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POLICE ALLOCATION MANUAL

Determination of the Number and Allocation of Personnel for

Patrol and Traffic Services for Municipal Law Enforcement Agencies

- Version M3.0 -

Prepared by

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for

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FOREWORD

The Police Allocation Manual (PAM) and Police Allocation Manual User's Guide were developed and field tested by The Traffic Institute of Northwestern University under a contract (No. DTNH22-92-C-05051) issued by the National Highway Traffic Safety Administration, U.S. Department of Transportation. Principal Investigator and author for the study was Dr. William Stenzel. Dr. Stenzel was assisted by Mr. Roy Lucke who directed the design, implementation, and coordination of the field test activities of the project. The Contracting Officer's Technical Representative for the project was Mr. David Seiler (Office of Enforcement and Emergency Services).

The PAM project was initiated in June 1988. Phases I and II were used to produce a staffing and allocation procedure and manual for statewide law enforcement agencies. Phase III was used to modify the products for sheriffs' departments. In Phase IV, the Manual and Guide were revised and field tested for use by municipal law enforcement agencies. The Phase I field test was conducted during the summer and fall of 1989, and the Phase I products were completed in February 1990. Phase II of the project was completed in January 1991 and the final version for state-level agencies (Version 4.0) was completed in July 1991. The final version for Phase III (Version S3.0) was completed for sheriff's departments in September of 1991. Activities to extend the PAM methodology to municipal agencies (Phase IV) were initiated in October 1992.

The project team wishes to identify and thank the municipal police departments that served as field test sites during Phase IV of the study. (The project liaison person for each agency is identified below with an "*." The ranks and titles reflect those held during the field test.)

Addison (Illinois) Police Department	Chief Melvin Mack *Deputy Chief Timothy Hayden
Boca Raton (Florida) Police Department	Chief Peter A. Petracco *Deputy Chief Philip Sweeting
Boise (Idaho) Police Department	Chief James J. Carvino *Officer Rich Sohnebly

Brick (New Jersey) Police Department	Chief Ronald J. Dougard *Mr. Dean Washburn
Brunswick (Ohio) Police Department	Chief Patrick Beyer *Sgt. Carl Meding
Chandler (Arizona) Police Department	Chief Ronald J. Danielson *Captain Roger Nash
Crystal (Illinois) Police Department	Chief Samual Johns *Lt. Ron Sheley
Knoxville (Tennessee) Police Department	Chief Phil E. Keith *Lt. Harold Dexter
Medina (Ohio) Police Department	Chief Tom Steyer *Lt. Dennis Hanwell
Oak Park (Illinois) Police Department	Chief Joseph M. Mendrick *Officer Richard Guttman
Sandy (Utah) Police Department	Chief Gary J. Leonard *Captain Gary Lancaster
Tucson (Arizona) Police Department	Chief Elaine S. Hedtke *Dr. Donald Ijams

The project team also thanks Dr. Michael Buren and Mr. Alex Weiss of The Traffic Institute; Mr. Sid Girling, formerly of the Ontario Provincial Police; and Mr. Richard Raub, formerly of the Illinois State Police (ISP), who reviewed initial drafts of the Manual during Phase I of the project and provided many valuable suggestions.

A special acknowledgment is extended to Mr. Raub. Many of the ideas used in the Manual reflect concepts developed and documented by Mr. Raub and his colleagues in a series of ISP reports beginning in 1981. Mr. Raub's outstanding work into the identification and estimation of the major elements of staffing and allocation of statewide police agency resources provided many of the concepts that appear in the PAM model.

The authors also wish to thank Ms. Darry Ware whose diligence and persistence helped to insure that project materials were available to the field test agencies in a timely manner.

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CHAPTER 1: Introduction

Purpose of the Manual

The Police Allocation Manual (PAM) is designed to be used by municipal police agencies whose mission includes the delivery of patrol and traffic services. The Manual may be used to determine staffing levels for a traffic division with limited patrol coverage or for a patrol division with traffic responsibilities. The Manual is designed to help agencies address the following questions:

1. What is the total number of officers, field supervisors, and command personnel that are required to provide acceptable levels of patrol and traffic services? and

2. How should a total number of patrol officers be allocated by geographic regions or time periods to maximize agency productivity?

This version of the Manual is derived from earlier editions that were based on a review of procedures currently used by state and sheriffs' departments throughout the United States and Canada. The framework and rationale presented in the Manual are the result of a distillation process that identified the "best" procedures, and then modified and blended those procedures into a comprehensive model for determining appropriate patrol staffing levels and deployment patterns.

It is anticipated that the Manual will provide both immediate and long-range benefits. The procedures in PAM will provide agencies with a logical and explicit format in which to frame requests for additional personnel and/or staff allocation. In addition, it is anticipated that the Manual will serve as a catalyst for stimulating further discussion and research in the area of patrol staffing and allocation for law enforcement agencies.

How To Use the Manual

Version M3.0 of the Police Allocation Manual consists of four chapters and one appendix. Chapter 1 provides a brief introduction to the purposes and uses of the Manual. Chapter 2 describes the PAM patrol staffing and allocation model. Chapter 3 contains eight

worksheets, each with instructions, that provide a step-by-step process for determining patrol staffing levels. Chapter 4 contains one worksheet for determining patrol staffing allocations over several geographic areas or time periods. Appendix A contains worksheets that can be used as alternatives to the procedures presented in Section 5.2 in Chapter 3.

Additional information about the PAM procedures can also be found in the companion document, Police Allocation Manual User's Guide. The Guide presents implementation, data definition, and data collection strategies used by the field test agencies. Also included in the Guide is a summary of key input values and numerical results obtained by the agencies that field tested the Manual. The appendix materials in the Guide include a list of the input data required to use the PAM model (Appendix A), a glossary of key terms and notation (Appendix B), a detailed example showing all nine worksheets in completed form (Appendix C), and derivations of all key formulas used in the model (Appendix D).

For the first-time user of the Manual, the following procedure is recommended:

1. Read Chapter 2 - Chapter 2 can be used to gain an initial understanding of the overall logic of the model and its major components. (The reader may also want to refer to the material in Appendix D in the Guide.) It is not imperative to understand every detail at first reading. The primary objective of Chapter 2 is to provide a reader with sufficient information to assess how the model can be used to assist his/her agency.

2. Review Appendix A in the User's Guide - Appendix A provides an overview of the data that are required to use the PAM model.

3. Review Chapters 3 and 4 - Chapters 3 and 4 contain all the worksheets and instructions for the PAM model. Appendixes B and C in the Guide can be used as references as needed. The purpose of this step is to enhance understanding of the model, to resolve questions about the procedures that are used, and to help the user assess the effort required to use the model.

4. Determine the Data Collection Effort - After reading chapters 2, 3, and 4 (and referring to appendixes A, B, C, and D in the Guide as needed), the user should estimate the data collection effort that will be required to use the model. The following steps are recommended for this assessment:

- Review the sections in the Guide entitled "General Implementation Strategies" (Section 2) and "Recommended Data Collection and Implementation Procedure" (Section 4).

- Review the worksheets in chapters 3 and 4 to identify which model options will be used. (Section 3 in the Guide may also be useful for this step.)

- Compile a list of the input data requirements for the agency. This list will include all the data items in Worksheet 1 plus additional data items from worksheets 2 - 9 depending on the options selected. The user may find it convenient to use Appendix A in the Guide to compile this list.

- For each data item on the list, determine its availability, accessibility, and the effort that will be required to obtain it. It is important to recognize that probably no agency will have all the data required. As a result, it is likely that every agency will have to estimate some data items. (Section 3 in the Guide provides specific guidelines and recommendations for collecting input data items.)

5. Assess the Benefits of the Model to the Agency - Before proceeding further, the user should weigh the benefits of the model for the agency against the data collection effort that will be required.

6. Collect the Required Data - If a decision is made to use the model, initial activities should focus on data collection. The actual time required to collect the data will vary considerably by agency and will depend on agency size, the scope of existing records, and the degree of automation within the records section. Initial data collection efforts may require time that will not be necessary for later uses of the model because some data items are not likely to change (e.g., the number of roadway miles and the size of the patrol areas).

7. Complete the Worksheets - Once all input data items have been collected, the nine worksheets in chapters 3 and 4 can be used to determine the staffing level and allocation for each patrol area. Completion of the worksheets will require relatively little time (i.e., only a few hours) compared to the days or weeks that may be needed to collect the data.

8. Review and Adjust the Results - After the model has been used to determine patrol staffing and allocation levels, the results should be carefully reviewed. The purpose of this review is to:

- explicitly identify the rationale for each model option that is used,
- explicitly identify the rationale for each performance objective value that is used,
- verify that the agency data used is both comprehensive (e.g., that all patrol workload is accounted for) and consistent with model data definitions, and
- identify and understand differences between actual patrol staffing levels for the agency and those specified by the model.

The Role of Resource Allocation Models

It is important for PAM users to remember that the Manual is based on a "model" of staffing and deployment. All models are limited by the assumptions on which they are built and by the data that are used. (See Chapter 2 for additional discussion concerning the limitations of the PAM model.) The user must guard against the temptation to believe that the model provides "the answer." All models, including the one described in the Manual, use a variety of assumptions about the "real" world to assemble data into rational patterns that can be used by decision-makers. (Police administrators do not suffer from a lack of data, but rather from a scarcity of tools for effectively using that data.) The decision-maker, in turn, must weigh the merits of the recommendations of the model against other factors (e.g., political, economic, operational, etc.) in arriving at a final course of action. Perhaps John Schuiteman said it best when he wrote:

> "Adequate police protection, like beauty, lies in the eye of the beholder. The optimal or appropriate ratio of troopers [or deputies or officers] to population, traffic volumes, reported crimes or accidents, etc., is not a matter of mathematics or statistics. It is a matter of human judgment and community resources."
>
> "Allocating State Troopers: The Virginia Experience," The Police Chief, July 1985.

CHAPTER 2: Overview of the Police Allocation Manual Methodology

Time-Based Model

The procedures that are used in the PAM model to determine the total staff requirements for the delivery of patrol and traffic services are based on an analysis of patrol workload requirements, performance objectives, personnel policies, and the roadway system within the jurisdiction. All officer time, both on and off-duty, is divided into two categories: patrol and non-patrol. Non-patrol time includes all off-duty time and on-duty non-patrol assignments. Non-patrol time is accounted for by the operational practices and personnel policies of the agency and is reflected in the "shift relief factor" determined in Worksheet 8 of the Manual. All on-duty patrol time is divided into four components:

1. Reactive time (calls-for-service),
2. Proactive (self-initiated and community-oriented policing) time,
3. Proactive (uncommitted patrol) time, and
4. Administrative time.

Reactive Time

Reactive time refers to patrol time spent on activities that can be described as service-on-demand. These are usually calls for service (CFS) that are assigned by radio dispatch. Since most agencies provide both patrol and traffic services, the PAM model classifies all CFS as either "accidents" or "other CFS." The total time spent answering CFS is referred to as "obligated time."

Proactive (Self-Initiated and Community-Oriented Policing) Time

Proactive (self-initiated and community-oriented policing) time refers to patrol time spent on officer-initiated activities.

Time spent on CFS and administrative activities are not included in this category. In the PAM model, proactive activities may include the issuance of citations and warnings for driving violations, assisting motorists, providing traffic direction and control, conducting field interrogations, and time spent on community-oriented policing (COP) activities.

Proactive (Uncommitted Patrol) Time

Proactive (uncommitted patrol) time refers to time spent patrolling both on and off-road in the jurisdiction but not spent on reactive, self-initiated, or administrative activities. Uncommitted patrol provides two benefits: "visibility" for the general deterrence and detection of traffic and criminal violators, and "availability" for self-initiated activities and for the timely response to CFS. Uncommitted patrol time includes time spent on both moving and stationary patrol.

Administrative Time

Administrative time refers to patrol activities that do not fall into the reactive, self-initiated, or uncommitted patrol time categories. Typical administrative activities include on-duty court time, personal time (e.g., for meals), patrol car maintenance, training, and agency administrative duties. On-duty time spent on non-patrol activities such as extended training or special assignments are accounted for in the calculation of the shift relief factor for the agency.

Autonomous Patrol Areas

The PAM procedures are designed to determine total patrol staffing requirements for "autonomous patrol areas"; that is, geographic areas that exhibit the following characteristics:

- virtually all CFS that originate in the area are handled by officers assigned to the area (or conversely, few CFS in the area are handled by officers assigned to other areas);
- officers assigned to the area are rarely assigned to CFS outside of the area; and

- although officers may be assigned to specific geographic subdivisions within the area, an officer may be dispatched, if required, to a CFS anywhere within the area.

In most jurisdictions, APAs are larger than individual patrol beats since officers are routinely dispatched to CFS outside their assigned beat areas. In some agencies, each precinct, district, or zone operates as an autonomous patrol area (APA). In others, with larger geographic areas, one district may consist of several APAs. In many cases, the entire jurisdiction may serve as a single APA.

