location systems were merged with police data (citizen calls about random gunfire, random gunfire incidents, arrests for random gunfire), physical features of target areas (eg. trees, buildings, playing fields, etc), and social features of target areas (eg.ethnicity, income, gun ownership) they could be very helpful in the analysis phase of problem-solving. A gunshot location system could also help the police to track the success of their problem-solving interventions (assessment phase) by depicting changes in the number of shots fired (as picked up by the gunshot location system) in targeted locations.

A gunshot location system that is going to be used for problem-solving purposes requires system components that are highly portable. For example, the pole units installed in Dallas are small boxes that require installation on utility poles. Technically, these battery powered pole units can be easily moved to a number of different areas across a city landscape.[38]

Using gunshot location systems as a problem-solving tool is consistent with the recent paradigm shift in policing away from traditional, rapid response-type approaches to policing toward community policing and problem-solving. For this reason, coupled with the fact that the Dallas Police Department employed a "low priority" response to random gunfire calls for service, the University of Cincinnati Evaluation Team suggested to the Dallas Police Department and ATI that they use the gunshot location system to identify and respond to gunfire hot spots in the Oak Cliff test area within a problem-oriented policing context.

To facilitate the use of SECURES™ as a problem-solving tool, ATI provided weekly maps of places where SECURES™ had identified random gunfire. During the field test in Dallas and where possible (in 29.3 percent of the cases), ATI post-facto provided the Southwest Operations Division's crime analyst with the triangulated location of shots fired within the test area (the triangulated location is believed to be a more precise estimate of the location where the shot was fired). Generally these triangulated data were provided to the crime-analyst about a

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[38] This also assumes that the repeaters can be re-located along with the pole units.

week to ten days after the event was detected by SECURES™.

Dallas Police Department personnel recognized the potential benefits of using the SECURES™ technology as a problem-solving tool. One police department representative stated that "...if the system is determined to accurately locate shots fired on a consistent basis and it can determine a specific location of a problem, the department may be able to issue warrants and citations to persons in and around the problem area" (Personal Interview, Dallas Police Department, 11/13/96). The Evaluation Team hoped that the maps would be used by the Southwest Operations Division for problem-solving purposes and that some problem-solving efforts would be implemented. However, our monitoring of Southwest Operations Division personnel,[39] and in particular the uses of the maps provided by ATI revealed that they were not used in any manner even remotely consistent with attempts to identify or solve random gunfire problems in the test area.

Gunshot Location Systems as a Crime Prevention Tool

Gunshot location systems could also be used as a crime prevention tool. As a crime prevention tool, gunshot location systems could be implemented in neighborhoods or hotspots that are identified as places in decline (see Skogan, 1990; Wilson and Kelling, 1981). These places

[39] Ride-alongs were conducted in both the experimental area and a control area to assess the way that the police responded to shots fired calls for service across different sectors and divisions. To assign the number and timing for ride-alongs in both the experimental area and a control area, the evaluation team counted the total number of days in the experimental period (N = 53 days) and drew a random sample of ride dates and times. The rides were randomly assigned to 1 of 3 time periods — 6:00 am to noon; noon to 6:00 pm; and 6:00 pm to midnight. Rides were not conducted after midnight due to the rigid schedule demanded of the on-site research coordinator. In total 13 ride alongs with patrol officers were conducted in both the experimental (6 rides) and control area (7 rides) over the test period. During these rides, a total of 38 calls for service was responded to (see Appendix V).

may not necessarily have high rates of random gunfire, but the demographic trends (e.g. age, ethnicity, rate of gun ownership) and emerging crime patterns would suggest that the neighborhood street or block could be in the early stages of decline. Gunshot location systems could be implemented for short periods of time in these types of neighborhoods in order to extend the ability of police to monitor, respond to, and prevent criminal behavior.

The use of gunshot location systems for crime prevention purposes, like its applicability as a problem-solving tool, necessitates system portability. Assuming the adaptation of the technology for portable use, we imagine that gunshot location systems could be utilized for crime prevention purposes through several types of initiatives: first, akin to burglar alarm signs (or crime prevention signs generally), we propose advertising areas with gunshot location system "pole units" (or acoustic sensors) as "gunshot detection zones"; second, we suggest that community knowledge and involvement in the installation of a gunshot location system in a high risk area could deter some categories of offenders; third, moving gunshot location system pole units from location to location on a random basis could effectively increase the surveillance zone of the gunshot location technology without increasing many of the costs involved in leasing or purchasing the system.[40]

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[40] The installation of video surveillance or closed-circuit television (CCTV) is another example of how technology generally can be used for crime preventive purposes. Video surveillance has become quite popular in a variety of residential and commercial settings both nationally and internationally. For instance, video surveillance is being used to monitor activity in New York Port Authority Bus Terminals (Felson and colleagues, 1997). Just recently, a Cincinnati City Councilman proposed the use of video surveillance equipment to monitor the Cincinnati Downtown Business District. The councilman remarked, "...the cameras would be in use around the clock and would be pointed only at public places" (Cincinnati Enquirer, 3/18/97). Further, video surveillance equipment is being used to monitor apartment complexes in Manchester, England that have been experiencing strings of burglaries (Chatterton and Frenz, 1994). Similarly, such equipment has been employed on fleets of buses to address problems of vandalism (Poyner, 1988).

We explore these possible crime preventive uses of gunshot location systems below.

Advertising the presence of a crime preventive measure is an emerging strategy in the fight against crime. Such an approach supplements the actual implementation of security measures. For instance, it is not uncommon to see Neighborhood or Block Watch signs posted on utility poles in residential communities throughout the United States. Similarly, signs advertising residential burglar alarms and car theft alarms are also commonplace in today's society. As Lab (1997:6-7) indicates, the idea behind such approaches is that, "potential offenders will not commit a crime if they perceive citizen activity, awareness, and concern in an area." This idea supports Wilson and Kelling's (1982) and later Clarke's (1992) claims that setting rules demonstrates that someone cares. We propose that the benefits of gunshot location systems could be extended by strategically locating signs reading "gunshot detection zone" in problem areas. The implementation of technological innovations not only helps the police detect and respond to deviant behavior, but the accompanying advertisement of technology is value-added to the potential effectiveness of the technology in that it may prevent deviant behavior.

A second example of how technology can be used to gain a crime prevention effect is through eliciting support and involvement from the community. We argue that the introduction of technology can act as a deterrent when a community embraces the use of technology to control crime problems. Whether the technology has a real and positive impact on the crime problem becomes a secondary concern when the perceived effect of technology among local community members is that it can reduce the crime problem.

Implementation of a gunshot location system in Redwood City, CA provides an example of how the community became actively involved in the adoption of technology to tackle a random gunfire problem. Approximately 3 years ago, residents of a small neighborhood in Redwood City, CA mobilized themselves in a coordinated effort to address the problem of random gunfire in their community. Community residents expressed serious concerns over the extent of random gunfire in the area. To address the issue of random gunfire, the group of community activists enlisted support from neighborhood residents, the upper administration within the Redwood City Police Department, members of City Government, and the local television and radio networks. Through numerous news broadcasts both on the radio and on television, community leaders consistently expressed their concerns over the problem of random gunfire. Additionally, City Council as well as the Redwood City Police Department's Administration were approached on a regular basis by the community group stressing the importance of devising strategies to address the problem of random gunfire. The rigorous efforts by the community group resulted in the Redwood City Police Department initiating a public information campaign about the dangers associated with random gunfire and the punishments associated with performing such illegal activity. Moreover, the Redwood City Council approved a contract to test an urban gunshot locator system in their community. It is difficult to determine whether the perceived reduction of gunfire in the area can be attributed to either strategy or both but it appears to be the case that the proactive efforts undertaken by Redwood City residents, the Redwood City Police Department, and City Council have instilled the idea in the community that people firing their weapons will be caught.

Random moving of surveillance technology, such as speed cameras, is a third example of how technology can be used for crime preventive purposes (Bourne and Cooke, 1993). In Victoria, Australia, for example, speed cameras were introduced, along with several other programs, in an effort to reduce the amount of driving-related deaths and injuries. However, since the cost of speed cameras prohibited installation of cameras on every street, the Victorian Police Department implemented a program to periodically (and randomly) move the cameras from place to place. This method extended the geographic area covered by the technology and had the potential to increase the crime control effects of the technology. The innovative use of the speed cameras reduced both the number of traffic fatalities and the number of speeders (Bourne and Cooke, 1993).

While the addition of new technologies to police departments may or may not enhance police effectiveness, technological innovations can perhaps involve unwanted police entrance into the private lives of citizens. The use of various video devices or listening devices raises laudable concerns about violations of individuals' Fourth Amendment rights. Specifically, in *Katz vs. U.S. (1967)* it was established that, "...*any* form of electronic surveillance, including wiretapping, is a search and violates a reasonable expectation of privacy." The use of video surveillance and audio surveillance equipment in the context of detecting random gunfire is done in a public setting. As such the intent is clearly on monitoring public places not people, and is consistent with the Supreme Court's interpretation that the Constitution protects people and not places. Certainly, if these forms of surveillance become commonplace crime control tools in the United States, it can be expected that the constitutionality of monitoring public places will become an issue for debate. For now, however, programs for policing places with random gunfire problems should be developed and implemented with three main questions in mind: how should target areas be selected; what techniques work; and under what conditions can these programs provide a fair, yet successful, means to control incidences of random gunfire?

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Appendix I

MEMORANDUM OF UNDERSTANDING BETWEEN THE CITY OF DALLAS, ALLIANT TECHSYSTEMS, AND THE NATIONAL INSTITUTE OF JUSTICE OFFICE OF JUSTICE PROGRAMS

I. Purpose

This document sets forth the terms of cooperation between the City of Dallas, acting through its Dallas Police Department (DPD), Alliant Techsystems, and the National Institute of Justice (NIJ) regarding the SECURES program. SECURES is a technologically advanced sensing system designed to identify, discriminate, and report shots fired to a police department within seconds. NIJ, the DPD, and Alliant Techsystems agree jointly to implement and field test a remote acoustic gunshot detection system (SECURES) in Dallas, Texas. SECURES will then be evaluated by a competitively selected grantee.

II. Background

This project will support NIJ's mandated goals of reducing violent crime (Goal I), and developing new technology for law enforcement and the criminal justice system (Goal VI). In addition, Alliant Techsystems has been charged by Congress to report on the effectiveness of the SECURES program. DPD was selected through a targeted competition, in which 9 police departments applied to have SECURES tested in their jurisdiction. A solicitation will be issued for the selection of an independent evaluator.

III. Responsibilities of Key Participants

1. NIJ.

A. <u>NIJ will provide funding.</u> The DPD will receive no funds under this agreement. The targeted solicitation for the field testing of SECURES carried no award to the selected police department. Funding for the evaluation will be provided by NIJ, not to exceed $200,000.00 in FY 1996 actual funds. In addition, $30,000.00 will be provided to Alliant Techsystems for the necessary provision of additional sensor units to cover the targeted area in Dallas.

B. <u>NIJ will select and monitor the grantee.</u> NIJ will receive applications for funding under a solicitation for the evaluation of SECURES, will manage a peer review process for assessment of the technical and practical merit of each application, and will select an evaluation project to be funded. The design of the evaluation will be specified in detail in the "Statement of Work" to be developed jointly by NIJ and the selected grantee.

2. DPD

A. The DPD agrees to provide open access to relevant data collected during the SECURES field test.

B. The DPD agrees to maintain the level and intensity of routine patrol in the targeted area for the test period of *two months*. If changes in manpower allocations are necessary, the DPD agrees to notify NIJ and the independent evaluator selected of this change twenty-four (24) hours prior to the deployment.

C. The DPD agrees to provide the necessary manpower and desk space at Central Dispatch to maintain the monitoring equipment for the sensor units.

D. The DPD agrees to provide office space at the Southwest District Headquarters, from which the evaluator can coordinate necessary research activities.

E. The DPD agrees to withhold all press release and other program details of the field test site until after the program terminates, or November 30, 1996.

3. Alliant Techsystems.

A. Alliant Techsystems will setup, install and maintain sensors on utility poles throughout the test area, as well as a strategically located rooftop cellular repeater.

B. Alliant Techsystems will provide Central Dispatch with the equipment necessary to monitor the systems, as well as provide personnel in a timely manner to respond to malfunctioning equipment.

C. Alliant Techsystems will provide the targeted area with an additional 20 units at a price of $1,750 per unit with funds transferred from NIJ.

D. Alliant Techsystems agrees to withhold all press releases and other program details of the field test site until after the program terminates, or November 30, 1996.

E. Alliant Techsystems agrees to comply with all laws of the State of Texas and all laws and regulation of the DPD. Alliant Techsystems understands that any violation of this Agreement or any rules and regulations used for the control of the employees, equipment and/or facilities of the DPD will cause the DPD to remove any person or group from said equipment or facilities.