Total Patrol Staff Requirements

To determine the total patrol staffing requirement for an agency, the PAM model is used as follows:

1. The entire jurisdiction is used as single autonomous patrol area (APA) or is subdivided into a number of autonomous patrol areas (APAs). The APAs should cover the entire jurisdiction and should not overlap one another.

2. The PAM procedures are used to determine the total patrol staffing requirement for <u>each</u> APA.

3. The patrol staffing requirement for the <u>entire</u> jurisdiction is obtained by adding the staffing requirements for all the APAs. (The resulting total may need to be supplemented with additional personnel assigned to the central or regional headquarters of the agency.)

The PAM model uses the following steps to determine the total patrol staffing requirement for each APA:

1. Determine the average daily on-duty patrol staffing requirement (i.e., the number of officers required to meet the administrative, reactive, self-initiated, and uncommitted patrol requirements). The resulting number of officers is then adjusted for the use of two-officer patrol units, specialized units, and, if applicable, minimum staffing requirements.

2. Determine the average number of on-duty field supervisors required to support the average daily on-duty officer requirement. The number of officers is then adjusted to account for patrol workload performed by field supervisors.

3. Determine the total patrol staff requirement (i.e., the total number of personnel needed, both on and off-duty, to support the required on-duty patrol presence) for the APA. The total patrol staff requirement will include officers, field supervisors, and command personnel.

Average Daily On-Duty Officer Requirement

The PAM model determines the average number of on-duty officers that will be required each day (i.e., within each 24-hour period) with the following formula (see Appendix D in the Guide for a derivation of this formula):

$$N = \frac{N_r + N_p}{1 - \frac{m_a}{60} - \frac{m_s}{60}}$$

where:

N - the average number of on-duty officers required per day (i.e., per 24-hour period),

$\mathbf{N_r}$ - the average number of on-duty officers required per day to service all CFS and accidents in the APA,

$\mathbf{N_p}$ - the average number of on-duty officers required per day to provide the specified level of uncommitted patrol in the APA,

$\mathbf{m_a}$ - the average number of minutes per hour spent on administrative activities by each on-duty officer, and

$\mathbf{m_s}$ - the average number of minutes per hour spent

on self-initiated/COP activities by each on-duty officer.

Much of the effort required to use the PAM model is spent determining appropriate values for N_r, N_p, m_s, and m_a based on the workload level, operational policies, and roadway and traffic characteristics of the patrol area. The basis for deriving each of these values is outlined below.

Number of officers for reactive time workload (N_r). The average number of officers required per day to provide service for all accidents and other CFS in the patrol area is based on the average total obligated time per day required for all accidents and other CFS, and the shift length used by the agency.

Number of officers for uncommitted patrol time (N_p). The average number of officers required per day to provide uncommitted patrol is based on:

- the number of officers required to provide an adequate level of uncommitted patrol visibility as measured by the "patrol interval" (i.e., the average time between trips past any given point on the roadway); and
- the number of officers required to insure a timely response to emergency and non-emergency activities.

The number of officers required for visibility is based on the miles of roadway to be patrolled, the average uncommitted patrol speed, the shift length, and the desired patrol interval by roadway type. As an example, a patrol interval of eight hours indicates that an officer will be observed on uncommitted patrol on a given roadway segment about once every eight hours or three times per day.

Two criteria are available in the PAM model for determining the number of officers required for a timely response to CFS. The number can be determined based on either:

- the percent of emergency activities (i.e., accidents and other CFS) for which an officer is immediately "available" (i.e., either an officer who is not currently involved in a CFS, self-initiated, or administrative activity, or an officer currently assigned to an activity that can be preempted); or
- the average travel times to emergency and non-emergen-

cy CFS activities.

The number of officers required for immediate response is based on the average number of officers required per shift for reactive time activities, the immediate response percentage set by the agency, and the percentage of administrative, self-initiated/COP, and reactive activities that can be preempted. Travel time values are based on the size of the patrol area, the average response speeds for emergency and non-emergency activities, the shift length, the average travel time objectives for emergency and non-emergency reactive activities set by the agency, and the percentage of administrative, self-initiated/COP, and reactive activities that can be preempted.

Self-initiated/COP time per hour per officer (m_s). The PAM model does not attempt to directly determine the total number of officers that are necessary for all self-initiated/COP activities. To produce such a value would require measurement of the total self-initiated/COP workload for the agency (i.e., the total time that an agency could spend on these activities within the patrol area). To avoid the difficulties associated with determining this value, the PAM model focuses on the number of minutes per hour spent on self-initiated and COP activities by each officer (m_s). The PAM model allows the user either to specify a value for m_s or to derive a value based on self-initiated data for the agency from previous years.

Administrative time per hour per officer (m_a). Paralleling the rationale given above for determining m_s, the PAM model does not attempt to determine the total administrative workload of the patrol force, but rather focuses on the amount of administrative time required per hour per officer (m_a). The PAM model permits the user either to specify a value for m_a or to estimate it based on agency experience.

Adjustments to the Average Daily Number of On-Duty Officers

The initial value for the average number of on-duty officers required per day may be modified to account for:

- the use of two-officer patrol units,
- patrol provided by officers assigned to specialized units (e.g., officers assigned to a tactical unit or to an accident investigation unit), and
- minimum patrol staffing levels.

Average Daily Number of On-Duty Field Supervisors

The average number of on-duty officers required per day serves as the basis for calculating the number of on-duty field supervisors required. Two factors are used:

(1) the average number of officers supervised by each field supervisor (set by agency policy), and

(2) the fraction of each field supervisor's time spent on patrol (i.e., non-supervisory) activities.

Command Staff Requirement

Worksheet 8 of the PAM model is used to determine the total number of personnel, both on and off duty, required to support the average number of on-duty officers and field supervisors required per day. The total number of personnel consists of officers, field supervisors, and command personnel (e.g., field and shift commanders). The total number of officers and field supervisors is determined using the shift relief factor for the agency. This factor indicates the average number of officers required to staff one shift position every day, and is based on the shift length, the average work week (i.e., the average number of scheduled on-duty hours per week per officer), and the average number of on-duty patrol hours per officer per year. The number of command personnel required is specified by the user.

Total Patrol Staff Allocation

The final worksheet in the Manual (Worksheet 9 in Chapter 4) is used to determine patrol staffing allocations over several geographic areas based on PAM staffing estimates for each APA and the total number of patrol personnel available for deployment. Although the discussion in this section and Chapter 4 refers only to the allocation of staff over several APAs (i.e., allocation over geographic areas), the logic of the procedure can be applied equally well for the allocation of staff over several time periods (e.g., staff allocation over several shifts or days of the week). To use Worksheet 9 for allocation over different time periods, PAM staffing estimates must be obtained for each time period of interest.

Worksheet 9 can be used to determine two kinds of allocations.

Unconstrained Allocation

Unconstrained allocation refers to a redistribution of all available patrol staff among several APAs according to the percentage of patrol staff in each APA based on staffing estimates from the PAM model. Such an allocation is called "unconstrained" because it is possible that a reallocation of the total staff may produce a deployment in which some APAs gain patrol staff and other APAs lose staff.

Constrained Allocation

Constrained allocation refers to a reallocation of patrol staff under the following limitations:

- if the total patrol staff is to be increased, no APA will lose patrol staff because of the reallocation, or
- if the total patrol staff is to be decreased, no APA will gain patrol staff because of the reallocation.

The process for determining the allocation under these limitations consists of the following steps:

1. The results of the unconstrained allocation are used to characterize each APA as either overstaffed or understaffed.

2a. If the total patrol staff is to be increased, the additional staff (i.e., the difference between the current total patrol staff and the final total patrol staff) are allocated, based on the PAM patrol staffing estimates for each APA, only to those APAs that are currently understaffed; (Patrol staffing levels for overstaffed APAs remain unchanged.) or

2b. If the total patrol staff is to be decreased, the staff reduction (i.e., the difference between the current total patrol staff and the final total patrol staff) is allocated, based on the PAM patrol staffing estimates for each APA, only to those APAs that are currently overstaffed. (Patrol staffing levels for understaffed APAs remain unchanged.)

It is possible under the limitations of constrained allocation that, even after reallocation, some APAs may still be over or understaffed.

Limitations of the PAM Model

Municipal police departments in the United States vary significantly in size, operational mode, and physical setting. The PAM model presented in this document is a generic procedure that must be adapted to fit the mission, physical environment, roadway system, and operational idiosyncrasies of each agency.

In addition, there are a number of issues that, although addressed in a general sense in the model, represent relationships and circumstances for which additional research and operational experience are needed. These include:

- the impact of state and county law enforcement agencies upon the mission and resource requirements of municipal police agencies;
- the relationship between the amount of self-initiated work and various roadway and traffic characteristics;
- the determination of travel times for large non-urban areas with sparse roadway systems; and
- the determination of patrol staffing requirements for patrol and traffic services on high-volume, high-density, urban interstate and expressway systems.

CHAPTER 3: PAM Instructions and Worksheets for Determining Total Patrol staff Requirements

Introduction

This chapter provides a format and systematic process for determining the total patrol staff requirements for municipal police agencies that provide patrol and traffic services in autonomous patrol areas. The process is presented in a series of eight worksheets entitled:

Worksheet 1: Operations, Workload, and Roadway Data

Worksheet 2: Administrative Time

Worksheet 3: Reactive Time

Worksheet 4: Proactive Time - Self-initiated and Community-Oriented Policing

Worksheet 5: Proactive Time - Uncommitted Patrol

Worksheet 6: Average Daily Number of On-Duty Officers

Worksheet 7: Special Assignments and Field Supervision

Worksheet 8: Total Patrol staff Requirements

Worksheet Format

The same format for each data entry and calculation step is used in all eight worksheets. Each worksheet is divided into a number of sections. The beginning and end of each section are identified with a double line. Each section, in turn, consists of a series of individual steps. For each step, a numeric value is obtained and recorded in a box on the right-hand side of the worksheet. Each box is labeled with a numeric identifier to facilitate reference to values that are used in later steps, sections, or worksheets. The numeric value that is recorded for each step is obtained in one of four ways:

- data collection,

- policy decision,
- referenced from an earlier step, or
- calculated using the method or formula given in the worksheet based on numeric quantities from previous steps.

Two methods are used to highlight important results:

1. The box is drawn with double lines; and/or
2. A letter notation, shown in parentheses to the right of the box, is used to identify the result.

Preceding each worksheet is a brief description of its purpose followed by instructions for individual steps and the anticipated source of required data items; that is: data collection (D), policy decision or current agency practice (P), referenced value (R), or calculation (C).

For some procedures, more than one method is available for obtaining a particular data item. When two or more options are presented, they are separated by a pair of horizontal lines with the word "OR" between them.

Terminology, Notation, and Key Assumptions

Appendix B in the Guide presents definitions for key terms that are used in the PAM instructions and worksheets. The appendix also lists and identifies all abbreviations and notations that are used in the worksheet formulas.

Within the Manual, the term "patrol" refers to the activities associated with all four time categories used in the PAM model (i.e., reactive, self-initiated, administrative, and uncommitted). "Non-patrol" refers either to off-duty time or to on-duty time spent on temporary special assignments that do not include activities in any of the four time categories. (A more detailed discussion of non-patrol time is presented in the instructions for Worksheet 1.) The term "uncommitted patrol" refers to one of the four time categories and represents on-duty patrol time spent in the field while not engaged in reactive, self-initiated, or administrative activities. This definition of patrol is sometimes referred to as "preventive patrol" or "uncommitted time." The total uncommitted patrol time per hour equals the time left

over when the average number of minutes per hour spent on reactive, self-initiated, and administrative activities is subtracted from 60 minutes. The appropriate meaning of "patrol" in the Manual is indicated by the context in which it is used.

Two additional sets of terms the PAM user will encounter are "emergency" and "non-emergency," and "preemptable" and "non-preemptable." Emergency activities include accidents and other CFS (e.g., crime-in-progress calls) which require a rapid police response. Emergency calls are reactive activities for which one or more officers will be immediately assigned even if the officers need to be diverted from other calls or activities. Non-emergency calls are reactive activities for which one or more officers will be assigned, but an immediate response is not necessary. Non-emergency calls include taking reports of "old" crimes or accidents where there are no injuries or roadway blockage.

Non-preemptable activities can be administrative, self-initiated/COP, or other CFS activities. Officers assigned to non-preemptable activities are not available for immediate reassignment to emergency activities. Examples of non-preemptable activities are court appearances and assignment to an emergency call. The critical feature of a non-preemptable activity is that the assigned officer cannot be assigned to any other activity until the non-preemptable activity is completed or the officer is relieved by another officer. An officer assigned to a preemptable activity can be diverted from that activity at any time to an emergency call. Examples of preemptable activities are meal breaks and traffic stops.

The PAM model is based on a number of assumptions that are identified in the instructions preceding each worksheet. Several assumptions that should be kept in mind are:

1. The total patrol staff requirement determined with the worksheets is only applicable to autonomous patrol areas (APA). If a jurisdiction, district, or precinct consists of more than one APA, the total patrol staffing requirement for the jurisdiction, district, or precinct is obtained by determining the staffing requirement for each APA and adding the results together.