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IV. Indemnification/Release of Liability

1. NIJ and Alliant Techsystems agree to conduct its activities so as not to endanger any person or property. NIJ and Alliant Techsystems shall indemnify and hold the DPD and all of its agents, councilmembers, officers, directors, employees, and servants harmless and free from any and all liability, including claims, suits, damages, costs, losses, expenses and attorney's fees of any type whatsoever alleged to have arisen out of or to have resulted from any activities undertaken by NIJ or Alliant Techsystems pursuant to this Agreement.

2. The DPD assumes no responsibility whatsoever for any personal property of either NIJ or Alliant Techsystems and/or its employees, servants, or agents.

3. NIJ and Alliant Techsystems acknowledge that the DPD assumes no responsibility for any defects or other conditions of any DPD facility or equipment which may render same to be dangerous, whether known or unknown, and agrees to assume the risk of any and all defects and other conditions of any DPD facility or equipment which may render same to be dangerous, whether known or unknown.

4. NIJ and Alliant Techsystems agree, as part of the execution of this Agreement, to release and covenant not to sue the City of Dallas, it agents, councilmembers, officers, directors, employees, and servants for any type of liability.

V. Access to Private Property

NIJ and Alliant Techsystems hereby acknowledge that neither the DPD nor its officers or employees has given or attempted to give NIJ and Alliant Techsystems permission to enter on private property.

VI. Certificate of Insurance

NIJ and Alliant Techsystems shall obtain and present to the DALLAS POLICE DEPARTMENT a certificate of insurance as required and prepared by the Risk Management Division of the Human Resources Department of the City of Dallas and attached hereto and incorporated for all purposes of this Agreement as Exhibit "A". Access to DPD or City property will NOT be allowed until the insurance requirements are satisfied by NIJ and Alliant Techsystems.

VII. Venue

This Agreement shall be governed by the laws of the State of Texas. The parties agree that venue for any dispute related to this Agreement or any actions or lawsuits that arise out of actions taken by NIJ or Alliant Techsystems, it agents and employees, that involve the City of Dallas, its agents, councilmembers, officers, directors, employees, and servants shall lie in Dallas County, Texas.

VIII. **Period of Agreement**

The period of this agreement is from signature through December 31, 1996.

IX. **Financial Provisions**

Total financial provision is $230,000 from NIJ, of which $200,000 shall be given to a grantee not-yet selected, and $30,000 shall be given to Alliant Techsystems. Fiscal year 1996 funds are available.

X. **Legal Authority**

This agreement is made in accordance with Conference Report 102-99, and Senate Report 102-353.

XI. **Effective Date/Modifications**

This agreement is effective when signed by all parties. This MOU is subject to periodic review by the parties entering into the agreement. This Agreement sets forth the entire agreement of the Parties. Any modification of this Agreement shall be in writing, signed by proper officials of both Parties and attached hereto.

XII. **Contact Persons**

Stephen T. Holmes
Program Manager
National Institute of Justice
633 Indiana Ave., NW
Washington, DC 20531
(202)616-3482

Edward Page
Alliant Techsystems
Advanced Tech Center, Suite 600
1911 Ft. Myer Drive
Arlington, VA 22209
(703)558-9432

Sgt. Bruce McDonald
Dallas Police Department
Southwest District
4230 W. Illinois Ave.
Dallas, Texas 75211
(214)670-7470

XIII. Approvals

IN WITNESS WHEREOF, the Parties have caused this Agreement to be properly executed as of this 12th day of October, 1996.

On behalf of the National Institute of Justice:

Jeremy Travis 10/21/96
Jeremy Travis
Director

Date

On behalf of the Dallas Police Department:

Ben Click 10-18-96
Ben Click
Chief

Date

On behalf of Alliant Techsystems:

Edward Page 10/21/96
Edward Page

Date

APPROVED AS TO FORM:
SAM A. LINDSAY, CITY ATTORNEY

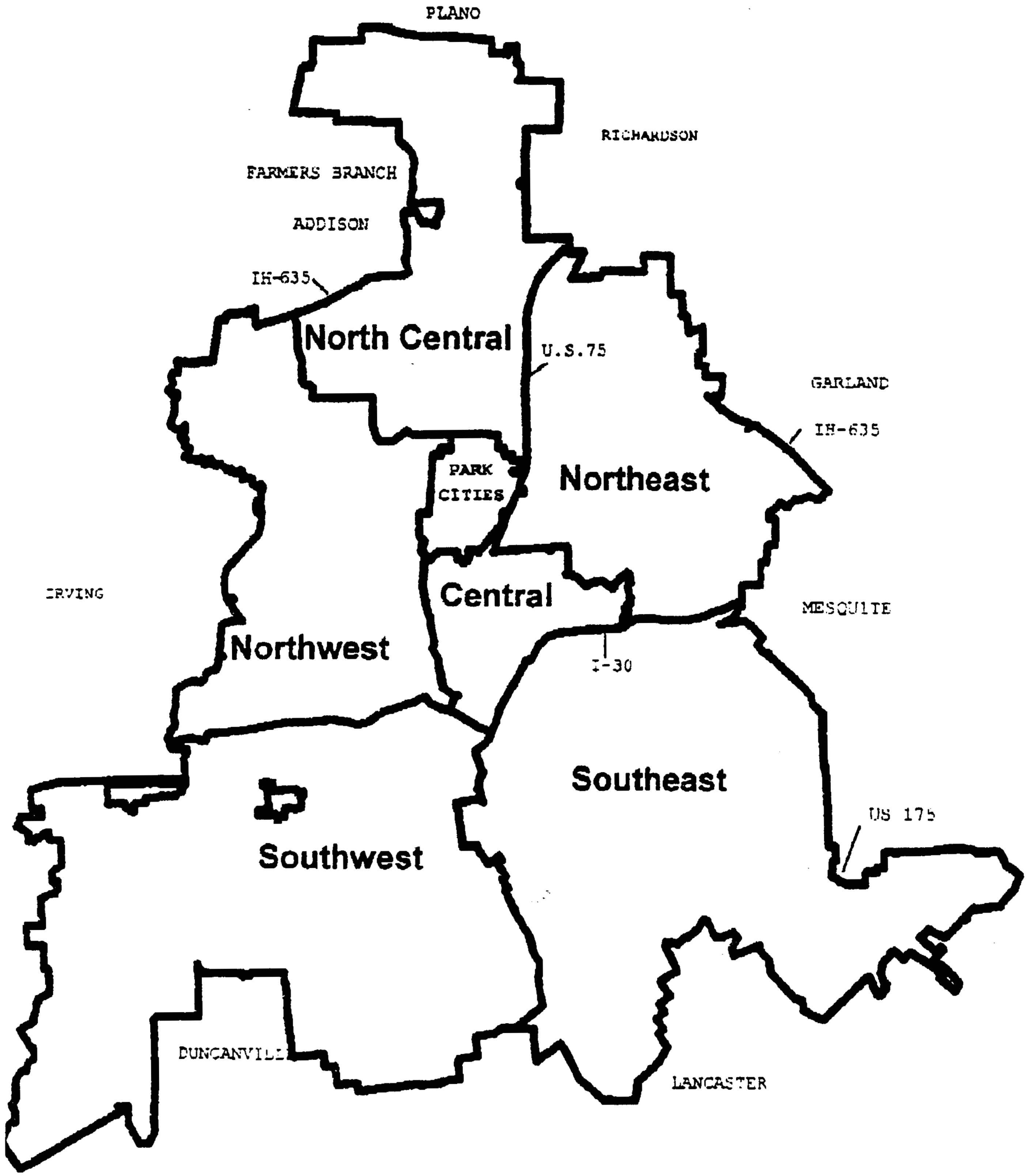
Roxanna Garcia
Assistant City Attorney
Submitted to City Attorney RG

APPROVED: CITY OF DALLAS
JOHN WARE, CITY MANAGER

Assistant City Manager

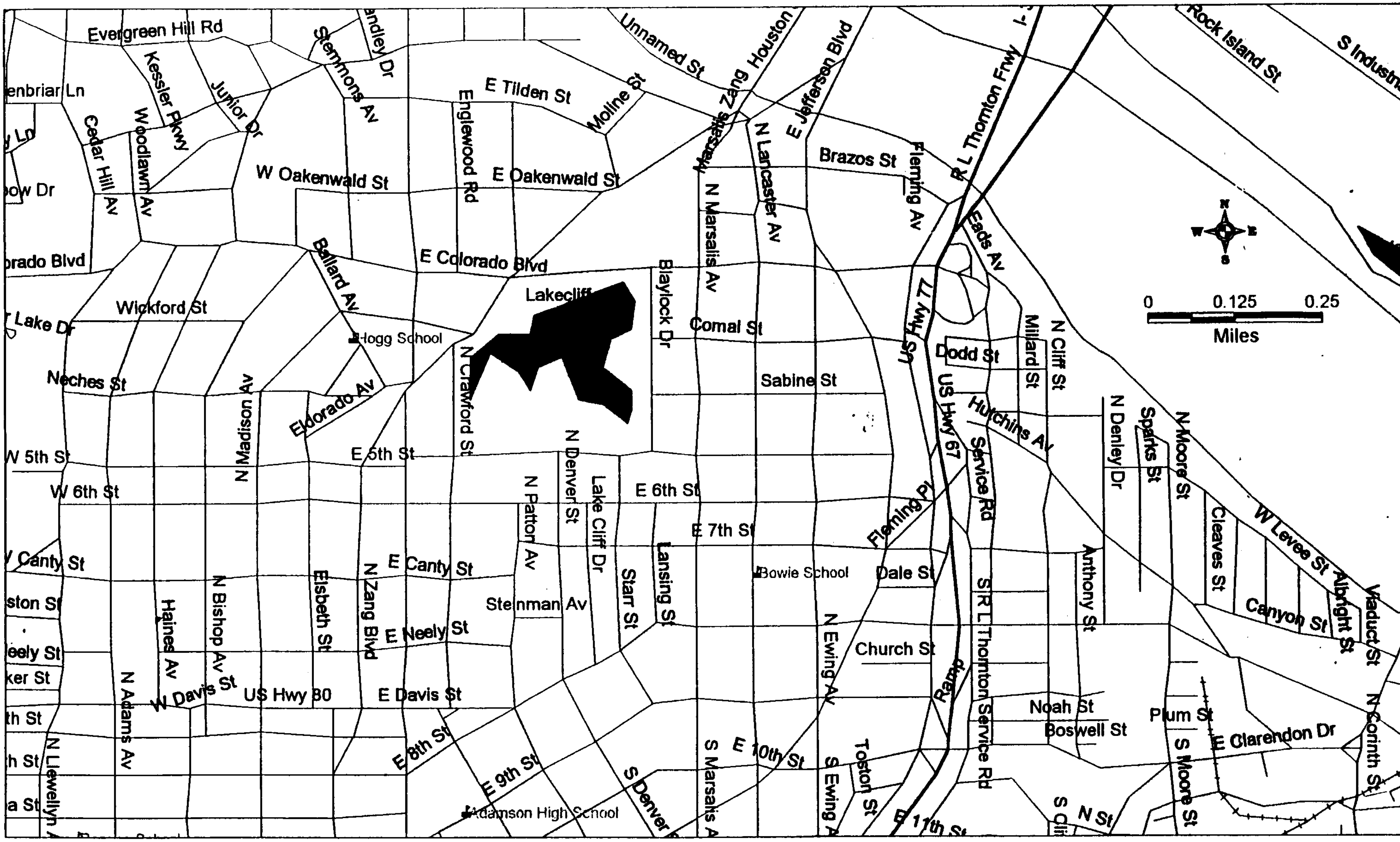
Appendix II

Appendix II
Map of Dallas Police Department Patrol Operations Divisions



Appendix III

Experimental Test Area -- Oak Cliff, TX



This document is a research report submitted to the U.S. Department of Justice. This report has not been published by the Department. Opinions or points of view expressed are those of the author(s) and do not necessarily reflect the official position or policies of the U.S. Department of Justice.