2. The procedures used in worksheets 1-5 and Section 6.1 of Worksheet 6 assume the use of only one officer for each patrol unit. As a result, the phrases "number of officers" and "number of patrol units"

are used interchangeably. An adjustment for the use of two-officer patrol units is presented in Section 6.2 in Worksheet 6.

3. All emergency activities are either accidents or other CFS. Administrative and self-initiated/COP activities are never treated as emergencies.

4. All accidents are treated as non-preemptable events. PAM users can specify what percentage of administrative, self-initiated/COP, and other CFS activities are non-preemptable.

5. Patrol coverage on all roadways within each APA is assumed to be 24 hours a day.

Instructions for Worksheet 1: Operations, Workload, and Roadway Data

Worksheet 1 is used to identify most of the data items that will be used in worksheets 2 - 8. Worksheet 1 is not a complete list of all the data items that may be needed since several of the worksheets permit the use of optional procedures, each requiring a slightly different set of data items. (A complete list of all input data items is presented in Appendix A in the Guide.)

Some procedures in the worksheets use the number of roadway miles in the APA as part of the calculation process. The worksheets in this version of the Manual permit the use of one, two, or three categories or types of roadways. (More than three can be easily accommodated if necessary.) Each PAM user is free to determine how many types will be used and the definition of each type. The number and definitions used should be is related to the kinds of roadways in each APA and the kinds of data available to the agency about the roadway system. Roadway categories that can be used include: controlled-access; U.S. highway; expressway; freeway; state highway; primary roadway; secondary roadway; rural roadway; and arterial, collector, and residential streets. Definitions for roadway categories are provided in Appendix B in the Guide.

Regardless of the number and definitions of roadway types used, all roadways in the APA regularly patrolled by the agency should be included.

Instructions for Individual Steps

1.1 Name of the autonomous patrol area (usually a precinct, district, or city) (D).

1.2 Operations Data for the APA

1.2.1 Shift length is the number of hours each officer is on duty for one tour or watch or shift (P). If shift length varies by officer or assignment, an average value should be used.

1.2.2 The average number of on-duty hours on patrol per year per officer refers to the actual number of hours that an officer appears for regular patrol duty each year

(D). This number should include both regularly scheduled on-duty time and paid overtime. (See discussion below about "non-patrol" time.)

The average number of on-duty hours spent on patrol per year may be determined in a number of ways. The agency may have a system that keeps track of the number of on-duty patrol hours for each officer. If such a system is used, the average number of hours for one year is obtained by adding all the on-duty patrol hours and dividing by the number of officers. In some agencies, it may be easier to determine the average on-duty hours on patrol per year per officer by assuming that each officer works one shift on patrol every day and then subtracting the average number of non-patrol hours, both on and off-duty, per year per officer.

"Non-patrol" time consists of:

(1) regular days off - unpaid time off. The number of regularly-scheduled days off is determined by the shift length and the average work week (e.g., an 8-hour shift length and a 40-hour work week produce an average of 2 days off per week).

(2) benefit days off - paid days off. Benefit days off usually include vacation leave, sick leave, holiday leave, compensatory time off, and a variety of other kinds of days off that vary by agency.

(3) temporary special assignments - on-duty assignments that remove an officer from patrol operations (e.g., attendance at a training course, limited duty status, etc.). It is recommended that only assignments that last for one or more shifts at a time be included in this category. Activities that require less than one shift (e.g., roll-call training and desk duty for one or two hours) should be included as administrative time when estimating m_a in Worksheet 2.

1.2.2.1 Average work week (P).

The average number of hours an officer is paid for each week. Most agencies use 40 hours a week, although it is not uncommon to find values that are slightly above or below this value.

1.2.2.2 Average number of benefit hours off per year per officer (D).

The average number of paid off-duty hours an officer uses per year for vacation, holidays, illness, compensatory time off, etc. It is important to note that this value is the benefit time taken which may be less than the total benefit time earned per year. Since this value reflects the specific benefit time-off policies and experience of an agency, it can only be estimated by collecting data about the benefit time-off history of the agency.

1.2.2.3 Average number of on-duty hours spent on temporary (non-patrol) special assignments per year per officer.

Paid on-duty time that is not spent on regular patrol operations.

1.2.3 Average number of officers supervised by each field supervisor (P).

1.2.4 Percent of field supervisor on-duty time spent on patrol activities (D).

"Patrol activity" refers to any activity that would be performed by an officer if the field supervisor was not present. Alternatively, patrol activities for field supervisors can be thought of as all non-supervisory activities. The percentage is a number between 0 and 100. A value of 0 indicates that each field supervisor spends no (zero) time on patrol activities. A value of 50 indicates that each field supervisor spends an average of 50% of his/her time on patrol activities.

1.2.5 Patrol operations - roadway category 1

1.2.5.1 Name or type of roadway used for category 1.

Examples of roadway categories for municipal agencies are arterial, collector, and residential.

1.2.5.2 Average patrol speed (D).

The average speed in miles per hour (MPH) of units while on "uncommitted patrol" on category 1 roadways (i.e., it does not include the average speed during travel to an accident or other CFS or travel while performing administrative or self-initiated/COP activities or travel while on uncommitted patrol on non-category 1 roadways). This value can be determined by dividing the miles driven while on uncommitted patrol (on category 1 roadways) per shift by the time spent on uncommitted patrol (on category 1 roadways) during the shift. The uncommitted patrol time spent on a particular roadway type equals the shift length minus time spent on accidents, other CFS, self-initiated, administrative activities, and uncommitted time spent on other roadway types. Note that uncommitted patrol time includes time spent both on stationary patrol and on moving patrol even when speeds are reduced because of traffic volumes or control devices.

1.2.5.3 Patrol interval performance objective (P).

The patrol interval indicates the frequency with which an officer will pass a given point on a category 1 roadway. Measured in hours, it is also defined as the average time a stranded motorist would have to wait for an officer to come by on uncommitted patrol. As the patrol interval objective is increased, the number of officers required decreases. As examples, consider the table below (based on 8-hour shifts):

Patrol Interval (hours)	Patrol Frequency (times past a fixed location)
2	4 times per shift
4	2 times per shift
8	once a shift
24	once per day
168	once per week

Note that "patrol interval" and "patrol coverage" are not directly related. Patrol coverage merely indicates responsibility for patrolling a roadway segment. The patrol interval determines the extent or intensity of the coverage.

1.2.6 Patrol operations - roadway category 2

See instructions for steps 1.2.5.1 - 1.2.5.3.

1.2.7 Patrol operations - roadways category 3

See instructions for steps 1.2.5.1 - 1.2.5.3.

1.3 Workload Data for the APA

1.3.1 Total number of days in the sample period (D).

Total days in the period for which accident and other CFS data have been collected. The sample period should be between one and three years.

1.3.2 Total number of accidents during the sample period (D).

Total number of accidents handled or investigated by the agency during the sample period. The number should include accidents in which the agency only provides backup services.

1.3.3 Average service time (hours) per accident (D).

The average time required to handle one accident. The

average time should be determined with a sample of 100 or more accidents. The average service time for an accident includes:

- travel time to the accident,
- on-scene time,
- report writing time,
- follow-up investigation or processing time, and
- time charged by all agency units assigned to the accident.

Note that the average service time for accidents does not include dispatching time.

1.3.4 Total number of other CFS during the sample period (D).

Total number of other CFS handled by the agency during the sample period. The number should include CFS for which the agency only provides backup support.

1.3.5 Average service time (hours) per other CFS (D).

The average time required to process one CFS. The average time should be determined with a sample of 100 or more other CFS. The average service time for a CFS includes:

- travel time to the CFS,
- on-scene time,
- report writing time,
- follow-up investigation or processing time, and
- time charged by all agency units assigned to the CFS.

Note that the average service time for other CFS does not include dispatching time.

1.3.6 Percent of other CFS activities that cannot be preempted. (P)

Officers assigned to non-preemptable other CFS cannot be reassigned prior to completing the assignment.

1.3.7 Percent of administrative activities that cannot be preempted. (P)

Officers assigned to non-preemptable administrative activities cannot be reassigned prior to completing the assignment.

1.3.8 Percent of self-initiated/COP activities that cannot be preempted. (P)

Officers working on non-preemptable self-initated/COP activities cannot be reassigned prior to completing the activity.

1.4 Roadway Data for the APA

For steps 1.4.1 - 1.4.3, enter the number of miles in the patrol area for category 1, 2, and 3 type roadways based on the roadway category definitions determined by the agency.

The total miles determined should be based on roadways in the jurisdiction of the agency that are routinely patrolled by agency personnel.

Note: If visibility or access to opposing lanes on a roadway is limited (e.g., on some interstate roadways and urban expressways), each direction of travel can be considered as a separate roadway in determining total length.

WORKSHEET 1: Operations, Workload, and Roadway Data

Objective: Identify data items to be used for determining the number of patrol personnel within an APA.

Method: Data is identified as either operations, workload, or roadway.

1.1 Autonomous Patrol Area Name . [ ] (1.1)

1.2 Operations Data for the APA

1.2.1 Shift length (hours) . . . . . [ ] (1.2.1)

1.2.2 Average number of on-duty hours on patrol per year per officer

1.2.2.1 Average work week (average number of paid hours per week per officer) . . . . . [ ] (1.2.2.1)

1.2.2.2 Average number of benefit (paid) off-duty hours per year per officer . . . . . [ ] (1.2.2.2)

1.2.2.3 Average number of on-duty hours spent on non-patrol temporary assignments per year per officer . . . . . [ ] (1.2.2.3)

1.2.3 Average number of officers to be supervised by each field supervisor . . . . . [ ] (1.2.3)

1.2.4 Percentage of field supervisor on-duty time spent on uncommitted patrol, reactive, and self-initiated/COP activities . . . . . [ ] (1.2.4)

1.2.5 Patrol operations - roadway category 1

1.2.5.1 Category 1 roadway type . . [ ] (1.2.5.1)

1.2.5.2 Average uncommitted patrol speed (MPH) . . . . [ ] (1.2.5.2)

1.2.5.3 Patrol interval performance objective (hours) . . . . . [ ] (1.2.5.3)

1.2.6 Patrol operations - roadway category 2

1.2.6.1 Category 2 roadway type . . [ ] (1.2.6.1)

1.2.6.2 Average uncommitted patrol speed (MPH) . . . . [ ] (1.2.6.2)

1.2.6.3 Patrol interval performance objective (hours) . . . . . [ ] (1.2.6.3)

1.2.7 Patrol operations - roadway category 3

1.2.7.1 Category 3 roadway type . . [ ] (1.2.7.1)

1.2.7.2 Average uncommitted patrol speed (MPH) . . . . [ ] (1.2.7.2)

1.2.7.3 Patrol interval performance objective (hours) . . . . . [ ] (1.2.7.3)

1.3 Workload Data for the APA

1.3.1 Total number of days in the sample period . . . . . [ ] (1.3.1)

1.3.2 Total number of accidents handled by the agency during the sample period . . . . . [ ] (1.3.2)

1.3.3 Average service time (hours) per accident . . . . . [ ] (1.3.3)

1.3.4 Total number of other CFS handled by the agency during the sample period . . . . . [ ] (1.3.4)

1.3.5 Average service time (hours) per other CFS . . . . . [ ] (1.3.5)

1.3.6 Percentage of other CFS that cannot be preempted . . . . . [ ] (1.3.6)

1.3.7 Percentage of administrative activities that cannot be preempted . . . . . [ ] (1.3.7)

1.3.8 Percentage of self-initiated/COP activities that cannot be preempted . . . . . [ ] (1.3.8)

1.4 Roadway Data for the APA

1.4.1 Roadway category 1 (miles) . . . . [ ] (1.4.1)

1.4.2 Roadway category 2 (miles) . . . . [ ] (1.4.2)

1.4.3 Roadway category 3 (miles) . . . . [ ] (1.4.3)

Instructions for Worksheet 2: Administrative Time

Worksheet 2 is used to determine the average number of minutes per hour per officer spends on administrative activities (e.g., on-duty court time, range training, etc.). Either of two procedures can be used to obtain a value for the administrative time (m_a). In Section 2.1, the user specifies the value directly. In Section 2.2, the user determines the value based on agency administrative workload information for the APA. Care must be taken in defining what agency activities will be included as administrative time to insure that all patrol time not spent on reactive, self-initiated/COP, and uncommitted patrol is included and that no activities are counted more than once. (See the instructions for operations data in Worksheet 1 above and Section 3 in the Guide.)

Instructions for Individual Steps

2.1 User specifies average number of minutes per hour per officer spent on administrative time (P).

2.2 Determine m_a based on the historical experience of the agency within the APA (D).

2.2.1 Select a sample period (e.g., one year) and collect data that indicates the total amount of time (hours) spent by the patrol force on administrative activities during the sample period within the APA.