Appendix IV

COMPUTER OUTPUT AND DOCUMENTATION
FOR
1000 FOOT RADIUS VALIDATION

VALIDATION RUN FOR 1000 FOOT RADIUS
6S, 6G, 6X, AND 19 SHOT CALLS
IN EXPERIMENTAL AREA DURING EXPERIMENTAL PERIOD

CASE4	ADDRESS	S6	G6	X6	S19
1	N. BECKLEY AV && E NEELY ST	0	0	0	0
2	250 N PATTON AV	0	0	0	0
3	350 STARR ST	1	0	0	0
4	515 LANSING ST	2	0	0	0
5	272 N MARSALIS AV	1	0	0	0
6	277 N MARSALIS AV	1	0	0	0
7	268 N MARSALIS AV	1	0	0	0
8	N PATTON AV && E CANTY ST	1	0	0	0
9	552 SABINE ST	1	0	0	0
10	136 W 6TH ST	1	2	0	0
11	SABINE ST && N MARSALIS AV	1	1	0	0
12	N MARSALIS AV && E 7TH ST	1	0	0	0
13	368 STARR ST	1	0	0	0
14	366 STARR ST	1	0	0	0
15	539 N MARSALIS AV	1	0	1	0
16	N LANCASTER AV && E 7TH ST	1	0	0	0
17	513 E 7TH ST	1	2	0	0
18	639 E 7TH ST	0	0	0	0
19	N LANCASTER AV && E 5TH ST	1	0	0	0
20	N DENVER ST && STEINMAN AV	1	0	0	0
21	N BECKLEY AV && E 6TH ST	1	0	1	0
22	546 LANSING ST	1	0	0	0
23	N DENVER ST && E 7TH ST	1	0	0	0
24	N PATTON AV && E 8TH ST	0	0	0	0
25	LAKE CLIFF DR & E 7TH ST	1	0	0	0
26	1175 N CRAWFORD ST	0	0	0	0
27	749 E 6TH ST	1	0	0	0
28	E 7TH ST && N PATTON AV	1	0	0	0
29	SABINE ST && N LANCASTER AV	0	1	0	0
30	SABINE ST && N LANCASTER AV	0	1	0	0
31	138 W NEELY ST	0	0	1	0
32	E JEFFERSON BLVD && COMAL ST	0	0	0	0
33	750 E COLORADO BLVD	0	0	0	0
34	COMAL ST && N EWING AV	0	0	0	0
35	946 N ZANG BLVD	0	0	0	0
36	746 COMAL ST	0	0	0	0
37	244 N PATTON AV	0	0	0	0
38	N DENVER ST && E 5TH ST	0	0	0	0
39	E JEFFERSON BLVD && COMAL ST	0	0	0	0
40	E COLORADO BLVD && N EWING AV	1	0	0	0
41	E JEFFERSON BLVD && COMAL ST	1	0	0	0
42	E 6TH ST && N EWING AV	1	0	0	0
43	SABINE ST && N MARSALIS AV	2	0	0	0
44	E 6TH ST && N MARSALIS AV	1	0	0	0
45	SABINE ST && N LANCASTER AV	2	1	0	0
46	SABINE ST && N LANCASTER AV	1	0	0	0
47	LANSING ST && E 6TH ST	1	0	0	0
48	W 6TH ST && N BISHOP AV	1	0	0	0

49	N LANCASTER AV && E 6TH ST	1	0	0	0
50	N CRAWFORD ST && E 5TH ST	1	0	0	0
51	750 E 7TH ST	1	0	0	0
52	N CRAWFORD ST && E 6TH ST	1	0	0	0
53	N LANCASTER AV && E 7TH ST	1	0	1	0
54	734 E 6TH ST	0	0	1	0
55	742 E 6TH ST	0	0	1	0
56	734 E 6TH ST	0	0	1	0
57	E 5TH ST && N EWING AV	1	0	0	0
58	255 W 5TH ST	1	0	0	0
59	E 7TH ST && N PATTON AV	1	0	0	0
60	417 STARR ST	1	1	0	0
61	952 N ZANG BLVD	1	0	0	0
62	110 W 5TH ST	1	0	0	0
63	951 N BECKLEY AV	1	0	0	0
64	849 N BECKLEY AV	1	0	0	0
65	108 W 5TH ST	1	0	0	0
66	N BISHOP AV && W DAVIS ST	1	0	0	0
67	453 E 7TH ST	1	0	0	0
68	601 N BISHOP AV	0	0	0	0
69	E JEFFERSON BLVD && COMAL ST	1	0	0	0
70	535 N LANCASTER AV	1	0	0	0
71	E 6TH ST && N LANCASTER AV	1	0	0	0
72	N PATTON AV && E 8TH ST	0	0	0	0
73	746 COMAL ST	1	0	0	0
74	SABINE ST && N LANCASTER AV	1	0	0	0
75	STARR ST && E 7TH ST	1	0	0	0
76	N EWING AV && E 7TH ST	1	0	0	0
77	335 LAKE CLIFF DR	1	0	0	0
78	638 E 6TH ST	1	0	0	0
79	E 8TH ST && LAKE CLIFF DR	1	0	0	0
80	E 6TH ST && N MARSALIS AV	1	0	0	0
81	E 6TH ST && N MARSALIS AV	0	0	0	0
82	N BECKLEY AV && E 5TH ST	0	0	0	0
83	681 N ZANG BLVD	2	1	0	0
84	N ZANG BLVD && W NEELY ST	2	1	0	0
85	E JEFFERSON BLVD && COMAL ST	1	0	0	0
86	COMAL ST && N MARSALIS AV	1	0	0	0
87	W 5TH ST && N BISHOP AV	1	0	0	0
88	E COLORADO BLVD && N EWING AV	1	0	0	0
89	SABINE ST && N MARSALIS AV	0	0	2	0
90	E COLORADO BLVD && N EWING AV	1	0	0	0
91	ELSBETH ST && W NEELY ST	1	1	0	0
92	N PATTON AV && E CANTY ST	1	0	0	0
93	BLAYLOCK DR && COMAL ST	1	0	0	0
94	N PATTON AV && E CANTY ST	1	0	0	0
95	613 E 6TH ST	1	0	0	0
96	STARR ST && E 8TH ST	1	0	0	0
97	240 W NEELY ST	1	0	0	0
98	831 N ZANG BLVD	1	0	0	0
99	N MARSALIS AV && E 7TH ST	1	0	0	0
100	N BECKLEY AV && E CANTY ST	1	0	0	0
101	N ZANG BLVD && W CANTY ST	3	0	0	0
102	ELSBETH ST && W NEELY ST	4	0	0	0
103	ELSBETH ST && W CANTY ST	3	0	0	0
104	E DAVIS ST && N BECKLEY AV	2	0	0	0
105	E 6TH ST && N LANCASTER AV	1	0	0	0
106	E 6TH ST && N MARSALIS AV	1	0	0	0
107	E JEFFERSON BLVD && COMAL ST	2	0	0	0
108	E COLORADO BLVD && N EWING AV	2	0	0	0

	109 316 LAKE CLIFF DR	1	0	0	0
	110 540 N DENVER ST	0	0	0	0
	111 170 E 6TH ST	1	0	0	0
	112 E 6TH ST && N MARSALIS AV	1	0	0	0
*	113 350 STARR ST	1	0	0	0
	114 459 N PATTON AV	1	0	0	0
*	115 350 STARR ST	0	0	0	0
	116 E 7TH ST && N PATTON AV	1	0	0	0
	117 750 E COLORADO BLVD	1	0	0	0
	118 750 E COLORADO BLVD	1	0	0	0
	119 STARR ST && E 5TH ST	1	1	0	0
	120 880 ELSBETH ST	1	1	0	0
	121 788 ELSBETH ST	1	1	0	0
	122 746 COMAL ST	1	0	0	0
	123 746 COMAL ST	0	0	0	0
	124 N PATTON AV && E CANTY ST	0	0	0	0
	125 N PATTON AV && E CANTY ST	0	0	0	0
	126 N PATTON AV && E CANTY ST	0	0	0	0
	127 350 STARR ST	1	0	0	0
	128 663 BLAYLOCK DR	0	0	0	0
	129 633 COMAL ST	1	0	0	0
	130 N BECKLEY AV && E CANTY ST	1	0	0	0
	131 E JEFFERSON BLVD && COMAL ST	1	0	0	0
	132 E 6TH ST && N EWING AV	1	0	0	0
	133 E 6TH ST && N MARSALIS AV	1	0	0	0
	134 ELSBETH ST && NECHES ST	1	0	0	0
	135 ELSBETH ST && W DAVIS ST	0	0	0	0
	136 N LANCASTER AV && E 7TH ST	1	0	0	0
	137 E 6TH ST && N LANCASTER AV	1	0	0	0
	138 N LANCASTER AV && E 7TH ST	1	0	0	0
	139 N BECKLEY AVE && E 6TH ST	0	1	0	0
	140 SABINE ST && N MARSALIS AV	1	0	0	0
	141 SABINE ST && BLAYLOCK DR	1	0	0	0
	142 N MARSALIS AV && E 6TH ST	1	0	0	0
	143 N ZANG BLVD && W 5TH ST	1	0	0	0
	144 N PATTON AV && E CANTY ST	1	0	0	0
	145 N PATTON AV && E CANTY ST	1	0	0	0
	146 E 6TH ST && N EWING AV	1	0	0	0
	147 E 7TH ST && N PATTON AV	1	0	0	0
	148 COMAL ST && N MARSALIS AV	2	0	0	0
	149 SABINE ST && N MARSALIS AV	1	0	0	0
	150 637 COMAL ST	0	0	0	0
	151 626 COMAL ST	0	0	0	0
	152 134 W CANTY ST	1	0	0	0
	153 COMAL ST && N MARSALIS AV	1	0	0	0
	154 COMAL ST && N MARSALIS AV	1	0	0	0
	155 N PATTON AV && E 6TH ST	1	0	0	0
	156 E 6TH ST && N EWING AV	1	0	0	0
	157 N PATTON AV && E CANTY ST	1	0	0	0
	158 LANSING ST && E 7TH ST	1	0	0	0
	159 N PATTON AV && E CANTY ST	1	0	0	0
	160 651 SABINE ST	1	0	0	0
	161 N MARSALIS AV && E 7TH ST	2	0	0	0
	162 403 E 7TH ST	0	0	0	0
	163 658 N MARSALIS AV	1	1	0	0
	164 ELSBETH ST && W NEELY ST	1	0	0	0
	165 648 SABINE ST	1	2	0	0
	166 N DENVER ST && E 6TH ST	1	0	0	0
	167 516 LANSING ST	1	1	0	0
	168 749 E 6TH ST	1	0	0	0

169	410 E COLORADO BLVD	1	0	0	0
170	N LANCASTER AV && E COLORADO BLVD	1	0	0	0
171	N DENVER ST && E 5TH ST	1	0	0	0
172	N LANCASTER AV && E COLORADO BLVD	1	0	0	0
173	E JEFFERSON BLVD && COMAL ST	1	0	0	0
174	E JEFFERSON BLVD && COMAL ST	1	0	0	0
175	N MARSALIS AV && E 7TH ST	1	0	1	0
176	513 LANSING ST	1	0	0	0
177	N LANCASTER AV && E COLORADO BLVD	1	0	0	0
178	566 E 7TH ST	1	0	0	0
179	746 COMAL ST	0	0	0	0
180	661 N LANCASTER AV	1	3	1	0
181	E 5TH ST && N MARSALIS AV	2	3	0	0
182	LANSING ST && E 7TH ST	1	0	0	0
183	N DENVER ST && E 7TH ST	1	0	0	0
184	N DENVER ST && E 7TH ST	1	0	0	0
185	N DENVER ST && E 7TH ST	1	0	0	0
186	N DENVER ST && E 7TH ST	0	0	0	0
187	N DENVER ST && E 7TH ST	1	0	0	0
188	660 E 6TH ST	0	0	0	0
189	650 SABINE ST	0	0	0	0
190	N CRAWFORD ST && E NEELY ST	1	0	0	0
191	1000 N BECKLEY AV	1	0	1	0
192	564 SABINE ST	1	0	0	0
193	E 6TH ST && N MARSALIS AV	1	0	0	0
194	STARR ST && E 8TH ST	1	0	0	0
195	509 E 8TH ST	1	0	0	0
196	N MARSALIS AV && E 7TH ST	1	0	0	0
197	E JEFFERSON BLVD && COMAL ST	1	0	0	0
198	649 COMAL ST	1	0	0	0
199	750 E COLORADO BLVD	1	0	1	0
200	N PATTON AV && E 6TH ST	1	0	0	0
201	N PATTON AV && E CANTY ST	1	0	0	0
202	STARR ST && E 8TH ST	1	0	0	0
203	636 E 6TH ST	1	0	0	0
204	750 E COLORADO BLVD	1	0	0	0
205	ELSBETH ST && NECHES ST	1	0	0	0
206	415 STARR ST	2	1	0	0
207	739 N LANCASTER AV	2	1	0	0
208	560 N MARSALIS AV	1	1	0	0
209	LANSING ST && E 6TH ST	1	0	0	0
210	650 SABINE ST	0	0	0	0
211	LANSING ST && E 7TH ST	1	0	0	0
212	W 6TH ST && N BISHOP AV	1	3	0	0
213	LANSING ST && E 7TH ST	1	0	0	0
214	E 6TH ST && N EWING AV	1	0	0	0
215	N MADISON AV && W CANTY ST	1	0	0	0