2.2.2 Determine the total number of on-duty hours on patrol provided in the APA during the sample period used for Step 2.2.1.

2.3 Administrative Time

User selects a value for m_a based on either section 2.1 or 2.2.

Note that the value selected for m_a (Step 2.3) must satisfy the following condition:

$$0 \leq m_a < 60.$$

This condition requires that the total administrative time per hour for administrative activities must be greater than or equal to zero minutes and less than 60 minutes. In practice, administrative time per officer is usually less than 20 minutes per hour.

WORKSHEET 2: Administrative Time

Objective: Determine the average number of minutes per hour per officer to be spent on administrative activities within the APA (m_a).

Method: Based either on policy decision or historical experience.

OPTION: Complete Section 2.1 or Section 2.2.

2.1 Average Number of Minutes Per Hour Per Officer - Policy Decision

Select administrative time performance objective in minutes per hour per officer . . . . . [ ] (2.1)

Continue with Section 2.3.

OR

2.2 Average Number of Minutes Per Hour Per Officer - Historical Experience

2.2.1 Total time (hours) spent on administrative activities within the APA during the sample period . [ ] (2.2.1)

2.2.2 Total on-duty hours on patrol within the APA during the sample period . . . . . [ ] (2.2.2)

2.2.3 Fraction of time spent on administrative activities, divide: (2.2.1) ÷ (2.2.2) . . . . [ ] (2.2.3)

2.2.4 Average number of minutes per hour per officer, multiply: (2.2.3) x 60 . . . . . [ ] (2.2.4)

2.3 Administrative Time

Minutes per hour per officer, select either (2.1) or (2.2.4) . . . . . [ ] (m_a) (2.3)
(note: $0 \leq m_a < 60$)

Instructions for Worksheet 3: Reactive Time

Worksheet 3 is used to determine the average number of on-duty officers ($\mathbf{N_r}$) that is needed each day to handle accidents and other CFS within an APA. The average number of on-duty officers required per day is determined with the formula:

$$N_r = \frac{\text{Average Total Obligated Time (hours) Per Day For Accidents and Other CFS}}{\text{Shift Length (hours)}}$$

Derivation of this formula is presented in Section D.1 in Appendix D in the Guide.

Sections 3.1 and 3.2 are used to determine the average obligated time per day for accidents and other CFS respectively. If desired, the "other CFS" category can be divided into subcategories (e.g., criminal calls, service calls, other agency assists, etc.) for informational purposes. The total average obligated time per day is obtained in Step 3.3.1, and the number of on-duty officers is calculated in Step 3.3.3.

Agencies that have computer-aided dispatching (CAD) systems may be able to obtain the total obligated time data required for steps 3.1.3 and 3.2.3 directly. Agencies that use this approach should insure that the total time reported by the CAD system includes all of the elements of obligated time; i.e.,

- travel time to the scene,
- on-scene time,
- report writing time,
- follow-up investigation or processing time, and
- time consumed by all units involved with the incident.

WORKSHEET 3: Reactive Time

Objective: Determine the number of officers required to handle accidents and other CFS within an APA (N_r).

Method: Based on the total time required to handle all accidents and other CFS, and the shift length.

3.1 Daily Service Time Requirement for Accidents

3.1.1 Total number of accidents within the APA during the sample period, use (1.3.2) . . . . [ ] (3.1.1)

3.1.2 Average service time (hours) for each accident, use (1.3.3) . . [ ] (3.1.2)

3.1.3 Total obligated time for accidents within the APA during the sample period, multiply: (3.1.1) x (3.1.2) . . . (or enter directly from CAD system) [ ] (3.1.3)

3.1.4 Total number of days in the sample period, use (1.3.1) . . . . [ ] (3.1.4)

3.1.5 Average workload per day for accidents (hours), divide: (3.1.3) ÷ (3.1.4) . . . . . [ ] (3.1.5)

3.2 Daily Service Time Requirement for Other CFS

3.2.1 Total number of other CFS within the APA during the sample period, use (1.3.4) . . . . [ ] (3.2.1)

3.2.2 Average service time (hours) for each CFS, use (1.3.5) . . . . [ ] (3.2.2)

3.2.3 Total obligated time for other CFS within the APA during the sample period, multiply: (3.2.1) x (3.2.2) . . . (or enter directly from CAD system) [ ] (3.2.3)

3.2.4 Total number of days in the sample period, use (1.3.1) . . . . [ ] (3.2.4)

3.2.5 Average workload per day for other CFS (hours), divide: (3.2.3) ÷ (3.2.4) . . . . . [ ] (3.2.5)

3.3 Total Number of Officers Required per Day for Reactive Time

3.3.1 Total average workload per day within the APA (hours), add: (3.1.5) + (3.2.5) . . . . . [ ] (3.3.1)

3.3.2 Shift length (hours), use (1.2.1) . . . . . [ ] (3.3.2)

3.3.3 Average number of on-duty officers required per day within the APA to meet the avg. daily workload, divide: (3.3.1) ÷ (3.3.2) . . . . . [ ] (N_r) (3.3.3)

Instructions for Worksheet 4: Proactive Time - Self-initiated and Community-Oriented Policing (COP)

Worksheet 4 is used to determine the average number of minutes per hour (m_s) each officer spends on self-initiated/COP activities within the APA. Three procedures are available to determine m_s. The user can either:

(1) select the value directly based on agency policy (Section 4.1);

(2) determine the value indirectly by specifying a number of self-initiated contacts per shift per officer, the shift length of the agency, and the average time per contact (based on agency experience within the APA) (Section 4.2); or

(3) determine the value based on agency workload experience within the APA (Section 4.3).

Time spent on community-oriented policing activities are based on agency policy (Section 4.5).

Instructions for Individual Steps

4.1 User selects the average number of minutes per hour per officer to be spent on self-initiated activities within the APA (P).

4.2 User selects the average number of minutes per hour per officer on self-initiated activities based on a performance objective for the average number of self-initiated contacts (i.e., warnings, citations, assists, etc.) per shift, the agency shift length, and the average time per contact within the APA (P) (D).

4.2.1 Collect data to determine the total number of self-initiated contacts within the APA during a specified sample period (e.g., one year).

4.2.2 Determine the total time (hours) spent on self-initiated activities by the patrol force within the APA during the

sample period used for Step 4.2.1. The total hours indicate the time actually spent handling self-initiated activities (i.e., issuing violations, assisting disabled motorists, etc.). It does not include the time spent in looking for these activities.

4.2.4 User selects the average number of self-initiated contacts per shift per officer (P).

4.3 Determine the average number of minutes per hour per officer on self-initiated activities based on agency experience within the APA (D).

4.3.1 Determine the total time (hours) spent on self-initiated activities within the APA during a sample period (e.g., one year). This is the same value that is used for Step 4.2.2.

4.3.2 Determine the total on-duty hours on patrol within the APA during the sample period used for Step 4.3.1. This is the same value that is used for Step 2.2.2 if the same sample period is used for both Worksheet 2 and Worksheet 4.

4.4 Proactive Time (Self-Initiated Activities)

User selects a value from either step 4.1, 4.2.7, or 4.3.4.

4.5 Proactive Time (Community-Oriented Policing)

For agencies with community-oriented policing (COP) programs, the user may identify the average number of minutes per hour to be spent on COP activities by each officer. If no COP program is in place, zero is entered for Step 4.5.3.

4.5.1 A number between 0 and 100 that indicates the percentage of time each officer should spend on COP activities each day. Note that this value is an average based on time spent by officers on all shifts. If, for example, an agency with equal staffing on all shifts, requires officers on the Day shift to spend 30% of their time on COP activities and expects no COP activities on the other two shifts, then the average for the entire day would only be 10% per officer.

4.6 Proactive Time (Self-Initiated/COP)

The sum of sections 4.4 and 4.5 yields the total $\mathbf{m_s}$ value.

Note that the values selected for $\mathbf{m_a}$ (Section 2.3) and $\mathbf{m_s}$ (Section 4.6) must satisfy the following conditions:

$$0 \leq m_a < 60,$$

$$0 \leq m_s < 60, \text{ and}$$

$$0 \leq m_a + m_s < 60.$$

These conditions require that the total time per hour for administrative activities and self-initiated/COP activities individually, and for administrative and self-initiated/COP activities combined must be greater than or equal to zero minutes and less than 60 minutes. In practice, self-initiated and COP time per hour is usually less than 15 minutes.

The PAM field test results suggest that the combined times for administrative and self-initiated/COP activities (i.e., $\mathbf{m_a} + \mathbf{m_s}$) for most agencies falls in the range: 15 - 30 minutes per hour; i.e.,

$$15 \leq m_a + m_s \leq 30.$$

It should be noted that the general structure of the PAM model is predicated on the assumption that administrative and self-initiated activities together do not consume a majority of available patrol time (i.e., $\mathbf{m_a} + \mathbf{m_s}$ should be less than 30 minutes). The use of a combined time for administrative and self-initiated activities that is greater than 30 minutes is not recommended.

WORKSHEET 4: Proactive Time - Self-initiated and Community-Oriented Policing

Objective: Determine the average number of minutes per hour per officer to be spent on self-initiated/COP activities within the APA (m_s).

Method: Based either on policy decision or historical experience within the APA.

OPTION: Complete Section 4.1 or Section 4.2 or Section 4.3.

4.1 Average Number of Minutes Per Hour Per Officer for Self-Initiated Activities - Policy Decision (Direct)

Select self-initiated performance objective for the APA, minutes per hour per officer . . . . . [ ] (4.1)

Continue with Section 4.4

OR

4.2 Average Number of Minutes Per Hour Per Officer for Self-Initiated Activities - Policy Decision (Indirect)

4.2.1 Total number of self-initiated contacts within the APA during the sample period . . . . . [ ] (4.2.1)

4.2.2 Total time (hours) spent on self-initiated contacts within the APA by all officers on patrol during the sample period . [ ] (4.2.2)

4.2.3 Average time (hours) per self-initiated contact within the APA during the sample period, divide: (4.2.2) ÷ (4.2.1) . . . . [ ] (4.2.3)

4.2.4 Select number of self-initiated contacts per shift per officer performance objective . . . . . [ ] (4.2.4)

4.2.5 Shift length (hours), use (1.2.1) . . . . . [ ] (4.2.5)

4.2.6 Number of self-initiated contacts per hour per officer, divide: (4.2.4) ÷ (4.2.5) . . . . [ ] (4.2.6)

4.2.7 Self-initiated performance objective for the APA in minutes per hour per officer, multiply: 60 x (4.2.3) x (4.2.6) . . . . . [ ] (4.2.7)

Continue with Section 4.4

OR

4.3 Average Number of Minutes Per Hour Per Officer for Self-Initiated Activities - Historical Experience

4.3.1 Total time (hours) spent on self-initiated contacts within the APA by all officers on patrol during the sample period, (same as (4.2.2)) . . . . . [ ] (4.3.1)

4.3.2 Total on-duty hours by officers on patrol within the APA during the sample period used for (4.3.1) . . . . . [ ] (4.3.2)

4.3.3 Fraction of time spent on self-initiated activities within the APA during the sample period, divide: (4.3.1) ÷ (4.3.2) . . . . . [ ] (4.3.3)

4.3.4 Average number of minutes per hour per officer to be spent on self-initiated activities within the APA, multiply: 60 x (4.3.3) . . [ ] (4.3.4)

4.4 Proactive Time (Self-Initiated Activities)

Minutes per hour per officer, select either (4.1) or (4.2.7) or (4.3.4) . . . [ ] (4.4)

4.5 Proactive Time (Community-Oriented Policing)

Note: If the agency does not identify COP activities separately, enter zero (0) for Step 4.5.3 and continue with Step 4.6.

4.5.1 Average percentage of time per officer to be spent on community-oriented policing . . . [ ] (4.5.1)

4.5.2 Fraction of time per hour per officer to be spent on community-oriented policing, divide: (4.5.1) ÷ 100 . . . . . [ ] (4.5.2)

4.5.3 Minutes per hour per officer to be spent on community-oriented policing, multiply: 60 x (4.5.2) . . . . . [ ] (4.5.3)

4.6 Proactive Time (Self-Initiated and Community-Oriented Policing)

Minutes per hour per officer, add: (4.4) + (4.5.3) . . . . . [ ] (m_s) (4.6)

Instructions for Worksheet 5: Proactive Time - Uncommitted Patrol

Worksheet 5 is used to determine the number of officers (N_p) that are required for an adequate level of uncommitted patrol to provide visibility for the general deterrence and detection of traffic violations and criminal activity, and availability for the timely response to accidents and other CFS within the APA.

Section 5.1 is used to determine the number of officers that are required to meet the patrol interval level specified by the user for each roadway type within the APA. The formula for the number of officers (used in steps 5.1.2.5, 5.1.3.5, and 5.1.4.5) is based on:

- the number of roadway miles,
- the average patrol speed (MPH),
- the shift length (hours), and
- the patrol interval (hours) set by agency policy.