VERIFICATION INFORMATION
1000 FOOT RADIUS WITH 30 MINUTES
EXPERIMENTAL AREA DURING EXPERIMENTAL PERIOD
EACH ALLIANT SHOT IS FOLLOWED BY ITS VERIFIED SHOTS

```
-----------------------------------------------------------------------------
1 10/24/96 1508 N. BECKLEY AV && E NEELY ST
-----------------------------------------------------------------------------
2 10/24/96 1539 250 N PATTON AV
-----------------------------------------------------------------------------
3 10/24/96 2152 350 STARR ST
     0996396E 10/24/96 2154 6S STARR ST && E 7TH ST                       3
-----------------------------------------------------------------------------
4 10/25/96 0028 515 LANSING ST
     0996727E 10/25/96 0029 6S LANSING ST && E 6TH ST                     4
     0996749E 10/25/96 0036 6S E 8TH ST  && STARR ST                      4
-----------------------------------------------------------------------------
5 10/25/96 0920 272 N MARSALIS AV
     0997439E 10/25/96 0921 6S N MARSALIS AV && E 8TH ST                  5
-----------------------------------------------------------------------------
6 10/25/96 0920 277 N MARSALIS AV
     0997439E 10/25/96 0921 6S N MARSALIS AV && E 8TH ST                  6
-----------------------------------------------------------------------------
7 10/25/96 0920 268 N MARSALIS AV
     0997439E 10/25/96 0921 6S N MARSALIS AV && E 8TH ST                  7
-----------------------------------------------------------------------------
8 10/25/96 1451 N PATTON AV && E CANTY ST
     0998169E 10/25/96 1452 6S E CANTY ST && N PATTON AV                  8
-----------------------------------------------------------------------------
9 10/25/96 1638 552 SABINE ST
     0998462E 10/25/96 1639 6S BLAYLOCK DR  && SABINE ST                  9
-----------------------------------------------------------------------------
10 10/27/96 0115 136 W 6TH ST
     1004802E 10/27/96 0116 6S ELSBETH ST && W 6TH ST                    10
     1004806E 10/27/96 0117 6G 836 N MADISON AV                          10
     1004905E 10/27/96 0141 6G 836 N MADISON AV                          10
-----------------------------------------------------------------------------
11 10/27/96 0135 SABINE ST && N MARSALIS AV
     1004604E 10/27/96 0135 6S N MARSALIS AV && SABINE ST                11
     1004615E 10/27/96 0137 6G 800 N MARSALIS AV                         11
-----------------------------------------------------------------------------
12 10/27/96 0223 N MARSALIS AV && E 7TH ST
     1005112E 10/27/96 0224 6S N MARSALIS AV && E 7TH ST                 12
-----------------------------------------------------------------------------
13 10/27/96 0350 368 STARR ST
     1005379E 10/27/96 0352 6S E 8TH ST  && STARR ST                     13
-----------------------------------------------------------------------------
14 10/27/96 0350 366 STARR ST
     1005379E 10/27/96 0352 6S E 8TH ST  && STARR ST                     14
-----------------------------------------------------------------------------
15 10/27/96 0442 539 N MARSALIS AV
     1005473E 10/27/96 0443 6S 505 N MARSALIS AV                         15
     1005475E 10/27/96 0444 6X 501 N MARSALIS AV                         15
-----------------------------------------------------------------------------
16 10/27/96 0937 N LANCASTER AV && E 7TH ST
     1005920E 10/27/96 0939 6S N LANCASTER AV && E 7TH ST                16
-----------------------------------------------------------------------------
```

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17 10/27/96 1309 513 E 7TH ST
     1006381E 10/27/96 1311 6G N MARSALIS AV && E 7TH ST                 17
     1006382E 10/27/96 1311 6G N MARSALIS AV && E 6TH ST                 17
     1006383E 10/27/96 1311 6S LANSING ST && E 6TH ST                    17
-----------------------------------------------------------------------------
18 10/27/96 1312 639 E 7TH ST
-----------------------------------------------------------------------------
19 10/27/96 1648 N LANCASTER AV && E 5TH ST
     1007020E 10/27/96 1648 6S E 5TH ST &&  N LANCASTER AV               19
-----------------------------------------------------------------------------
20 10/27/96 1955 N DENVER ST && STEINMAN AV
     1007700E 10/27/96 1957 6S N DENVER ST && STEINMAN AV                20
-----------------------------------------------------------------------------
21 10/27/96 1956 N BECKLEY AV && E 6TH ST
     1007701E 10/27/96 1957 6S N BECKLEY AV && E 6TH ST                  21
     1007710E 10/27/96 2000 6X 111 E 6TH ST                              21
-----------------------------------------------------------------------------
22 10/27/96 2127 546 LANSING ST
     1008008E 10/27/96 2128 6S STARR ST && E 6TH ST                      22
-----------------------------------------------------------------------------
23 10/28/96 1510 N DENVER ST && E 7TH ST
     1010114E 10/28/96 1511 6S N DENVER ST && E 6TH ST                   23
-----------------------------------------------------------------------------
24 10/28/96 2207 N PATTON AV && E 8TH ST
-----------------------------------------------------------------------------
25 10/29/96 2158 LAKE CLIFF DR & E 7TH ST
     1014391E 10/29/96 2158 6S LAKE CLIFF DR && E 7TH ST                 25
-----------------------------------------------------------------------------
26 10/30/96 1602 1175 N CRAWFORD ST
-----------------------------------------------------------------------------
27 10/30/96 1855 749 E 6TH ST
     1016898E 10/30/96 1856 6S N LANCASTER AV && E 6TH ST                27
-----------------------------------------------------------------------------
28 10/31/96 0716 E 7TH ST && N PATTON AV
     1018080E 10/31/96 0717 6S N PATTON AV && E 7TH ST                   28
-----------------------------------------------------------------------------
29 11/01/96 0044 SABINE ST && N LANCASTER AV
     1021186E 11/01/96 0046 6G 720 N LANCASTER AV                        29
-----------------------------------------------------------------------------
30 11/01/96 0045 SABINE ST && N LANCASTER AV
     1021186E 11/01/96 0046 6G 720 N LANCASTER AV                        30
-----------------------------------------------------------------------------
31 11/02/96 0151 138 W NEELY ST
     1024723E 11/02/96 0159 6X 610 N MADISON AV                          31
-----------------------------------------------------------------------------
32 11/02/96 0208 E JEFFERSON BLVD && COMAL ST
-----------------------------------------------------------------------------
33 11/02/96 0549 750 E COLORADO BLVD
-----------------------------------------------------------------------------
34 11/02/96 1215 COMAL ST && N EWING AV
-----------------------------------------------------------------------------
35 11/02/96 2045 946 N ZANG BLVD
-----------------------------------------------------------------------------
36 11/02/96 2140 746 COMAL ST
-----------------------------------------------------------------------------
37 11/03/96 0403 244 N PATTON AV
-----------------------------------------------------------------------------
38 11/03/96 1413 N DENVER ST && E 5TH ST
-----------------------------------------------------------------------------
39 11/03/96 2315 E JEFFERSON BLVD && COMAL ST
```

40 11/05/96 0742 E COLORADO BLVD && N EWING AV
1035219E 11/05/96 0743 6S E COLORADO BLVD && N EWING AV 40

41 11/05/96 1043 E JEFFERSON BLVD && COMAL ST
1035623E 11/05/96 1045 6S COMAL ST && E JEFFERSON BLVD 41

42 11/05/96 1447 E 6TH ST && N EWING AV
1036233E 11/05/96 1449 6S N EWING AV && E 6TH ST 42

43 11/05/96 1756 SABINE ST && N MARSALIS AV
1036869E 11/05/96 1758 6S N MARSALIS AV && SABINE ST 43
1036880E 11/05/96 1802 6S N MARSALIS AV && E 6TH ST 43

44 11/05/96 1801 E 6TH ST && N MARSALIS AV
1036880E 11/05/96 1802 6S N MARSALIS AV && E 6TH ST 44

45 11/05/96 1919 SABINE ST && N LANCASTER AV
1037125E 11/05/96 1920 6S N LANCASTER AV && SABINE ST 45
1037126E 11/05/96 1921 6G 720 N LANCASTER AV 45
1037144E 11/05/96 1925 6S N LANCASTER AV && E 6TH ST 45

46 11/06/96 0813 SABINE ST && N LANCASTER AV
1038372E 11/06/96 0814 6S N LANCASTER AV && SABINE ST 46

47 11/06/96 1528 LANSING ST && E 6TH ST
1039383E 11/06/96 1529 6S LANSING ST && E 6TH ST 47

48 11/06/96 1531 W 6TH ST && N BISHOP AV
1039389E 11/06/96 1532 6S N BISHOP AV && W 6TH ST 48

49 11/06/96 1548 N LANCASTER AV && E 6TH ST
1039434E 11/06/96 1549 6S N LANCASTER AV && E 8TH ST 49

50 11/06/96 2256 N CRAWFORD ST && E 5TH ST
1040632E 11/06/96 2259 6S N CRAWFORD ST && E 5TH ST 50

51 11/07/96 1608 750 E 7TH ST
1042620E 11/07/96 1609 6S N LANCASTER AV && E 7TH ST 51

52 11/08/96 0904 N CRAWFORD ST && E 6TH ST
1044659E 11/08/96 0907 6S N CRAWFORD ST && E 6TH ST 52

53 11/09/96 1302 N LANCASTER AV && E 7TH ST
1048688E 11/09/96 1305 6S N LANCASTER AV && E 7TH ST 53
1048736E 11/09/96 1321 6X 426 N LANCASTER AV 53

54 11/09/96 1306 734 E 6TH ST
1048736E 11/09/96 1321 6X 426 N LANCASTER AV 54

55 11/09/96 1306 742 E 6TH ST
1048736E 11/09/96 1321 6X 426 N LANCASTER AV 55

56 11/09/96 1307 734 E 6TH ST
1048736E 11/09/96 1321 6X 426 N LANCASTER AV 56

57 11/09/96 1501 E 5TH ST && N EWING AV
1048978E 11/09/96 1501 6S N EWING AV && E 5TH ST 57

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58 11/09/96 1736 255 W 5TH ST
     1049385E 11/09/96 1738 6S N MADISON AV && W 6TH ST                     58
------------------------------------------------------------------------------
59 11/09/96 1932 E 7TH ST && N PATTON AV
     1049727E 11/09/96 1932 6S N PATTON AV && E 7TH ST                      59
------------------------------------------------------------------------------
60 11/09/96 2346 417 STARR ST
     1050628E 11/09/96 2347 6S LAKE CLIFF DR && E 7TH ST                    60
     1050669E 11/09/96 2354 6G 400 E 7TH ST                                 60
------------------------------------------------------------------------------
61 11/09/96 2351 952 N ZANG BLVD
     1050656E 11/09/96 2352 6S N ZANG BLVDD && W 5TH ST                     61
------------------------------------------------------------------------------
62 11/09/96 2351 110 W 5TH ST
     1050656E 11/09/96 2352 6S N ZANG BLVDD && W 5TH ST                     62
------------------------------------------------------------------------------
63 11/09/96 2352 951 N BECKLEY AV
     1050656E 11/09/96 2352 6S N ZANG BLVDD && W 5TH ST                     63
------------------------------------------------------------------------------
64 11/09/96 2352 849 N BECKLEY AV
     1050656E 11/09/96 2352 6S N ZANG BLVDD && W 5TH ST                     64
------------------------------------------------------------------------------
65 11/09/96 2352 108 W 5TH ST
     1050656E 11/09/96 2352 6S N ZANG BLVDD && W 5TH ST                     65
------------------------------------------------------------------------------
66 11/10/96 0056 N BISHOP AV && W DAVIS ST
     1051036E 11/10/96 0057 6S N BISHOP AV && W 8TH ST                      66
------------------------------------------------------------------------------
67 11/10/96 0105 453 E 7TH ST
     1051080E 11/10/96 0105 6S LAKE CLIFF DR && E 7TH ST                    67
------------------------------------------------------------------------------
68 11/10/96 0142 601 N BISHOP AV
------------------------------------------------------------------------------
69 11/11/96 1856 E JEFFERSON BLVD && COMAL ST
     1056490E 11/11/96 1858 6S COMAL ST && E JEFFERSON BLVD                 69
------------------------------------------------------------------------------
70 11/11/96 2205 535 N LANCASTER AV
     1057044E 11/11/96 2206 6S N MARSALIS AV && E 6TH ST                    70
------------------------------------------------------------------------------
71 11/12/96 1637 E 6TH ST && N LANCASTER AV
     1058975E 11/12/96 1638 6S N LANCASTER AV && E 6TH ST                   71
------------------------------------------------------------------------------
72 11/12/96 1812 N PATTON AV && E 8TH ST
------------------------------------------------------------------------------
73 11/12/96 2119 746 COMAL ST
     1059824E 11/12/96 2121 6S COMAL ST && N LANCASTER AV                   73
------------------------------------------------------------------------------
74 11/13/96 1435 SABINE ST && N LANCASTER AV
     1061590E 11/13/96 1443 6S N LANCASTER AV && SABINE ST                  74
------------------------------------------------------------------------------
75 11/14/96 1140 STARR ST && E 7TH ST
     1064232E 11/14/96 1143 6S STARR ST && E 7TH ST                         75
------------------------------------------------------------------------------
76 11/14/96 1517 N EWING AV && E 7TH ST
     1064762E 11/14/96 1518 6S N EWING AV && E 7TH ST                       76
------------------------------------------------------------------------------
77 11/14/96 1721 335 LAKE CLIFF DR
     1065097E 11/14/96 1722 6S N DENVER ST && STEINMAN AV                   77
------------------------------------------------------------------------------
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78 11/15/96 0002 638 E 6TH ST
    1066174E 11/15/96 0004 6S N LANCASTER AV && E 6TH ST 78

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79 11/15/96 1405 E 8TH ST && LAKE CLIFF DR
    1067713E 11/15/96 1406 6S LAKE CLIFF DR && E 8TH ST 79

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80 11/15/96 1425 E 6TH ST && N MARSALIS AV
    1067795E 11/15/96 1427 6S N MARSALIS AV && E 6TH ST 80

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81 11/15/96 1428 E 6TH ST && N MARSALIS AV

---

82 11/15/96 1849 N BECKLEY AV && E 5TH ST

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83 11/16/96 0059 681 N ZANG BLVD
    1069916E 11/16/96 0059 6S ELSBETH ST && W NEELY ST 83
    1069917E 11/16/96 0100 6S W NEELY ST && N ZANG BLVD 83
    1070020E 11/16/96 0127 6G ELSBETH ST && W NEELY ST 83

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84 11/16/96 0059 N ZANG BLVD && W NEELY ST
    1069916E 11/16/96 0059 6S ELSBETH ST && W NEELY ST 84
    1069917E 11/16/96 0100 6S W NEELY ST && N ZANG BLVD 84
    1070020E 11/16/96 0127 6G ELSBETH ST && W NEELY ST 84

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85 11/16/96 0629 E JEFFERSON BLVD && COMAL ST
    1070644E 11/16/96 0630 6S COMAL ST && E JEFFERSON BLVD 85

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86 11/16/96 1830 COMAL ST && N MARSALIS AV
    1072478E 11/16/96 1831 6S COMAL ST && N MARSALIS AV 86

---

87 11/16/96 1854 W 5TH ST && N BISHOP AV
    1072556E 11/16/96 1854 6S N BISHOP AV && W 5TH ST 87

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88 11/17/96 0031 E COLORADO BLVD && N EWING AV
    1073751E 11/17/96 0032 6S E COLORADO BLVD && N EWING AV 88

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89 11/17/96 0037 SABINE ST && N MARSALIS AV
    1073896E 11/17/96 0103 6X N MARSALIS AV && E 6TH ST 89
    1073908E 11/17/96 0107 6X 501 N MARSALIS AV 89

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90 11/17/96 0204 E COLORADO BLVD && N EWING AV
    1074123E 11/17/96 0204 6S E COLORADO BLVD && N EWING AV 90

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91 11/17/96 0223 ELSBETH ST && W NEELY ST
    1074191E 11/17/96 0223 6S ELSBETH ST && W NEELY ST 91
    1074193E 11/17/96 0224 6G 302 W NEELY ST 91

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92 11/17/96 1014 N PATTON AV && E CANTY ST
    1075011E 11/17/96 1014 6S E CANTY ST && N PATTON AV 92

---

93 11/17/96 1150 BLAYLOCK DR && COMAL ST
    1075211E 11/17/96 1152 6S BLAYLOCK DR && COMAL ST 93

---

94 11/17/96 1435 N PATTON AV && E CANTY ST
    1075586E 11/17/96 1436 6S 200 E CANTY ST 94

---

95 11/17/96 2232 613 E 6TH ST
    1076751E 11/17/96 2233 6S N MARSALIS AV && E 6TH ST 95

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96 11/17/96 2343 STARR ST && E 8TH ST
    1076876E 11/17/96 2345 6S STARR ST && E 8TH ST 96

97 11/18/96 0147 240 W NEELY ST
    1077052E 11/18/96 0148 6S ELSBETH ST && W DAVIS ST   97

98 11/18/96 0637 831 N ZANG BLVD
    1077315E 11/18/96 0637 6S N BECKLEY AV && E CANTY ST   98

99 11/18/96 0651 N MARSALIS AV && E 7TH ST
    1077343E 11/18/96 0652 6S N MARSALIS AV && E 7TH ST   99

100 11/18/96 0720 N BECKLEY AV && E CANTY ST
    1077374E 11/18/96 0720 6S N BECKLEY AV && E CANTY ST   100

101 11/18/96 1014 N ZANG BLVD && W CANTY ST
    1077753E 11/18/96 1015 6S ELSBETH ST && W CANTY ST   101
    1077755E 11/18/96 1016 6S N ZANG BLVD && W CANTY ST   101
    1077756E 11/18/96 1016 6S ELSBETH ST && W NEELY ST   101

102 11/18/96 1014 ELSBETH ST && W NEELY ST
    1077753E 11/18/96 1015 6S ELSBETH ST && W CANTY ST   102
    1077755E 11/18/96 1016 6S N ZANG BLVD && W CANTY ST   102
    1077756E 11/18/96 1016 6S ELSBETH ST && W NEELY ST   102
    1077761E 11/18/96 1018 6S N BECKLEY AV && W DAVIS ST   102

103 11/18/96 1015 ELSBETH ST && W CANTY ST
    1077753E 11/18/96 1015 6S ELSBETH ST && W CANTY ST   103
    1077755E 11/18/96 1016 6S N ZANG BLVD && W CANTY ST   103
    1077756E 11/18/96 1016 6S ELSBETH ST && W NEELY ST   103

104 11/18/96 1016 E DAVIS ST && N BECKLEY AV
    1077756E 11/18/96 1016 6S ELSBETH ST && W NEELY ST   104
    1077761E 11/18/96 1018 6S N BECKLEY AV && W DAVIS ST   104

105 11/18/96 1105 E 6TH ST && N LANCASTER AV
    1077879E 11/18/96 1105 6S N LANCASTER AV && E 6TH ST   105

106 11/19/96 1817 E 6TH ST && N MARSALIS AV
    1081971E 11/19/96 1818 6S N MARSALIS AV && E 6TH ST   106

107 11/19/96 2250 E JEFFERSON BLVD && COMAL ST
    1082732E 11/19/96 2251 6S COMAL ST && E JEFFERSON BLVD   107
    1082734E 11/19/96 2252 6S E COLORADO BLVD && N EWING AV   107

108 11/19/96 2250 E COLORADO BLVD && N EWING AV
    1082732E 11/19/96 2251 6S COMAL ST && E JEFFERSON BLVD   108
    1082734E 11/19/96 2252 6S E COLORADO BLVD && N EWING AV   108

109 11/20/96 1306 316 LAKE CLIFF DR
    1083940E 11/20/96 1308 6S N DENVER ST && STEINMAN AV   109

110 11/20/96 1925 540 N DENVER ST

111 11/21/96 0003 170 E 6TH ST
    1085881E 11/21/96 0004 6S N CRAWFORD ST && E 6TH ST   111