The total number of officers required for uncommitted patrol equals the sum of the number of officers needed for each roadway type (Step 5.1.5). The derivation of the formula used in steps 5.1.2.5, 5.1.3.5, and 5.1.4.5 is presented in Section D.2 in Appendix D in the Guide.

The number of officers required for rapid response is determined using section 5.2 or sections 5.3 and 5.4. Section 5.2 determines the number of officers that must be available to insure that at least one officer will be available in the APA for immediate dispatch or action for emergency accidents and other CFS. The number of required officers is based on the number of reactive, self-initiated/COP, and administrative activities per day; the immediate response percent set by the agency; and the percentage of non-preemptable administrative, self-initiated/COP, and other CFS activities.

Two procedures are available for determining the number of officers required for immediate availability. A simplified procedure is presented in Section 5.2. If the simplifying assumptions used in Section 5.2 are not valid, a supplemental worksheet in Appendix A can be used. For either procedure, the final number of officers for uncommitted patrol is obtained from

a table in Appendix A based on a queuing theory model that assumes that accidents and other CFS occur randomly and that service times are distributed exponentially. The derivations of the formulas and procedures used in Section 5.2 and in the Supplemental Worksheet are presented in Section D.3 in Appendix D in the Guide.

Sections 5.3 and 5.4 determines the number of officers that must be available in the APA to provide specified average travel times for emergency and non-emergency reactive activities. The formula for the number of officers required is based on:

- shift length (hours),
- area (square miles) of the APA,
- average response speeds for emergency and non-emergency activities (MPH), and
- average travel time objectives for emergency and non-emergency activities.

The derivation of the formula for travel time is presented in Section D.4 in Appendix D in the Guide.

The average number of officers per day for uncommitted patrol ($\mathbf{N_p}$) is determined by calculating the number of officers required for visibility (Step 5.1.5) and the number of officers required for timely response (Step 5.6), and using the larger of the two values (Step 5.7).

Instructions for Individual Steps

5.1 Uncommitted Patrol Visibility

5.1.2.3 The average patrol speed (MPH) is defined as the average speed while on "uncommitted patrol" on category 1 roadways only. Uncommitted patrol time is defined as the total shift time minus time spent on reactive (i.e., accidents and CFS), self-initiated, and administrative activities, and uncommitted time on non-category 1 roadways. Some agencies make a distinction between "moving" and "stationary" patrol. The PAM model does not make this distinction and the average patrol speed used in

the PAM model should be based on <u>both</u> moving and stationary patrol time while on category 1 roadways. If the average patrol speed is known for moving patrol time only, it is possible to estimate the overall patrol speed with the formula given below.

Average Patrol Speed (MPH)	=	Average Patrol Speed (moving) (MPH)	x	Fraction of Time on Moving Patrol

As an example, if the average speed during moving patrol is estimated to be 40 MPH and moving patrol time represents approximately 50% of total uncommitted patrol time, then the average patrol speed that should be used in the PAM model is 20 MPH (i.e., 20 = 40 x .50). The fraction of time on moving patrol (a number between 0 and 1) is obtained by dividing the percentage of time by 100. If all uncommitted patrol time is spent on moving patrol, the average speed patrol used in the PAM model and the average speed for moving patrol will be equal.

5.1.2.4 The patrol interval performance objective indicates the average time it will take all officers on uncommitted patrol to drive over all category 1 roadways within the APA. The lower the patrol interval the greater the number of officers required. A patrol interval of eight hours indicates that, on the average, the available patrol force will travel every category 1 roadway in the APA three times a day.

5.1.3.3 Average patrol speed on uncommitted time on category 2 roadways. See discussion above for Step 5.1.2.3.

5.1.3.4 Patrol interval performance objective for category 2 roadways. See discussion above for Step 5.1.2.4.

5.1.4.3 Average patrol speed on uncommitted time on category 3 roadways. See discussion above for Step 5.1.2.3.

5.1.4.4 Patrol interval performance objective for category 3 roadways. See discussion above for Step 5.1.2.4.

5.2 Uncommitted Patrol Availability - Immediate Response

Determination of the number of officers needed for immediate response in Section 5.2 is based on two simplifying assumptions:

1. staffing is uniform over all shifts, and
2. the same user-specified immediate response performance objective is used for each shift.

If either of these assumptions is not valid, the user should use the supplemental worksheet in Appendix A to determine the number of officers needed to satisfy the immediate response performance objective. As a rule of thumb, shift staffing can be considered uniform if the proportion of staff on each shift is within 10% of perfect uniform staffing for each shift. The table below indicates the range of staffing for operations with 2, 3, and 4 shifts.

Number of Shifts	Uniform Staffing — Percent of Staffing on Each Shift: Exact	Range
2	50.0	45.0 - 55.0
3	33.3	30.0 - 36.7
4	25.0	22.5 - 27.5

5.2.2 Steps 5.2.2.1 and 5.2.2.2 are used to determine the average number of officers on duty daily on each shift to provide service for all reactive activities.

Steps 5.2.2.3 through 5.2.2.16 is used to determine an adjusted number of reactive officers (N_{ars}) required on each shift per day to handle accidents and other CFS

meet the immediate response requirement (Step 5.2.4.2) with the number of officers that are "available" on each shift because they are assigned to preemptable activities. If the number of officers available on preemptable activities equals or exceeds the total number required, Step 5.2.4.4 will produce a zero or negative value (i.e., no additional officers are needed). If the number of officers on preemptable activities is less than the total number required, Step 5.2.4.4 will produce a positive value which indicates the additional officers that must be added to meed the immediate response requirement.

5.2.4.6 The actual number of additional officers required per day (i.e., over all shifts) to meet the immediate response requirement. Either use the results from Section 5.2 or the supplemental worksheet in Appendix A.

5.3 Uncommitted Patrol Availability - Travel Time for Emergency Activities

This section is used to determine the average number of officers required for uncommitted patrol within the APA to provide a user-specified <u>average</u> travel time response to emergency accidents and CFS.

5.3.1 Steps 5.3.1.1 through 5.3.1.4 are used to determine the average number of on-duty officers for reactive activities per shift.

5.3.2 Maximum number of uncommitted patrol officers required for response to emergency activities.

5.3.2.2 Average response speed (MPH) (D).

The average speed of a patrol unit while responding to an emergency accident or CFS. The average speed is usually lower than anticipated due to factors that may delay or impede a responding unit (e.g., heavy traffic, cornering, etc.)

5.3.2.3 Average travel time performance objective (minutes) (P).

The user-specified average travel time performance objective for patrol unit response to emergency accidents and other CFS within the APA. It is important to note that this procedure is based on the average travel time. The number of officers determined will provide a level of availability that will produce travel times that collectively will equal the travel time objective value. For individual responses, however, some travel times will be lower than the objective value and some will be higher. The number of officers obtained does not guarantee that the travel time to every incident will be equal to or less than the agency-specified objective value.

5.3.2.4 Step 5.3.2.4 is used to determine the maximum number of additional officers on uncommitted patrol per shift that are needed to meet the average travel time performance objective for emergency activities. This number of officers assumes that no administrative, reactive, or self-initiated/COP activities are preemptable.

5.3.3 Adjusted number of additional officers required to meet the average travel time performance objective for emergency activities.

Steps 5.3.3.1 through 5.3.6.15 are used to determine an adjusted number of additional officers that are needed to meet the emergency activity travel time requirement. The adjusted number of officers is always less than or equal to the maximum number of officers determined in (5.3.2.4) because of the availability of officers assigned to preemptable administrative, reactive, and self-initiated/COP activities.

It is possible that the calculation for (5.3.3.15) will produce a negative value. Such a result indicates that there is a sufficient number of officers available on preemptable activities to meet the emergency travel time performance objective. If (5.3.3.15) produces a negative value, zero (0) is entered in (5.3.4).

5.4 Uncommitted Patrol Availability - Travel Time for Non-Emergency Activities

Steps 5.4.1 through 5.4.5.3 are used to determine the average number of officers required for uncommitted patrol within the APA to provide a user-specified average travel time response to non-emergency accidents and CFS. The number of officers determined assumes that no officers are available from preemptable administrative, reactive, or self-initiated/COP activities

5.4.3 Average response speed (MPH) (D).

The average speed of a patrol unit while responding to a non-emergency accident or CFS. The average speed is usually lower than anticipated due to factors that may delay or impede a responding unit (e.g., heavy traffic, cornering, etc.)

5.4.4 Average travel time performance objective (minutes) (P).

The user-specified average travel time performance objective for patrol unit response to non-emergency accidents and other CFS within the APA. It is important to note that this procedure is based on the average travel time. The number of officers determined will provide a level of availability that will produce travel times that collectively will equal the travel time objective value. For individual responses, however, some travel times will be lower than the objective value and some will be higher. The number of officers obtained does not guarantee that the travel time to every incident will be less than or equal to the agency-specified objective value.

WORKSHEET 5: Proactive Time - Uncommitted Patrol

Objective: Determine the number of officers required within the APA to provide an adequate level of visibility and availability.

Method: Based on: (1) the patrol interval, and (2) the probability of immediate response to accidents and other CFS or the average travel time to accidents and other CFS.

5.1 Uncommitted Patrol Visibility

5.1.1 Shift length (hours), use (1.2.1) . . . . . [ ] (5.1.1)

5.1.2 Number of officers needed per day for uncommitted patrol on category 1 roadways in the APA

5.1.2.1 Category 1 roadway type, use (1.2.5.1) . . [ ] (5.1.2.1)

5.1.2.2 Miles of roadway, use (1.4.1) . . . . . [ ] (5.1.2.2)

5.1.2.3 Average patrol speed (MPH), use (1.2.5.2) . . . [ ] (5.1.2.3)

5.1.2.4 Performance objective patrol interval (hours), use (1.2.5.3) . . . . . [ ] (5.1.2.4)

5.1.2.5 Number of officers required per day to meet the patrol interval performance objective for category 1 roadways in the APA, use the formula below . . . [ ] (5.1.2.5)

$$\text{Number of Officers (5.1.2.5)} = \frac{24 \times \text{Roadway Miles (5.1.2.2)}}{\text{Average Patrol Speed (5.1.2.3)} \times \text{Shift Length (5.1.1)} \times \text{Perf. Obj. Patrol Interval (5.1.2.4)}}$$

5.1.3 Number of officers needed per day for uncommitted patrol on category 2 roadways in the APA

5.1.3.1 Category 2 roadway type, use (1.2.6.1) . . [ ] (5.1.3.1)

5.1.3.2 Miles of roadway, use (1.4.2) . . . . . [ ] (5.1.3.2)

5.1.3.3 Average patrol speed (MPH), use (1.2.6.2) . . . [ ] (5.1.3.3)

5.1.3.4 Performance objective patrol interval (hours), use (1.2.6.3) . . . . . [ ] (5.1.3.4)

5.1.3.5 Number of officers required per day to meet the patrol interval performance objective for category 2 roadways in the APA, use the formula below . . . [ ] (5.1.3.5)

$$\text{Number of Officers (5.1.3.5)} = \frac{24 \times \text{Roadway Miles (5.1.3.2)}}{\text{Average Patrol Speed (5.1.3.3)} \times \text{Shift Length (5.1.1)} \times \text{Perf. Obj. Patrol Interval (5.1.3.4)}}$$

5.1.4 Number of officers needed per day for uncommitted patrol on category 3 roadways in the APA

5.1.4.1 Category 3 roadway type, use (1.2.7.1) . . [ ] (5.1.4.1)

5.1.4.2 Miles of roadway, use (1.4.3) . . . . . [ ] (5.1.4.2)

5.1.4.3 Average patrol speed (MPH), use (1.2.7.2) . . . [ ] (5.1.4.3)

5.1.4.4 Performance objective patrol interval (hours), use (1.2.7.3) . . [ ] (5.1.4.4)

5.1.4.5 Number of officers required per day to meet the patrol interval performance objective for category 3 roadways in the APA, within the APA, use use the formula below . . . [ ] (5.1.4.5)

$$\text{Number of Officers (5.1.4.5)} = \frac{24 \times \text{Roadway Miles (5.1.4.2)}}{\text{Average Patrol Speed (5.1.4.3)} \times \text{Shift Length (5.1.1)} \times \text{Perf. Obj. Patrol Interval (5.1.4.4)}}$$

5.1.5 Total number of officers required per day to meet patrol interval performance objective within the APA, add: (5.1.2.5) + (5.1.3.5) + (5.1.4.5) . [ ] (5.1.5)

OPTION: Complete Section 5.2 or the Supplemental Worksheet in Appendix A or complete Sections 5.3 and 5.4.