112 11/21/96 1604 E 6TH ST && N MARSALIS AV
    1087521E 11/21/96 1604 6S N MARSALIS AV && E 6TH ST   112

113 11/21/96 1808 350 STARR ST
    1087885E 11/21/96 1809 6S STARR ST && E 7TH ST   113

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114 11/21/96 1917 459 N PATTON AV
    1088080E 11/21/96 1917 6S N PATTON AV && E 7TH ST 114

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115 11/21/96 1810 350 STARR ST

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116 11/21/96 1917 E 7TH ST && N PATTON AV
    1088080E 11/21/96 1917 6S N PATTON AV && E 7TH ST 116

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117 11/22/96 0418 750 E COLORADO BLVD
    1089126E 11/22/96 0419 6S E COLORADO BLV && N LANCASTER AV 117

---

118 11/22/96 0848 750 E COLORADO BLVD
    1089492E 11/22/96 0849 6S E COLORADO BLV && N LANCASTER AV 118

---

119 11/23/96 0117 STARR ST && E 5TH ST
    1092281E 11/23/96 0118 6S STARR ST && E 5TH ST 119
    1092297E 11/23/96 0122 6G BLAYLOCK DR && E 5TH ST 119

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120 11/23/96 0432 880 ELSBETH ST
    1092700E 11/23/96 0433 6S N MADISON AV && W 6TH ST 120
    1092701E 11/23/96 0433 6G 825 ELSBETH ST 120

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121 11/23/96 0432 788 ELSBETH ST
    1092700E 11/23/96 0433 6S N MADISON AV && W 6TH ST 121
    1092701E 11/23/96 0433 6G 825 ELSBETH ST 121

---

122 11/25/96 1245 746 COMAL ST
    1100732E 11/25/96 1246 6S COMAL ST && N LANCASTER AV 122

---

123 11/25/96 1247 746 COMAL ST

---

124 11/25/96 1532 N PATTON AV && E CANTY ST

---

125 11/25/96 1604 N PATTON AV && E CANTY ST

---

126 11/25/96 1604 N PATTON AV && E CANTY ST

---

127 11/25/96 1647 350 STARR ST
    1101353E 11/25/96 1700 6S STARR ST && E 7TH ST 127

---

128 11/25/96 1939 663 BLAYLOCK DR

---

129 11/26/96 0004 633 COMAL ST
    1102337E 11/26/96 0007 6S COMAL ST&& N MARSALIS AV 129

---

130 11/26/96 1943 N BECKLEY AV && E CANTY ST
    1104682E 11/26/96 1943 6S N BECKLEY AV && E CANTY ST 130

---

131 11/27/96 0812 E JEFFERSON BLVD && COMAL ST
    1105794E 11/27/96 0814 6S COMAL ST && E JEFFERSON BLVD 131

---

132 11/27/96 1132 E 6TH ST && N EWING AV
    1106199E 11/27/96 1133 6S N EWING AV && E 6TH ST 132

---

133 11/27/96 1501 E 6TH ST && N MARSALIS AV
    1106733E 11/27/96 1501 6S N MARSALIS AV && E 6TH ST 133

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134 11/27/96 1715 ELSBETH ST && NECHES ST
    1107142E 11/27/96 1715 6S ELSBETH ST && NECHES ST 134

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------------------------------------------------------------------------------
135 11/27/96 1716 ELSBETH ST && W DAVIS ST
------------------------------------------------------------------------------
136 11/27/96 1826 N LANCASTER AV && E 7TH ST
     1107360E 11/27/96 1827 6S N LANCASTER AV && E 7TH ST                136
------------------------------------------------------------------------------
137 11/27/96 1858 E 6TH ST && N LANCASTER AV
     1107454E 11/27/96 1858 6S N LANCASTER AV && E 6TH ST                137
------------------------------------------------------------------------------
138 11/27/96 2021 N LANCASTER AV && E 7TH ST
     1107703E 11/27/96 2021 6S N LANCASTER AV && E 7TH ST                138
------------------------------------------------------------------------------
139 11/27/96 2310 N BECKLEY AVE && E 6TH ST
     1108138E 11/27/96 2312 6G 108 E FIFTH ST                            139
------------------------------------------------------------------------------
140 11/28/96 1252 SABINE ST && N MARSALIS AV
     1109521E 11/28/96 1252 6S N MARSALIS AV && SABINE ST                140
------------------------------------------------------------------------------
141 11/28/96 1940 SABINE ST && BLAYLOCK DR
     1110260E 11/28/96 1941 6S BLAYLOCK DR && SABINE ST                  141
------------------------------------------------------------------------------
142 11/29/96 0146 N MARSALIS AV && E 6TH ST
     1111164E 11/29/96 0147 6S N MARSALIS AV && E 8TH ST                 142
------------------------------------------------------------------------------
143 11/29/96 0509 N ZANG BLVD && W 5TH ST
     1111408E 11/29/96 0510 6S N ZANG BLVD && W 5TH ST                   143
------------------------------------------------------------------------------
144 11/29/96 1058 N PATTON AV && E CANTY ST
     1111946E 11/29/96 1058 6S E CANTY ST && N PATTON AV                 144
------------------------------------------------------------------------------
145 11/29/96 1344 N PATTON AV && E CANTY ST
     1112416E 11/29/96 1344 6S E CANTY ST && N PATTON AV                 145
------------------------------------------------------------------------------
146 11/29/96 1358 E 6TH ST && N EWING AV
     1112448E 11/29/96 1359 6S N EWING AV && E 6TH ST                    146
------------------------------------------------------------------------------
147 11/29/96 1557 E 7TH ST && N PATTON AV
     1112736E 11/29/96 1558 6S N PATTON AV && E 7TH ST                   147
------------------------------------------------------------------------------
148 11/29/96 2309 COMAL ST && N MARSALIS AV
     1113985E 11/29/96 2310 6S COMAL ST && N MARSALIS AV                 148
     1113989E 11/29/96 2311 6S N MARSALIS AV  && SABINE ST               148
------------------------------------------------------------------------------
149 11/29/96 2311 SABINE ST && N MARSALIS AV
     1113989E 11/29/96 2311 6S N MARSALIS AV  && SABINE ST               149
------------------------------------------------------------------------------
150 11/29/96 2320 637 COMAL ST
------------------------------------------------------------------------------
151 11/29/96 2327 626 COMAL ST
------------------------------------------------------------------------------
152 11/30/96 0002 134 W CANTY ST
     1114149E 11/30/96 0002 6S W CANTY ST && N ZANG BLVD                 152
------------------------------------------------------------------------------
153 11/30/96 0058 COMAL ST && N MARSALIS AV
     1114321E 11/30/96 0059 6S 600 COMAL ST                              153
------------------------------------------------------------------------------
154 11/30/96 0058 COMAL ST && N MARSALIS AV
     1114321E 11/30/96 0059 6S 600 COMAL ST                              154
------------------------------------------------------------------------------
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155 11/30/96 0844 N PATTON AV && E 6TH ST
     1115135E 11/30/96 0845 6S N PATTON AV && E 6TH ST                    155
-------------------------------------------------------------------------------
156 11/30/96 1251 E 6TH ST && N EWING AV
     1115714E 11/30/96 1251 6S N EWING AV && E 6TH ST                     156
-------------------------------------------------------------------------------
157 11/30/96 1653 N PATTON AV && E CANTY ST
     1116491E 11/30/96 1653 6S E CANTY ST && N PATTON AV                  157
-------------------------------------------------------------------------------
158 11/30/96 1946 LANSING ST && E 7TH ST
     1117065E 11/30/96 1946 6S LANSING ST && E 7TH ST                     158
-------------------------------------------------------------------------------
159 12/01/96 1251 N PATTON AV && E CANTY ST
     1119389E 12/01/96 1251 6S E CANTY ST && N PATTON AV                  159
-------------------------------------------------------------------------------
160 12/01/96 1818 651 SABINE ST
     1120160E 12/01/96 1819 6S N MARSALIS AV && SABINE ST                 160
-------------------------------------------------------------------------------
161 12/01/96 2055 N MARSALIS AV && E 7TH ST
     1120588E 12/01/96 2055 6S N MARSALIS AV && E 7TH ST                  161
     1120596E 12/01/96 2057 6S LAKE CLIFF DR && E 7TH ST                  161
-------------------------------------------------------------------------------
162 12/01/96 2056 403 E 7TH ST
-------------------------------------------------------------------------------
163 12/01/96 2310 658 N MARSALIS AV
     1120878E 12/01/96 2310 6S N MARSALIS AV && SABINE ST                 163
     1120879E 12/01/96 2311 6G 600 N MARSALIS AV                          163
-------------------------------------------------------------------------------
164 12/02/96 0011 ELSBETH ST && W NEELY ST
     1121009E 12/02/96 0011 6S ELSBETH ST && W NEELY ST                   164
-------------------------------------------------------------------------------
165 12/02/96 0040 648 SABINE ST
     1121053E 12/02/96 0040 6S N LANCASTER AV && SABINE ST                165
     1121055E 12/02/96 0041 6G 622 N MARSALIS AV                          165
     1121056E 12/02/96 0041 6G 705 N MARSALIS AV                          165
-------------------------------------------------------------------------------
166 12/02/96 1648 N DENVER ST && E 6TH ST
     1123006E 12/02/96 1648 6S N DENVER ST && E 6TH ST                    166
-------------------------------------------------------------------------------
167 12/02/96 2316 516 LANSING ST
     1124088E 12/02/96 2317 6S LANSING ST && E 7TH ST                     167
     1124101E 12/02/96 2323 6G 520 E 5TH ST                               167
-------------------------------------------------------------------------------
168 12/03/96 0906 749 E 6TH ST
     1124884E 12/03/96 0907 6S N EWING AV && E 6TH ST                     168
-------------------------------------------------------------------------------
169 12/03/96 0938 410 E COLORADO BLVD
     1124958E 12/03/96 0939 6S BLAYLOCK DR && COMAL ST                    169
-------------------------------------------------------------------------------
170 12/04/96 0059 N LANCASTER AV && E COLORADO BLVD
     1127270E 12/04/96 0100 6S E COLORADO BLV && N LANCASTER AV           170
-------------------------------------------------------------------------------
171 12/05/96 0802 N DENVER ST && E 5TH ST
     1130754E 12/05/96 0806 6S N DENVER ST && E 5TH ST                    171
-------------------------------------------------------------------------------
172 12/06/96 0710 N LANCASTER AV && E COLORADO BLVD
     1133886E 12/06/96 0712 6S E COLORADO BLV && N LANCASTER AV           172
-------------------------------------------------------------------------------
173 12/06/96 1243 E JEFFERSON BLVD && COMAL ST
     1134650E 12/06/96 1243 6S COMAL ST && E JEFFERSON BLVD               173
```

```
------------------------------------------------------------------------------
174 12/06/96 1444 E JEFFERSON BLVD && COMAL ST
     1134992E 12/06/96 1444 6S COMAL ST && E JEFFERSON BLVD                174
------------------------------------------------------------------------------
175 12/07/96 1615 N MARSALIS AV && E 7TH ST
     1139134E 12/07/96 1615 6S N MARSALIS AV && E 7TH ST                    175
     1139198E 12/07/96 1635 6X 325 N EWING AV                               175
------------------------------------------------------------------------------
176 12/07/96 1900 513 LANSING ST
     1139671E 12/07/96 1900 6S LANSING ST && E 7TH ST                       176
------------------------------------------------------------------------------
177 12/07/96 2007 N LANCASTER AV && E COLORADO BLVD
     1139916E 12/07/96 2007 6S E COLORADO BLV && N LANCASTER AV             177
------------------------------------------------------------------------------
178 12/07/96 2055 566 E 7TH ST
     1140051E 12/07/96 2056 6S LANSING ST && E 7TH ST                       178
------------------------------------------------------------------------------
179 12/07/96 2213 746 COMAL ST
------------------------------------------------------------------------------
180 12/07/96 2301 661 N LANCASTER AV
     1140446E 12/07/96 2302 6X 622 N MARSALIS AV                            180
     1140448E 12/07/96 2303 6S N MARSALIS AV && SABINE ST                   180
     1140452E 12/07/96 2304 6G 705 N MARSALIS  AV                           180
     1140454E 12/07/96 2305 6G N MARSALIS AV && E 5TH ST                    180
     1140456E 12/07/96 2305 6G 515 N MARSALIS AV                            180
------------------------------------------------------------------------------
181 12/07/96 2303 E 5TH ST && N MARSALIS AV
     1140448E 12/07/96 2303 6S N MARSALIS AV && SABINE ST                   181
     1140452E 12/07/96 2304 6G 705 N MARSALIS  AV                           181
     1140454E 12/07/96 2305 6G N MARSALIS AV && E 5TH ST                    181
     1140456E 12/07/96 2305 6G 515 N MARSALIS AV                            181
     1140532E 12/07/96 2322 6S LANSING ST && E 7TH ST                       181
------------------------------------------------------------------------------
182 12/07/96 2321 LANSING ST && E 7TH ST
     1140532E 12/07/96 2322 6S LANSING ST && E 7TH ST                       182
------------------------------------------------------------------------------
183 12/08/96 1400 N DENVER ST && E 7TH ST
     1142418E 12/08/96 1403 6S N DENVER ST && E 7TH ST                      183
------------------------------------------------------------------------------
184 12/08/96 1526 N DENVER ST && E 7TH ST
     1142676E 12/08/96 1545 6S N DENVER ST && E 7TH ST                      184
------------------------------------------------------------------------------
185 12/08/96 1544 N DENVER ST && E 7TH ST
     1142676E 12/08/96 1545 6S N DENVER ST && E 7TH ST                      185
------------------------------------------------------------------------------
186 12/08/96 1614 N DENVER ST && E 7TH ST
------------------------------------------------------------------------------
187 12/08/96 1644 N DENVER ST && E 7TH ST
     1142836E 12/08/96 1645 6S N DENVER ST && E 7TH ST                      187
------------------------------------------------------------------------------
188 12/08/96 2253 660 E 6TH ST
------------------------------------------------------------------------------
189 12/09/96 0949 650 SABINE ST
------------------------------------------------------------------------------
190 12/09/96 1414 N CRAWFORD ST && E NEELY ST
     1145611E 12/09/96 1415 6S N CRAWFORD ST && E NEELY ST                  190
------------------------------------------------------------------------------
191 12/09/96 2239 1000 N BECKLEY AV
     1147086E 12/09/96 2244 6X 919 N BECKLEY AV                             191
     1147069E 12/09/96 2240 6S BECKLEY       AVE FIFTH         ST           191
```

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-----------------------------------------------------------------------------
192 12/10/96 1541 564 SABINE ST
     1148882E 12/10/96 1541 6S N MARSALIS AV && SABINE ST              192
-----------------------------------------------------------------------------
193 12/11/96 0742 E 6TH ST && N MARSALIS AV
     1150991E 12/11/96 0743 6S N MARSALIS AV && E 6TH ST               193
-----------------------------------------------------------------------------
194 12/11/96 1632 STARR ST && E 8TH ST
     1152272E 12/11/96 1633 6S E 8TH ST && STARR ST                    194
-----------------------------------------------------------------------------
195 12/11/96 1733 509 E 8TH ST
     1152498E 12/11/96 1734 6S STARR ST && E 7TH ST                    195
-----------------------------------------------------------------------------
196 12/12/96 0711 N MARSALIS AV && E 7TH ST
     1154175E 12/12/96 0712 6S N MARSALIS AV && E 7TH ST               196
-----------------------------------------------------------------------------
197 12/12/96 1502 E JEFFERSON BLVD && COMAL ST
     1155328E 12/12/96 1502 6S COMAL ST && E JEFFERSON BLVD            197
-----------------------------------------------------------------------------
198 12/12/96 1747 649 COMAL ST
     1155859E 12/12/96 1748 6S COMAL ST && N LANCASTER AV              198
-----------------------------------------------------------------------------
199 12/12/96 1958 750 E COLORADO BLVD
     1156262E 12/12/96 1959 6S E COLORADO BLVD  && N EWING AV          199
     1156322E 12/12/96 2020 6X 706 N EWING AV                          199
-----------------------------------------------------------------------------
200 12/12/96 2314 N PATTON AV && E 6TH ST
     1156808E 12/12/96 2315 6S N PATTON AV && E 6TH ST                 200
-----------------------------------------------------------------------------
201 12/13/96 0935 N PATTON AV && E CANTY ST
     1157709E 12/13/96 0935 6S E CANTY ST && N PATTON AV               201
-----------------------------------------------------------------------------
202 12/13/96 1227 STARR ST && E 8TH ST
     1158109E 12/13/96 1228 6S E 8TH ST && STARR ST                    202
-----------------------------------------------------------------------------
203 12/13/96 1635 636 E 6TH ST
     1158889E 12/13/96 1636 6S N MARSALIS AV && E 6TH ST               203
-----------------------------------------------------------------------------
204 12/13/96 2136 750 E COLORADO BLVD
     1159980E 12/13/96 2136 6S E COLORADO BLVD  && N EWING AV          204
-----------------------------------------------------------------------------
205 12/13/96 2202 ELSBETH ST && NECHES ST
     1160092E 12/13/96 2203 6S ELSBETH ST && NECHES ST                 205
-----------------------------------------------------------------------------
206 12/14/96 0152 415 STARR ST
     1160974E 12/14/96 0152 6S LANSING ST && E 7TH ST                  206
     1161041E 12/14/96 0209 6S N MARSALIS AV && E 5TH ST               206
     1161044E 12/14/96 0210 6G 515 N MARSALIS AV                       206
-----------------------------------------------------------------------------
207 12/14/96 0208 739 N LANCASTER AV
     1161036E 12/14/96 0208 6S N LANCASTER AV && SABINE ST             207
     1161041E 12/14/96 0209 6S N MARSALIS AV && E 5TH ST               207
     1161043E 12/14/96 0210 6G 800 N LANCASTER AV                      207
-----------------------------------------------------------------------------
208 12/14/96 0209 560 N MARSALIS AV
     1161041E 12/14/96 0209 6S N MARSALIS AV && E 5TH ST               208
     1161044E 12/14/96 0210 6G 515 N MARSALIS AV                       208
-----------------------------------------------------------------------------
209 12/14/96 0243 LANSING ST && E 6TH ST
     1161110E 12/14/96 0243 6S LANSING ST && E 6TH ST                  209
```