5.2 Uncommitted Patrol Availability - Immediate Response

5.2.1 Number of effective shifts per day

5.2.1.1 Shift length (hours), use (1.2.1) . . . . . [ ] (5.2.1.1)

5.2.1.2 Calculate the effective number of shifts per day based on the formula below . . . . . [ ] (5.2.1.2)

$$\text{Effective Number of Shifts Per Day (5.2.1.2)} = \frac{24}{\text{Shift Length (hours) (5.2.1.1)}}$$

5.2.2 Adjusted average number of on-duty officers for reactive activities per shift per day

5.2.2.1 Average daily number of on-duty officers (N_r) for reactive activities, use (3.3.3) . . . . . [ ] (N_r) (5.2.2.1)

5.2.2.2 Average daily number of on-duty officers (N_{rs}) per shift for reactive activities, divide: (5.2.2.1) ÷ (5.2.1.2) . . . [ ] (N_{rs}) (5.2.2.2)

5.2.2.3 Fraction of non-preemptable other CFS, divide: (1.3.6) ÷ 100 . . . . . [ ] (5.2.2.3)

5.2.2.4 Number of non-preemptable other CFS, multiply: (5.2.2.3) x (1.3.4) . . . . [ ] (5.2.2.4)

5.2.2.5 Calculate the fraction of non-preemptable reactive activities (f_{npr}), use the formula below . . . [ ] (f_{npr}) (5.2.2.5)

$$\text{Fraction of Non-Preemptable Reactive Activities } (f_{npr})\ (5.2.2.5) = \frac{\text{Number of Accidents (1.3.2)} + \text{Number of Non-Preemptable Other CFS (5.2.2.4)}}{\text{Number of Accidents (1.3.2)} + \text{Number of Other CFS (1.3.4)}}$$

5.2.2.6 Fraction of non-preemptable administrative act. (f_{npa}), divide: (1.3.7) ÷ 100 . . . [ ] (f_{npa}) (5.2.2.6)

5.2.2.7 Fraction of non-preemptable self-initiated/COP activities (f_{nps}), divide: (1.3.8) ÷ 100 . . . . . [ ] (f_{nps}) (5.2.2.7)

5.2.2.8 Administrative time - minutes per hour per officer (m_a), use (2.3) . . [ ] (m_a) (5.2.2.8)

5.2.2.9 Self-initiated/COP time - minutes per hour per officer (m_s), use (4.6) . . [ ] (m_s) (5.2.2.9)

5.2.2.10 Calculate **K_a**, use the formula below . . . . . [ ] **(K_a)**

(5.2.2.10)

$$K_a \text{ (5.2.2.10)} = \frac{\text{Administrative Activities, Minutes per Hour Per Officer } m_a \text{ (5.2.2.8)}}{60 - \text{Admin. Minutes Per Hour Per Off., } m_a \text{ (5.2.2.8)} - \text{S.I./COP Minutes Per Hour Per Off., } m_s \text{ (5.2.2.9)}}$$

5.2.2.11 Calculate **K_s**, use the formula below . . . . . [ ] **(K_s)**

(5.2.2.11)

$$K_s \text{ (5.2.2.11)} = \frac{\text{Self-Initiated Activities, Minutes per Hour Per Officer } m_s \text{ (5.2.2.9)}}{60 - \text{Admin. Minutes Per Hour Per Off., } m_a \text{ (5.2.2.8)} - \text{S.I./COP Minutes Per Hour Per Off., } m_s \text{ (5.2.2.9)}}$$

5.2.2.12 Calculate **K_{sa}**, add: (5.2.2.10) + (5.2.2.11) . [ ] **(K_{sa})**

(5.2.2.12)

5.2.2.13 Calculate K_{na}, multiply: (5.2.2.6) x (5.2.2.10) . . [ ] (K_{na})
(5.2.2.13)

5.2.2.14 Calculate K_{ns}, multiply: (5.2.2.7) x (5.2.2.11) . . [ ] (K_{ns})
(5.2.2.14)

5.2.2.15 Calculate K_{nsa}, add: (5.2.2.13) + (5.2.2.14) . [ ] (K_{nsa})
(5.2.2.15)

5.2.2.16 Calculate the adjusted average number of officers (N_{ars}) required for reactive activities per shift per day, use the formula below . . . . . [ ] (N_{ars})
(5.2.2.16)

$$\text{Adjusted Average Number of Officers for Reactive Act. Per Shift Per Day } (N_{ars})\ (5.2.2.16) = \frac{\text{No. of Officers, Reactive Act. per Shift } (N_{rs})\ (5.2.2.2) \times (f_{npr}\ (5.2.2.5) + K_{nsa}\ (5.2.2.15))}{1 + K_{nsa}\ (5.2.2.15)}$$

5.2.3 Select table in Appendix A based on K_{nsa} (5.2.2.15) from from the chart below . . . . . [Table A-]
(5.2.3)

If K_{nsa} (5.2.2.15) is in the range	Use Table (5.2.3)
0.0 - .099	A-1
0.1 - .199	A-2
0.2 - .299	A-3
0.3 - .399	A-4
0.4 - .499	A-5
0.5 - .599	A-6
0.6 - .699	A-7
0.7 - .799	A-8
0.8 - .899	A-9
0.9 - .999	A-10
1.0 - 1.099	A-11
1.1 - 1.199	A-12
1.2 - 1.299	A-13

5.2.4 Total number of additional officers required for patrol per shift to provide immediate response for the performance objective percentage of emergency accidents and other CFS

5.2.4.1 Performance objective (**IR%**), percentage of emergency accidents and other CFS activities, immediate response (a number between 50 and 99) . . . . . [ ] (**IR%**)

(5.2.4.1)

5.2.4.2 Total number of on-duty officers officers ($N_{ir\%s}$) required per shift to meet the immediate response performance objective, use N_{ars} (5.2.2.16), the table selected for (5.2.3), and (**IR%**) (5.2.4.1) . . . . [ ] ($N_{ir\%s}$)

(5.2.4.2)

5.2.4.3 Calculate K_{dsa}, subtract: (5.2.2.12) - (5.2.2.15) . . [ ] (K_{dsa})
(5.2.4.3)

5.2.4.4 Calculate the <u>additional</u> number of officers per shift needed per day to meet the immediate response performance objective (IR%), use the formula below . . . [ ]
(5.2.4.4)

$$\underline{\text{Additional}} \text{ No. Of Officers Needed Per Shift For Immediate Resp. (5.2.4.4)} = \frac{N_{ir\%s}\ (5.2.4.2) - N_{rs}\ (5.2.2.2) \times (1 - f_{npr}\ (5.2.2.5) + K_{das}\ (5.2.4.3))}{1 + K_{dsa}\ (5.2.4.3)}$$

5.2.4.5 Determine the actual <u>additional</u> number of officers per shift (N_{airs}) needed per day to meet the immediate response performance objective (IR%), select the larger of zero and (5.2.4.4) . . . . . [ ] (N_{airs})
(5.2.4.5)

5.2.4.6 Number of additional on-duty officers (N_{air}) required per day to meet the immediate response performance objective (IR%), multiply: (5.2.4.5) x (5.2.1.2); or enter value from Step (A.8) . . . . . [ ] (N_{air})
(5.2.4.6)

Continue with Section 5.5.

OR

5.3 Uncommitted Patrol Availability - Travel Time for Emergency Activities

5.3.1 Average number of on-duty officers for reactive activities per shift per day

5.3.1.1 Shift length (hours), use (1.2.1) . . . . . [ ] (5.3.1.1)

5.3.1.2 Calculate the effective number of shifts per day based on the formula below . . . . . [ ] (5.3.1.2)

$$\text{Effective Number of Shifts Per Day (5.3.1.2)} = \frac{24}{\text{Shift Length (hours) (5.3.1.1)}}$$

5.3.1.3 Average daily number of on-duty officers (N_r) for reactive activities, use (3.3.3) . . . . . [ ] (N_r) (5.3.1.3)

5.3.1.4 Average daily number of on-duty officers (N_{rs}) per shift for reactive activities, divide: (5.3.1.3) ÷ (5.3.1.2) . . . [ ] (N_{rs})
(5.3.1.4)

5.3.2 Maximum number of uncommitted patrol units for response to emergency activities

5.3.2.1 Area (square miles) of APA . . . . . [ ]
(5.3.2.1)

5.3.2.2 Average response speed (MPH) for emergency activities . . . . . [ ]
(5.3.2.2)

5.3.2.3 Avg. travel time (emergency activities) performance objective (minutes) . . . . [ ]
(5.3.2.3)

5.3.2.4 <u>Maximum</u> number of additional officers required per shift within the APA to meet the average travel time performance objective for emergency activities

5.3.2.4.1 Calculate K_{tt}, use the formula below . [ ] (K_{tt})
(5.3.2.4.1)

$$K_{tt} = \frac{40}{\text{Response Speed (MPH) (5.3.2.2)} \times \text{Travel Time (min) (5.3.2.3)}}$$

5.3.2.4.2 Calculate K_{tt}^2, multiply: (5.3.2.4.1) x (5.3.2.4.1) . . . . [ ] (K_{tt}^2)
(5.3.2.4.2)

5.3.2.4.3 Maximum number of officers (N_{maxtt}) required per shift for rapid response to emergency act., use the formula below . . . . . [ ] (N_{maxtt})
(5.3.2.4.3)

Maximum Daily No. of On-Duty Officers (N_{maxtt}), Rapid Response to Emerg. Activities (5.3.2.4.3) = K_{tt}^2 (5.3.2.4.2) x Area (5.3.2.1)

5.3.3 Adjusted number of additional officers required within the APA to meet the average travel time performance objective for emergency activities

5.3.3.1 Fraction of non-preemptable other CFS, divide: (1.3.6) ÷ 100 . . . . . [ ]
(5.3.3.1)

5.3.3.2 Number of non-preemptable other CFS, multiply: (5.3.3.1) x (1.3.4) . . . . [ ]
(5.3.3.2)

5.3.3.3 Calculate the fraction of non-preemptable reactive activities (f_{npr}), use the formula below . . . [ ] (f_{npr})

(5.3.3.3)

$$\text{Fraction of Non-Preemptable Reactive Activities } (f_{npr})\ (5.3.3.3) = \frac{\text{Number of Accidents (1.3.2)} + \text{Number of Non-Preemptable Other CFS (5.3.3.2)}}{\text{Number of Accidents (1.3.2)} + \text{Number of Other CFS (1.3.4)}}$$

5.3.3.4 Fraction of non-preemptable administrative activities divide: (1.3.7) ÷ 100 . . . [ ] (f_{npa})

(5.3.3.4)

5.3.3.5 Fraction of non-preemptable self-initiated/COP act., divide: (1.3.8) ÷ 100 . . . [ ] (f_{nps})

(5.3.3.5)

5.3.3.6 Administrative time - minutes per hour per officer (m_a), use (2.3) . . [ ] (m_a)

(5.3.3.6)

5.3.3.7 Self-initiated/COP time - minutes per hour per officer (m_s), use (4.6) . . [ ] (m_s)

(5.3.3.7)

5.3.3.8 Calculate K_a, use the formula below . . . . . [ ] (K_a)

(5.3.3.8)

$$K_a \text{ (5.3.3.8)} = \frac{\text{Administrative Activities, Minutes per Hour Per Officer } m_a \text{ (5.3.3.6)}}{60 - \text{Admin. Minutes Per Hour Per Off., } m_a \text{ (5.3.3.6)} - \text{S.I./COP Minutes Per Hour Per Off., } m_s \text{ (5.3.3.7)}}$$

5.3.3.9 Calculate **K_s**, use the formula below . . . . . [ ] **(K_s)**
(5.3.3.9)

$$K_s \text{ (5.3.3.9)} = \frac{\text{Self-Initiated Activities, Minutes per Hour Per Officer } m_s \text{ (5.3.3.7)}}{60 - \text{Admin. Minutes Per Hour Per Off., } m_a \text{ (5.3.3.6)} - \text{S.I./COP Minutes Per Hour Per Off., } m_s \text{ (5.3.3.7)}}$$

5.3.3.10 Calculate **K_{sa}**, add: (5.3.3.8) + (5.3.3.9) . . [ ] **(K_{sa})**
(5.3.3.10)

5.3.3.11 Calculate **K_{na}**, multiply: (5.3.3.4) x (5.3.3.8) . . [ ] **(K_{na})**
(5.3.3.11)

5.3.3.12 Calculate **K_{ns}**, multiply: (5.3.3.5) x (5.3.3.9) . . [ ] **(K_{ns})**
(5.3.3.12)

5.3.3.13 Calculate K_{nsa}, add: (5.3.3.11) + (5.3.3.12) . [ ] (K_{nsa})
(5.3.3.13)

5.3.3.14 Calculate K_{dsa}, subtract: (5.3.3.10) - (5.3.3.13) . [ ] (K_{dsa})
(5.3.3.14)

5.3.3.15 Calculate the adjusted number of additional officers required per shift to meet the average travel time performance objective, use the formula below . . . . . [ ]
(5.3.3.15)

$$\text{Adjusted Daily No. of Additional Officers (5.3.3.15)} = \frac{N_{maxtt}\ (5.3.2.4.3) - N_{rs}\ (5.3.1.4) \times (1 - f_{npr}\ (5.3.3.3) + K_{dsa}\ (5.3.3.14))}{1 + K_{dsa}\ (5.3.3.14)}$$

5.3.4 Actual number of additional officers required per shift to meet the travel time performance objective for emergency activities, select the larger of zero (0) and and (5.3.3.15) . . . . . [ ]
(5.3.4)

5.3.5 Actual number of additional officers (N_{ett}) required per day to meet the travel time performance objective for emergency activities, multiply: (5.3.1.2) x (5.3.4) . . . . . [ ] (N_{ett})
(5.3.5)

5.4 Uncommitted Patrol Availability - Travel Time for Non-Emergency Activities

5.4.1 Shift length (hours), use (1.2.1) . . . . . [ ]
(5.4.1)

5.4.2 Area (square miles) of the APA . . . . . [ ]
(5.4.2)

5.4.3 Average response speed (MPH) for non-emergency reactive activities . . . . . [ ]
(5.4.3)

5.4.4 Average travel time (non-emergency activities) performance objective (minutes) . . . . . [ ]
(5.4.4)

5.4.5 Number of officers required within the APA to meet the average travel time performance objective for non-emergency activities

5.4.5.1 Calculate K_{tt}, use the formula below . . . . . [ ] (K_{tt})
(5.4.5.1)

$$K_{tt} = \frac{40}{\text{Response Speed (MPH) (5.4.3)} \times \text{Travel Time (min) (5.4.4)}}$$

5.4.5.2 Calculate $\mathbf{K_{tt}^2}$, multiply: (5.4.5.1) x (5.4.5.1) . . . [ ] (5.4.5.2) **(K_{tt}^2)**

5.4.5.3 Number of officers (**N_{nett}**) required per day for rapid response to non-emergency activities, use the formula below . . . [ ] (5.4.5.3) **(N_{nett})**

$$\text{Daily No. of On-Duty Officers } (N_{att}) \text{ For Rapid Response (Non-Emerg. Act.) (5.4.5.3)} = \frac{24 \times K_{tt}^2 \text{ (5.4.5.2)} \times \text{Area (5.4.2)}}{\text{Shift Length (hours) (5.4.1)}}$$

5.5 Uncommitted Patrol Availability - Travel Time

Number of officers (**N_{tt}**) required to meet the travel time performance objectives for both emergency and non-emergency activities, select the larger of (5.3.5) and (5.4.5.3) . . . [ ] (5.5) **(N_{tt})**

5.6 Uncommitted Patrol Availability

Total officers required within the APA, select either (5.2.4.6) or (5.5) . . . . . [ ]

(5.6)

5.7 Total Number of Officers Required for Uncommitted Patrol

Average number of officers (N_p) required per day for uncommitted patrol within the APA, select the larger of (5.1.5) and (5.6) . . . . . [ ] (N_p)

(5.7)

Instructions for Worksheet 6: Average Daily Number of On-Duty Officers

Worksheet 6 uses information from worksheets 2, 3, 4, and 5 to determine the average number of on-duty officers that are needed per day within the APA. The formula for the average number of officers (Step 6.1.5) is based on:

- the average number of on-duty officers needed for reactive activities (N_r),
- the average number of on-duty officers needed for uncommitted patrol (N_p),
- the average number of minutes per hour per officer spent on administrative activities (m_a), and
- the average number of minutes per hour per officer spent on self-initiated/COP activities (m_s).

The derivation of the formula for Step (6.1.5) is presented in Section D.5 in Appendix D in the Guide.

Sections 6.2 and 6.3 are used to add officers to account for the use of two-officer patrol units and the presence of minimum patrol staffing requirements set by the agency. The derivation of the formula for adjusting the number of on-duty officers for two-officer units is presented in Section D.6 in Appendix D in the Guide.

Instructions for Individual Steps

6.1 Number of On-Duty Officers per Day - All One-Officer Patrols (C)

With the completion of Step 6.1.5, it is possible to determine how much time each officer, on the average, will spend on each of the four work categories: reactive, self-initiated/COP, uncommitted patrol, and administrative. The four times are given by:

Administrative Time (min/hr) = m_a (Step 2.3),

$$\text{Self-Init./COP Time (min/hr)} = m_s \text{ (Step 4.6)},$$

$$\text{Reactive Activities Time } (m_r) \text{ (min/hr)} = \frac{N_r \text{ (3.3.3) x 60}}{\text{On-Duty Officers Per Day (6.1.5)}}, \text{ and}$$

$$\text{Uncommitted Patrol Time (min/hr)} = 60 - m_a - m_s - m_r .$$

The four times sum to 60 minutes. The time (in hours) spent on each activity for an entire shift can be determined by dividing each time by 60 and multiplying by the shift length (in hours).

6.2 Adjustment for Two-Officer Patrol Units (P).

6.2.1 The percentage of time that patrol units are staffed with two officers. A value of 0 indicates that no patrol units within the APA are staffed with two officers while a value of 100 indicates that every patrol unit has two officers.

6.2.3 The adjustment factor is a number between 1 and 2 that is derived from the percentage entered for (6.2.1). The factor indicates the average number of officers per patrol unit. A value of 1 indicates an average of one officer per unit (i.e., no two-officer units are used). A value of 2 indicates that every unit has two officers.

6.3 Minimum Patrol Staffing Level

The minimum number of on-duty officers that must be available each day in the APA as determined by agency policy.

WORKSHEET 6: Average Daily Number of On-Duty Officers

Objective: Determine the average total number of officers required per day within the APA.

Method: Combine the total number of officers required for reactive (N_r) and patrol activities (N_p) with the per officer time requirements for self-initiated/COP (m_s) and administrative (m_a) activities. Adjust the required number of officers based on the percentage of two-officer patrols and, if applicable, minimum daily patrol staffing levels.

6.1 Number of On-Duty Officers per Day - All One-Officer Patrols

6.1.1 Administrative time - minutes per hour per officer, use (2.3) . . . . . [ ] (m_a)
(6.1.1)

6.1.2 Average number of officers required per day to meet reactive time workload, use (3.3.3) . . . . . [ ] (N_r)
(6.1.2)

6.1.3 Self-initiated/COP time - minutes per hour per officer, use (4.6) . . . . . [ ] (m_s)
(6.1.3)

6.1.4 Average number of officers required per day to meet patrol time requirements, use (5.7) . . . [ ] (N_p)
(6.1.4)

6.1.5 Average total number of on-duty officers required per day for all patrol activities within the APA, one officer per unit, use the formula below . . . . . [ ] (6.1.5)

$$\text{Average Total Number of On-Duty Officers Per Day (6.1.5)} = \frac{N_r\ (6.1.2) + N_p\ (6.1.4)}{1 - \frac{m_a\ (6.1.1)}{60} - \frac{m_s\ (6.1.3)}{60}}$$

6.2 Adjustment for Two-Officer Patrols

Note: If two-officer patrols are not used, enter (6.1.5) in (6.2.4) and continue with Section 6.3.

6.2.1 Percentage of time patrol units within the APA are staffed with two officers . . . . [ ] (6.2.1)

6.2.2 Fraction of time patrol units within the APA are staffed with two officers, divide: (6.2.1) ÷ 100 . . . . . [ ] (6.2.2)

6.2.3 Adjustment factor: average number of officers per unit, add: 1 + (6.2.2) . . . . . [ ] (6.2.3)

6.2.4 Average total number of on-duty officers required per day for all patrol activities, multiply: (6.1.5) x (6.2.3) . . . . . [ ] (6.2.4)

6.3 Adjustment for Minimum Patrol Staffing Levels

Note: If minimum patrol staffing levels are not used, enter (6.2.4) into (6.3.2) and continue with Worksheet 7.

6.3.1 Average minimum number of on-duty officers required per day for all patrol activities, based on agency policy . . . . . [ ] (N_{min}) (6.3.1)

6.3.2 Average daily number of on-duty officers required for all patrol activities (N_o), select the larger of (6.2.4) and (6.3.1) . . [ ] (N_o) (6.3.2)

Instructions for Worksheet 7: Special Assignments and Field Supervision

Worksheet 7 is used to determine the number of field supervisors required in the APA and the impact of special assignment units (e.g., tactical, K9, accident investigation) on total patrol staffing.

The number of field supervisors is based on the span of supervision (i.e., the average number of officers that report to each field supervisor) set by agency policy and the amount of patrol work done by each field supervisor.

The impact of special assignment personnel is based on the number of on-duty officers required for each type of specialized unit (specified by the PAM user) and the percentage of patrol work, if any, performed by the specialists. The procedure assumes that the number of officers on special assignments is permanent (i.e., that they will continue on the assignment for an indefinite period of time). Additional staffing for non-permanent or temporary assignments such as traffic and crowd control at special events (e.g., a fourth of July parade) is considered in the derivation of the shift relief factor in Worksheet 8.

The derivations of the formulas used for steps 7.1.6, 7.2.1.6, 7.2.2.6, 7.2.3.6, 7.2.4, and 7.3.1 are presented in Section D.7 of Appendix D in the Guide.

Instructions for Individual Steps

Since field supervisors, and officers assigned to special assignments, may spend part of their time performing patrol activities, the addition of field supervisors and special assignment personnel to the patrol force may reduce the number of full-time (i.e., non-supervisory and non-special assignment) officers that are needed. The number of on-duty officers determined in sections 7.1 and 7.2 consists of an adjusted number of full-time officers and the number of officers used for special assignments.

7.1 Number of full-time, on-duty officers required per day, adjusted for field supervisors (P,D,C)

The adjusted number of full-time, on-duty officers ($\mathbf{N}_{ao}$) is

based on the number of officers ($\mathbf{N_o}$) derived in Step 6.3.2, the average number of officers supervised by each field supervisor (Step 7.1.1), and the percentage of on-duty time field supervisors spend on patrol activities (i.e., time spent on reactive, self-initiated/COP, uncommitted patrol, and non-supervisory administrative work) (Step 7.1.2). If field supervisors spend no time on patrol activities, then the adjusted number of full-time, on-duty officers required is unchanged (i.e., $N_{ao} = N_o$).

7.2 Number of on-duty officers required per day, adjusted for special assignment personnel (D,C)

If special assignment personnel are used, Section 7.2 can be used for up to three types of special assignments. The adjustment is based on the adjusted number of full-time, on-duty officers ($\mathbf{N_{ao}}$) derived in Step 7.1.6; the number of on-duty officers required for special assignments (i.e., $\mathbf{N_{s1}}$, $\mathbf{N_{s2}}$, and $\mathbf{N_{s3}}$ in steps 7.2.1.2, 7.2.2.2, and 7.2.3.2); and the percentage of time special assignment personnel spent on patrol activities (i.e., time spent on reactive, self-initiated/COP, uncommitted patrol, and patrol-related administrative work) (steps 7.2.1.3, 7.2.2.3, and 7.2.3.3). The final adjusted value for the number of on-duty officers required per day ($\mathbf{N_{ot}}$) is determined in Step 7.2.4 and includes both full-time patrol officers and officers who spend all or part of their time on special assignments.

Note that the number of full-time, on-duty officers per day ($\mathbf{N_{ft}}$) is given by:

$$N_{ft} = \underset{(7.2.4)}{N_{ot}} - \underset{(7.2.1.2)}{N_{s1}} - \underset{(7.2.2.2)}{N_{s2}} - \underset{(7.2.3.2)}{N_{s3}}$$

7.3 Total number of on-duty field supervisors ($\mathbf{N_{os}}$) required per day for the adjusted number of on-duty officers ($\mathbf{N_{ot}}$) (C)

The number of on-duty field supervisors ($\mathbf{N_{os}}$) is based on the adjusted number of on-duty officers ($\mathbf{N_{ot}}$) from Step 7.2.4 and the number of officers assigned to each field supervisor (Step 7.1.1). The value determined for $\mathbf{N_{os}}$ in Step 7.3.1 includes supervisors for both full-time patrol officers and officers assigned to special units.

WORKSHEET 7: Special Assignments and Field Supervision

Objective: Determine (1) the revised number of on-duty officers required per day for officers on special assignments and (2) the number of field supervisors required.

Method: The number of officers for special assignments is based on the number of specialists assigned by the agency and the percentage of time each spends on field patrol activities. The number of field supervisors is based on the span of supervision (set by agency policy) and the percentage of field supervisor on-duty time spent on patrol activities.

7.1 Number of Full-Time, On-Duty Officers Required per Day, Adjusted for Field Supervisors

7.1.1 Average number of officers to be supervised by each field supervisor, use (1.2.3) . . . . . [ ] (7.1.1)

7.1.2 Percentage of field supervisor on-duty time spent on patrol activities (a number between 0 and 100), use (1.2.4) . . . . . [ ] (7.1.2)

7.1.3 Fraction of field supervisor on-duty time spent on patrol activities, divide: (7.1.2) ÷ 100 . . . . . [ ] (7.1.3)

7.1.4 Total number of on-duty officers required per day within the APA (N_o) for all patrol activities, use (6.3.2) . . . . . [ ] (N_o) (7.1.4)

7.1.5 Adjustment factor (K_f), use formula below . . . . . [ ] (K_f)
(7.1.5)

$$\text{Adjustment Factor } (K_f) \text{ (7.1.5)} = \frac{\text{Officers Per Field Sup. (7.1.1)}}{\text{Officers Per Field Sup. (7.1.1)} + \text{Fraction of Field Sup. Time on Patrol (7.1.3)}}$$

7.1.6 Adjusted daily number of full-time, on-duty officers (N_{ao}) required per day, use formula below . . . . . [ ] (N_{ao})
(7.1.6)

$$\text{Adjusted Number of Full-Time, On-Duty Officers Per Day } (N_{ao}) \text{ (7.1.6)} = K_f \times \text{No. of On-Duty Officers Per Day } (N_o) \text{ (7.1.4)}$$

NOTE: If no special assignment personnel are to be included, enter (7.1.6) into (7.2.4) and continue with Section 7.3. If special assignment personnel are to be included, continue with Section 7.2.