```
--------------------------------------------------------------------------------
210 12/14/96 0312 650 SABINE ST
--------------------------------------------------------------------------------
211 12/14/96 1913 LANSING ST && E 7TH ST
     1163537E 12/14/96 1913 6S LANSING ST && E 7TH ST                        211
--------------------------------------------------------------------------------
212 12/14/96 2206 W 6TH ST && N BISHOP AV
     1164116E 12/14/96 2206 6S N BISHOP AV && W 6TH ST                       212
     1164117E 12/14/96 2206 6G 900 N BISHOP AV                               212
     1164119E 12/14/96 2207 6G 900 HAINES AV                                 212
     1164159E 12/14/96 2217 6G 838 N BISHOP AV                               212
--------------------------------------------------------------------------------
213 12/15/96 2212 LANSING ST && E 7TH ST
     1167488E 12/15/96 2213 6S LANSING ST && E 7TH ST                        213
--------------------------------------------------------------------------------
214 12/16/96 0424 E 6TH ST && N EWING AV
     1168037E 12/16/96 0425 6S N EWING AV && E 6TH ST                        214
--------------------------------------------------------------------------------
215 12/16/96 0647 N MADISON AV && W CANTY ST
     1168151E 12/16/96 0649 6S W CANTY ST && N MADISON AV                    215-
```

Appendix V

Ride-Along Protocol
SECURES™ Evaluation

Date: ____________ **Watch:** ____________

Officer(s): ____________ **Element:** ____________

SHOTS FIRED CALLS

Street Address	Experimental Control area Neither(E C N)	Call Type 6G 6S	Time Call Rec'vd	Time End	# of Officers	Response(What Officer did, #Suspects, Witnesses, description of persons Encountered, Location)

1. ____________
2. ____________
3. ____________

OTHER TYPES OF CALLS(Non 6G or 6S)

Street Address	Experimental Control area Neither(E C N)	Call Type	Time Call Rec'vd	Time End	# of Officers	Response(What Officer did, #Suspects, Witnesses, description of persons Encountered, Location)

1. ____________
2. ____________
3. ____________
4. ____________

5. ____

6. ____

7. ____

8. ____

NON DIRECTED

Street Address	Experimental Control area Neither(E C N)	Call Type	Time Arrive	Time End	# of Officers	Response(What Officer did, #Suspects, Witnesses, description of persons Encountered, Location)

1. ____

2. ____

3. ____

4. ____

5. ____

6. ____

7. ____

8. ____

Appendix VI

Shots Fired Patrol Response Protocol
SECURES™ Evaluation

Date of Call for Shot Fired: ____________ **Watch:** ________________

Officer Name(s): ____________ **Element:** __________

Time Call Dispatched to You: ____________ (24 hour Clock) **Service Number:** __________

Shot-Fired Call Type(Circle Response): 6G (Citizen) 6S (SECURES)™

Call Address(Address Call Dispatched to): ______________________

Is this dispatched address: 1 = the location of the actual shot 2 = the location of the caller 3 = Other? ________________

Code 6 (Time Arrived) ______ (24 hour Clock) **Time Finished Call:** ______ (24 hour Clock)

Type of Location
(Circle All That Apply)
1 = Inside Residence
2 = Outside Residence
3 = Intersection/Street Corner
4 = On Street but not a Corner
5 = Alley
6 = Abandoned Building
7 = Business
8 = Public Property
9 = Vacant Lot
10 = Other ____________ (Please Explain)

Weather Conditions:
(Circle All That Apply)
1 = Rain
2 = FreezingRain/Snow
3 = Clear
4 = Thunderstorms

Approximate
Temperature _____ °F

What Found at Location:
(Circle All That Apply)
1 = Suspect(s)
2 = Witness(es)
3 = Weapon
4 = Bullets/Casings
5 = Nothing Discovered
6 = Injured Person
(Transmitted to Hospital Yes No)

Patrol Officer Response Response:
(Circle All That Apply)
1 = Arrest
2 = Identified Possible Suspect
3 = Check Houses
4 = Check Property
5 = Check Vehicles
6 = Speak with Witnesses
7 = Recovered Weapon
8 = Generate Incident Report
9 = N-Coded
10 = Other

1. How confident are you that this call for "shots-fired" is truly a shot-fired (i.e. Do you think that someone has really fired a gun)? Circle the Appropriate Response

Not at all Confident	Somewhat Not Confident	Neither Confident nor Not Confident	Somewhat Confident	Very Confident
0	1	2	3	4

2. How confident are you that the dispatched address for this random shot-fired is truly the location of the actual shot? Circle the Appropriate Response

Not at all Confident	Somewhat Not Confident	Neither Confident or Not Confident	Somewhat Confident	Very Confident
0	1	2	3	4

3. Did you respond quicker or about the same to this shot fired as compared to any other shot fired? Circle the Appropriate Response

1 = Quicker
2 = About Same

Why? ____
____
____

4. Please List any N-Coded Service Numbers __________ __________ __________ __________

Appendix VII

Dispatch Protocol

SECURES™ Evaluation

*Date:*___________________ *Timeslot:*______________

15 minutes *15 minutes* *15 minutes*

Emergency Call Takers		**Service Call Takers**		**Dispatchers**	
Time Start:		Time Start:		Time Start:	
Time End:		Time End:		Time End:	
Total calls taken:		Total Outgoing Calls made: Total Incoming Calls Taken:		Total calls dispatched:	
N calls for shots fired:		N SECURES™ calls:		N 6G calls dispatched:	
N calls for police:				N 6S calls dispatched:	
N non-police service calls:				N priority 1 calls received:	
				N priority 2 calls received:	
				N priority 3 calls received:	
				N priority 1 calls dispatched:	
				N priority 2 calls dispatched:	
				N priority 3 calls dispatched:	

Emergency call-taker: Do you think you have received more, less or about the same calls for random shots fired this week compared to a "normal" week at this time of year?

1 More calls this week
2 About the same
3 Fewer calls this week

Service call-taker: Do you think you have received more, less or about the same nmber of calls from SECURES™ for random shots fired this week compared to last week?

1 More SECURES™ calls this week
2 About the same
3 Fewer SECURES™ calls this week

Dispatcher: Do you think you have dispatched more, less, or about the same number of calls from SECURES™ for random shots fired (6S) this week compared to last week?

1 More SECURES™ calls this week
2 About the same
3 Fewer SECURES™ calls this week

Dispatcher: Do you think you have dispatched more, less, or about the same number of calls from citizens for random shots fired (6G) this week compared to last week?

1 More shots fired calls this week
2 About the same
3 Fewer shots fired calls this week

Appendix VIII

POLICE OFFICER SURVEY PROTOCOL
RANDOM SHOTS FIRED EVALUATION
SOUTHWEST DISTRICT

Date________

Please indicate the shift you work: ________ First ________ Second _______ Third ________ Fourth

Please indicate your element number ______

1. On what day, or days of the week do you think most shots fired calls occur? (mark all that apply)
___Monday ___Tuesday ___Wednesday ___Thursday ___Friday ___Saturday ___Sunday

2. Are there any holidays that generate shots fired calls?

____

3. In the course of a 24 hour time period between which hours do you think most shots are fired?

____

4. From which of the following locations do you think most shots are fired?
   - ___ Street corners
   - ___ On the street in front of a house
   - ___ On the street in front of a business
   - ___ Outside of a house
   - ___ Outside of a business
   - ___ Inside a home or apartment
   - ___ Inside a business
   - ___ in a parking lot
   - ___ In an alley
   - ___ In a park

5. What do you think is the age of most shots fired offenders
   - ___ 8 through 12 years old
   - ___ 13 through 17 years old
   - ___ 18 through 22 years old
   - ___ 23 through 27 years old
   - ___ 28 through 33 years old
   - ___ 33 through 40 years old
   - ___ 40 years and over

6. What type of weapon, or weapons are most commonly used in shots fired incidents?

____

7. Most Shot fired incidents involve: ___Males ___Females ___Both

9. How often do you think that a shots fired incident results in an injury to a person?

____Less that 10 percent of the time
____Between 11 and 25 percent of the time
____Between 26 and 50 percent of the time
____Between 51 and 75 percent of the time
____More than 75 percent of the time

10. We are interested in better understanding officer activities in response to shots fired calls(6G or 6S). Please indicate which of the following actions you have taken in response to a shots fired call.(Mark all that apply)

___ arrest suspect
___ issue warning
___ drive by identified location
___ talk to a complainant
___ talk to community residents
___ conduct additional surveillance of the area
___ other (please explain________________________________)

11. Considering all of the shots fired calls that you have responded to in the last 2 months, how often have you performed each of the following tasks?

___ % of all calls where you arrest suspect
___ % of all calls where you issue warning
___ % of all calls where you drive by identified location
___ % of all calls where you talk to a complainant
___ % of all calls where you talk to community residents
___ % of all calls where you conduct additional surveillance of the area
___ % of all calls where you perform other tasks

12. Considering a typical shots fired call, how much time do you spend performing each of the following tasks?

___ time spent in minutes arresting suspect
___ time spent in minutes issuing warning
___ time spent in minutes driving by identified location
___ time spent in minutes talking to a complainant
___ time spent in minutes talking to community residents
___ time spent in minutes conducting additional surveillance of the area
___ time spent in minutes doing other tasks

13. Please indicate (1) the average amount of time it takes you to arrive at the scene once you receive a shots fired call, and (2) the average amount of time it takes from arrival at the scene to writing a report or n-coding the call.

(1)_______average time in minutes to arrive at the scene
(2)_______average time in minutes from arrival to report writing or n-coding call

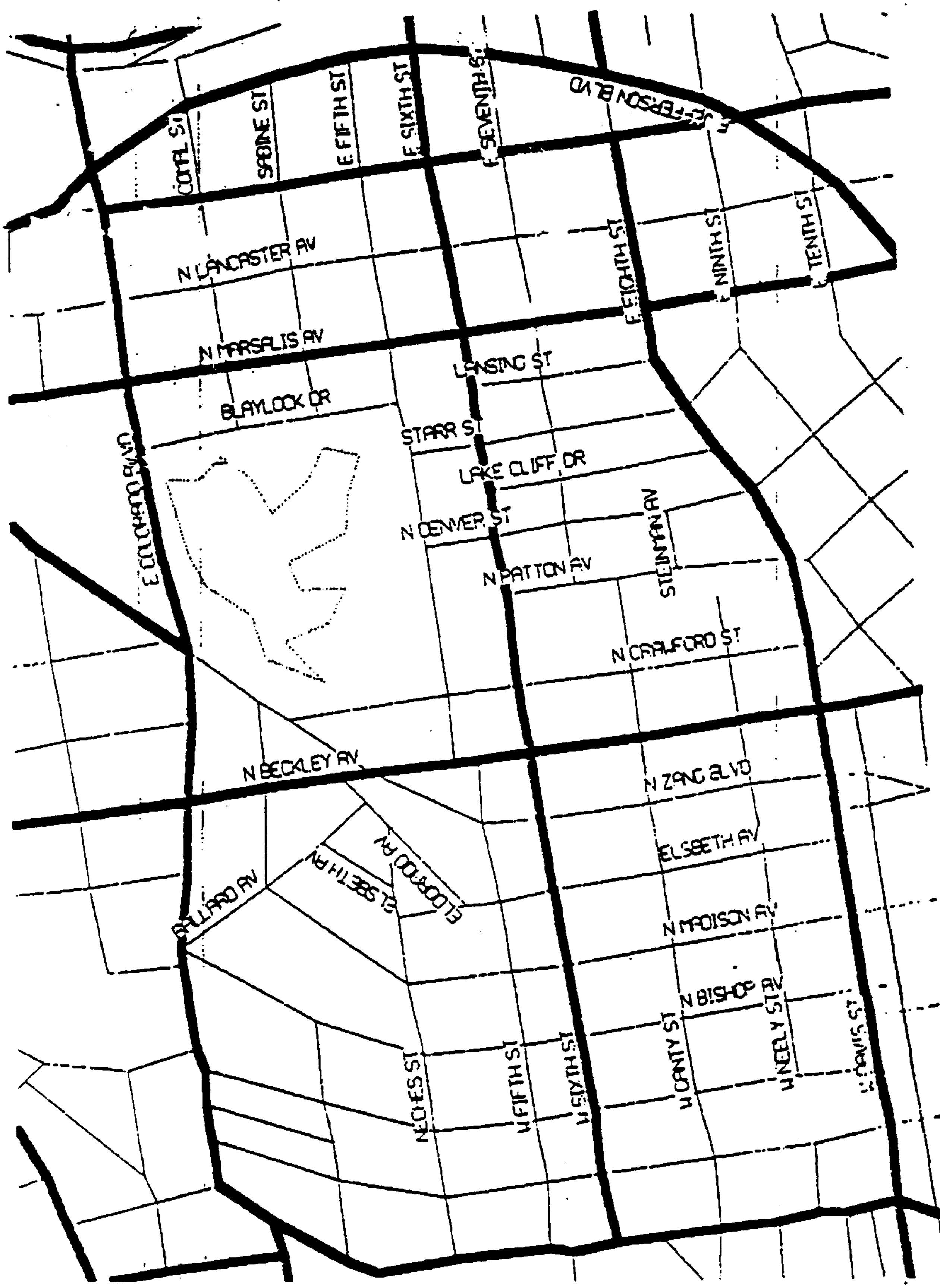
14. Are there specific locations within your patrol area where shots are often fired?

___ No
___ Yes

If Yes, please identify the specific locations.

______________ ____________ ______________________________

15. On the map below, please mark any locations that you would consider a shots fired hot spots location.



16. **Have specific strategies been developed that focus on these shots fired hot spot locations?**

___Yes ___No

16.a **If Yes, please briefly explain any strategies developed for problem locations.**

___

___

___

17. What could the Dallas Police Department do to improve the overall effectiveness of officer responses to random shots fired incidents?

___

___

___

18. What could the community do to improve the overall effectiveness of officer responses to random shots fired incidents?

___

___

___

19. What could the media do to improve the overall effectiveness of officer responses to random shots fired incidents?

___

___

___

We would now like to ask you a few questions about your experience with the SECURES system. This system was installed in October and is intended to help in the identification and locating of shots fired incidents. We are interested in your beliefs about the effect this system may have on your job.

20. In the last six weeks, that is since October 24, 1996, approximately how many shots fired calls (6G and 6S) have you responded to?

_____ number of shots fired calls

20a Approximately, how many of these calls were 6G calls? ______ 6G calls
20b Approximately, how many of these calls were 6S calls? ______ 6S calls
20c App roximately, how many of these 6S calls also had complainants? ______ 6G and 6S identified

21. When you respond to a 6S call do you typically have more, less, or about the same amount of information about the shots fired incident as you have when you respond to a 6G call?

___ more information when I respond to a 6S call than a 6G call
___ about the same amount of information when I respond to a 6S call as a 6G call
___ less information when I respond to a 6S call than a 6G call

22. Is the amount of time that you spend investigating a 6S incident greater, less, or about the same as the amount of time you spend on a 6G call?

___ a greater amount of time with 6S than 6G incidents
___ about the same amount of time with 6S and 6G incidents
___ less time with 6S than 6G incidents

23. How likely is the SECURES system to improve your ability to solve shots fired calls?

___ very likely for SECURES to improve my ability to solve shots fired calls
___ somewhat likely for SECURES to improve my ability to solve shots fired calls
___ not likely at all for SECURES to improve my ability to solve shots fired calls

24. How much confidence do you have in the ability of SECURES to identify actual gun shots?

___ a great deal of confidence in the ability of SECURES to identify actual gun shots
___ some confidence in the ability of SECURES to identify actual gun shots
___ no confidence at all in the ability of SECURES to identify actual gun shots

Appendix IX

25. How much confidence do you have in the ability of SECURES to identify the specific location of a gun shot?

___ a great deal of confidence in the ability of SECURES to identify the specific location of a gun shot?
___ some confidence in the ability of SECURES to identify the specific location of a gun shot?
___ no confidence at all in the ability of SECURES to identify the specific location of a gun shot?

The next section contains a number of statements about the SECURES system. Please mark whether you believe the statement is true or false. We are concerned with your own personal beliefs. There is no right or wrong response to these statements.

26. I respond quicker to 6S shots fired incidents than I do to 6G calls. TRUE FALSE

27. The SECURES system will increase the likelihood someone will be arrested in a shots fired incident. TRUE FALSE

28. The SECURES system will help the police focus on shots fired hot spots. TRUE FALSE

29. The SECURES system will increase the likelihood that the victim of a shooting will survive. TRUE FALSE

30. I think citizens are accurate in their reporting of shots fired locations. TRUE FALSE

31. The SECURES system has made me more effective when handling shots fired incidents. TRUE FALSE

32. I am more likely to talk to citizens when I respond to a 6S call than when on a 6G call. TRUE FALSE

33. I prefer using the SECURES system over just using citizen calls. TRUE FALSE

Please answer the following biographical questions.

34. What is your present rank? ________

35. How long have you been employed by the Dallas Police Department?
______ Years ______ Months

36. How long have you been assigned to your present district?
______ Years ______ Months

37. What is your normal assignment? ____ ______

38. How old are you? _______years

39. Are you a ______ Male or _______Female

40. What is the highest year of school you have completed?

_____ 11 years or less
_____ High school graduate or GED
_____ Some College
_____ Associate's Degree (AA or AS)
_____ Bachelor's Degree (BA or BS)
_____ Some Graduate course work
_____ Advanced Degree (Specify) ___________________

41. **What is your ethnic origin?**

_____ African American
_____ Caucasian
_____ Hispanic
_____ Latin American
_____ Asian American
_____ Other(Specify) ___________

POLICE OFFICER SURVEY PROTOCOL
RANDOM SHOTS FIRED EVALUATION
CENTRAL OPERATIONS DISTRICT

Date___ _

Please indicate the shift you work: _______ First _______ Second _______ Third _______ Fourth

Please indicate your element number ________

1. On what day, or days of the week do you think most shots fired calls occur? (mark all that apply)
___Monday ___Tuesday ___Wednesday ___Thursday ___Friday ___Saturday ___Sunday

2. Are there any holidays that generate shots fired calls?

____

3. In the course of a 24 hour time period between which hours do you think most shots are fired?

____

4. From which of the following locations do you think most shots are fired?
   - ___ Street corners
   - ___ On the street in front of a house
   - ___ On the street in front of a business
   - ___ Outside of a house
   - ___ Outside of a business
   - ___ Inside a home or apartment
   - ___ Inside a business
   - ___ in a parking lot
   - ___ in an alley
   - ___ In a park

5. What do you think is the age of most shots fired offenders
   - ___ 8 through 12 years old
   - ___ 13 through 17 years old
   - ___ 18 through 22 years old
   - ___ 23 through 27 years old
   - ___ 28 through 33 years old
   - ___ 33 through 40 years old
   - ___ 40 years and over

6. What type of weapon, or weapons are most commonly used in shots fired incidents?

____

7. Most Shot fired incidents involve: ___Males ___Females ___Both

9. How often do you think that a shots fired incident results in an injury to a person?

____Less that 10 percent of the time
____Between 11 and 25 percent of the time
____Between 26 and 50 percent of the time
____Between 51 and 75 percent of the time
____More than 75 percent of the time

10. We are interested in better understanding officer activities in response to shots fired calls (6G). Please indicate which of the following actions you typically take in response to a shots fired call.(Mark all that apply)

___ arrest suspect
___ issue warning
___ drive by identified location
_ _ talk to a complainant
___ talk to community residents
___ conduct additional surveillance of the area
___ other (please explain________________________________)

11. Considering all of the shots fired calls that you have responded to in the last 2 months, how often have you performed each of the following tasks?

___ % of all calls where you arrest suspect
___ % of all calls where you issue warning
_ _ % of all calls where you drive by identified location
___ % of all calls where you talk to a complainant
___ % of all calls where you talk to community residents
___ % of all calls where you conduct additional surveillance of the area
___ % of all calls where you perform other tasks

12. Considering a typical shots fired call, how much time do you spend performing each of the following tasks?

___ time spent in minutes arresting suspect
_ _ time spent in minutes issuing warning
___ time spent in minutes driving by identified location
time spent in minutes talking to a complainant
___ time spent in minutes talking to community residents
___ time spent in minutes conducting additional surveillance of the area
___ time spent in minutes doing other tasks

13. Please indicate (1) the average amount of time it takes you to arrive at the scene once you receive a shots fired call, and (2) the average amount of time it takes from arrival at the scene to writing a report or n-coding the call.

(1)________average time in minutes to arrive at the scene
(2)____ verage time in minutes from arrival to report writing or n-coding call

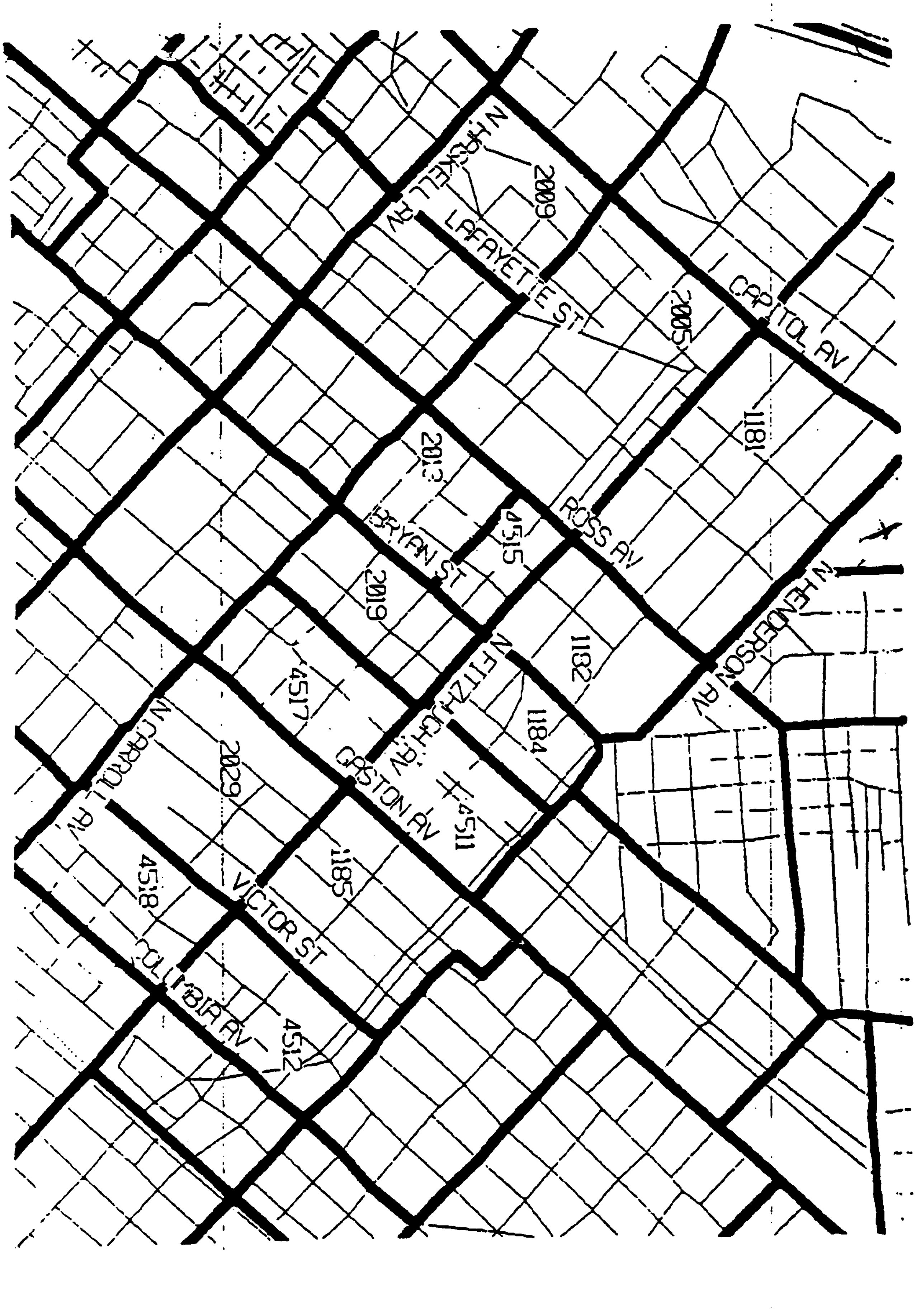
14. Are there specific locations within your patrol area where shots are often fired?

___ No
_ __ Yes

14.a If Yes, please identify the specific locations.

____

15. On the map below, please mark any location(s) that you would consider a shots fired hot spots location.



16. **Have specific strategies been developed that focus on these shots fired hot spot locations?**
___Yes ___No

16.a **If Yes, please briefly explain any strategies that have been developed for these problem locations.**

___

___

17. **What could the Dallas Police Department do to improve the overall effectiveness of officer responses to random shots fired incidents?**

___

___

___

18. **What could the community do to improve the overall effectiveness of officer responses to random shots fired incidents?**

___

___

___

19. **What could the media do to improve the overall effectiveness of officer responses to random shots fired incidents?**

___

___

___

20. **In the last six weeks, that is since October 24, 1996, approximately how many shots fired calls (6G) have you responded to?**
____ number of shots fired calls

Please answer the following biographical questions.

21. What is your present rank? ___

22. How long have you been employed by the Dallas Police Department?
______ Years ______ Months

23. How long have you been assigned to your present district?
______ Years ______ Months

24. What is your normal assignment? ___

25. How old are you? ___ years

26. Are you a ______Male or ______Female

27. What is the highest year of school you have completed?
- _____ 11 years or less
- _____ High school graduate or GED
- _____ Some College
- _____ Associate's Degree (AA or AS)
- _____ Bachelor's Degree (BA or BS)
- _____ Some Graduate course work
- _____ Advanced Degree (Specify) ___

28. What is your ethnic origin?
- _____ African American
- _____ Caucasian
- _____ Hispanic
- _____ Mexican American
- _____ Asian American
- _____ Other(Specify) ___