7.2 Number of On-Duty Officers Required Per Day, Adjusted for Special Assignment Personnel

7.2.1 Special Assignment 1

7.2.1.1 Assign. 1 name . _____ (7.2.1.1)

7.2.1.2 Average number of <u>on-duty</u> officers per day on specialized assignment 1 . . . . . _____ (7.2.1.2) (N_{s1})

7.2.1.3 Percentage of on-duty time spent on patrol activities by officers assigned to special assignment 1 (a number between 0 and 100) . . . . _____ (7.2.1.3)

7.2.1.4 Percentage of on-duty time spent on non-patrol activities by officers assigned to special assignment 1, subtract: 100 - (7.2.1.3) . . . . . _____ (7.2.1.4)

7.2.1.5 Fraction of on-duty time spent on non-patrol activities by officers assigned to special assignment 1, divide: (7.2.1.4) ÷ 100 . . . . . _____ (7.2.1.5) (f_{s1})

7.2.1.6 Adjusted daily number of on-duty officers assigned to special assignment 1, use formula below . . . . . [ ] (N_{as1})
(7.2.1.6)

Adjusted Number On-Duty Officers, Special Assignment 1 (N_{as1}) (7.2.1.6)	=	Number On-Duty Officers S.A. 1 (N_{s1}) (7.2.1.2)	x	Fraction Time On Non-Patrol Activities (f_{s1}) (7.2.1.5)	x	Adjustment Factor (K_f) (7.1.5)

NOTE: If personnel for a second special assignment are to be included, complete steps (7.2.2.1) through (7.2.2.6). If not, enter zeros for steps (7.2.2.6) and (7.2.3.6) and continue with Step 7.2.4.

7.2.2 Special Assignment 2

7.2.2.1 Assign. 2 name . [ ]
(7.2.1.1)

7.2.2.2 Average number of <u>on-duty</u> officers per day on specialized assignment 2 . . . . . [ ] (N_{s2})
(7.2.2.2)

7.2.2.3 Percentage of on-duty time spent on patrol activities by officers assigned to special assignment 2 (a number between 0 and 100) . . . . [ ]
(7.2.2.3)

7.2.2.4 Percentage of on-duty time spent on non-patrol activities by officers assigned to special assignment 2, subtract: 100 - (7.2.2.3) . . . . . [ ] (7.2.2.4)

7.2.2.5 Fraction of on-duty time spent on non-patrol activities by officers assigned to special assignment 2, divide: (7.2.2.4) ÷ 100 . . . . . [ ] (f_{s2}) (7.2.2.5)

7.2.2.6 Adjusted daily number of on-duty officers assigned to special assignment 2, use formula below . . . . . [ ] (N_{as2}) (7.2.2.6)

Adjusted Number On-Duty Officers, Special Assignment 2 (N_{as2}) (7.2.2.6) = Number On-Duty Officers S.A. 2 (N_{s2}) (7.2.2.2) x Fraction Time On Non-Patrol Activities (f_{s2}) (7.2.2.5) x Adjustment Factor (K_f) (7.1.5)

NOTE: If personnel for a third special assignment are to be included, complete steps (7.2.3.1) through (7.2.3.6). If not, enter zero for step (7.2.3.6) and continue with Step 7.2.4.

7.2.3 Special Assignment 3

7.2.3.1 Assign. 3 name . _____ (7.2.3.1)

7.2.3.2 Average number of <u>on-duty</u> officers per day on specialized assignment 3 . . . . . _____ (7.2.3.2) (N_{s3})

7.2.3.3 Percentage of on-duty time spent on patrol activities by officers assigned to special assignment 3 (a number between 0 and 100) . . . . _____ (7.2.3.3)

7.2.3.4 Percentage of on-duty time spent on non-patrol activities by officers assigned to special assignment 3, subtract: 100 - (7.2.3.3) . . . . . _____ (7.2.3.4)

7.2.3.5 Fraction of on-duty time spent on non-patrol activities by officers assigned to special assignment 3, divide: (7.2.3.4) ÷ 100 . . . . . _____ (7.2.3.5) (f_{s3})

7.2.3.6 Adjusted daily number of on-duty officers assigned to special assignment 3, use formula below . . . . . _____ (7.2.3.6) (N_{as3})

Adjusted Number On-Duty Officers, Special Assignment 3 (N_{as3}) (7.2.3.6)	=	Number On-Duty Officers S.A. 3 (N_{s3}) (7.2.3.2)	x	Fraction Time On Non-Patrol Activities (f_{s3}) (7.2.3.5)	x	Adjustment Factor (K_f) (7.1.5)

7.2.4 Adjusted total daily number of on-duty officers required per day, use formula below . . . . . [ ] (N_{ot})

(7.2.4)

Adjusted Total Number of On-Duty Officers Per Day (N_{ot}) (7.2.4)	=	N_{ao} (7.1.6)	+	N_{as1} (7.2.1.6)	+	N_{as2} (7.2.2.6)	+	N_{as3} (7.2.3.6)

7.3 Total Number of On-Duty Field Supervisors Required Per Day for the Adjusted Number of On-Duty Officers

7.3.1 Total number of on-duty field supervisors (N_{os}) required per day, day, divide: (7.2.4) ÷ (7.1.1) . . [ ] (N_{os})

(7.3.1)

Instructions for Worksheet 8: Total Patrol Staff Requirements

Worksheet 8 is used to determine the total patrol staff needed to support the on-duty officer and field supervisor requirements determined in worksheets 6 and 7. The total patrol staff requirement for the APA is derived using the following procedure:

- Sections 8.1, 8.2, and 8.3 are used to determine the total number of officers and field supervisors, both on and off-duty, that are needed.
- Section 8.4 is used to indicate the total number of command personnel that are required.
- Section 8.5 is used to collect the results into a final tabulation of the total patrol staff requirements for the APA.

The total number of officers and field supervisors required is determined based on the shift relief factor for the APA. The shift relief factor is defined as the average number of officers required to staff one shift position per day, 365 days a year. The shift relief factor for an APA is calculated with the following formula:

$$\text{Shift Relief Factor} = \frac{\text{Total Number of Hours To Cover One Shift Position Per Day, 365 Days Per Year}}{\text{Average Number of Actual On-Duty Hours On Patrol Per Person Per Year}}$$

The average number of actual on-duty hours on patrol per officer per year is determined by the average work week, the shift length, the benefit time policies (i.e., time off for vacations, holidays, sick leave, etc.) of the agency, and the extent to which officers are used for non-patrol activities. For agencies with eight-hour shifts, shift relief factors usually fall between 1.60 and 1.90. Derivation of the shift relief factor formula is presented in Section D.9 in Appendix D in the Guide.

To indicate the number of command personnel, the user must specify the number directly in Section 8.4.

Instructions for Individual Steps

8.2 Shift Relief Factor

8.2.7 Average number of on-duty hours on patrol per officer per year

This value is obtained by taking the total hours that an officer is paid per year (Step 8.2.4) and subtracting the total hours for benefit time off (Step 8.2.5) and temporary assignments (Step 8.2.6).

8.4 The Number of Command Personnel - Agency Policy (P).

This category should include all command personnel (e.g., lieutenants, captains, majors, etc.) that are needed for the supervision of the patrol force within the APA. The specific kinds of personnel included in this category will vary from agency to agency.

WORKSHEET 8: Total Staff Patrol Requirements

Objective: Determine total patrol staff needed to support the required daily on-duty field personnel.

Method: Use the shift relief factor, daily on-duty patrol staffing requirements, and the number of command positions based on agency policy.

8.1 On-Duty Officers and Field Supervisors Required per Day

8.1.1 Total number of on-duty officers per day within the APA, use (7.2.4) . . . . . [ ] (N_{ot})
(8.1.1)

8.1.2 Total number of on-duty field supervisors per day within the APA, use (7.3.1) . . . . . [ ] (N_{os})
(8.1.2)

8.2 Shift Relief Factor

8.2.1 Shift length (hours), use (1.2.1) . . . . . [ ]
(8.2.1)

8.2.2 Total hours on one shift during one year, multiply: 365 x (8.2.1) . . . . . [ ] (H_t)
(8.2.2)

8.2.3 Average work week (average number of paid hours per week per officer), use (1.2.2.1) . . . [ ] **(AWW)**

(8.2.3)

8.2.4 Average number of paid hours of work per year per officer, use formula below . . . . . [ ] **(H_y)**

(8.2.4)

$$\text{Average Number of Paid Hours of Work per Year per Officer } (H_y) = \frac{365 \times \text{AWW (8.2.3)}}{7}$$

8.2.5 Average number of benefit (paid) hours off per year per officer, use (1.2.2.2) . . . . [ ] **(H_b)**

(8.2.5)

8.2.6 Average number of on-duty hours on temporary assignments (non-patrol) per officer per year, use (1.2.2.3) . . . . . [ ] **(H_{ta})**

(8.2.6)

8.2.7 Average number of on-duty, hours on patrol per year per officer, use formula below . . . . [ ] **(H_p)**

(8.2.7)

$$\text{Average Number of On-Duty Hours On Patrol per Year per Officer } (H_p) = \underset{(8.2.4)}{H_y} - \underset{(8.2.5)}{H_b} - \underset{(8.2.6)}{H_{ta}}$$

8.2.8 Shift relief factor divide: (8.2.2) ÷ (8.2.7) . . . . [ ] **(SRF)**

(8.2.8)

8.3 Total Number of Required Officers and Field Supervisors Within the APA

8.3.1 Total number of patrol officers, multiply: (8.1.1) x (8.2.8) . . . [ ] (N_t)
(8.3.1)

8.3.2 Total number of field supervisors, multiply: (8.1.2) x (8.2.8) . . . . . [ ] (N_s)
(8.3.2)

8.3.3 Total number of officers and field supervisors, add: (8.3.1) + (8.3.2) . . . . . [ ]
(8.3.3)

8.4 Number of Command Personnel - Agency Policy

Enter the number of command staff (N_c) required for the number of officers and field supervisors in (8.3.3) . . . . [ ] (N_c)
(8.4)

8.5 Total Patrol Staff Requirement for the APA

8.5.1 Number of officers within the APA, use (8.3.1) . . . . . [ ] (N_t)
(8.5.1)

8.5.2 Number of field supervisors within the APA, use (8.3.2) . . . [ ] (N_s)
(8.5.2)

8.5.3 Number of command personal within the APA, use (8.4) . . . . . [ ] (N_c)
(8.5.3)

8.5.4 Total required patrol staff for the APA, add: (8.5.1) + (8.5.2) + (8.5.3) . . . . [ ] (N_{tot})
(8.5.4)

Chapter 4: PAM Instructions and Worksheet for Allocating Patrol Personnel Among Several APAs

Introduction

This chapter describes a systematic procedure for allocating personnel for police patrol and traffic services over several APAs (or several time periods) based on staffing estimates obtained from the procedures described in the eight worksheets in Chapter 3. The allocation procedure is presented in Worksheet 9 which uses the same data entry format as the worksheets in Chapter 3.

Throughout this chapter, the terms "personnel" and "staff" are used generically to refer to officers, field supervisors, and command staff who are to be added or subtracted from current patrol staffing levels or be reallocated among several APAs.

To facilitate the allocation procedure, the data items and calculations for each step in Worksheet 9 can be recorded in Table 4-1 at the end of this chapter. The table provides for up to six APAs, but the format can be easily modified to accommodate any number of patrol areas.

To use Worksheet 9 and Table 4-1, the user must provide the following information:

- the total number of personnel that will be added to or subtracted from the current patrol staff assigned to the APAs (Step 9.1.1),
- the number of personnel currently assigned to each APA (Step 9.1.3), and
- the number of personnel estimated by the PAM model for each APA (Step 9.1.5).

The total number of personnel included in the reallocation consists of the number of current patrol staff (**TC**) plus the number to added or subtracted (**TA**). If personnel are to be subtracted (noted in Worksheet 9 as **-TA**), then the total number to be allocated will be equal to **TC** minus **TA**. Worksheet 9 and Table 4-1 are used to derive two allocations for the total personnel:

- Unconstrained (Section 9.1) - The values recorded in Column 3 of Table 4-1 indicate the reallocation of all personnel based on the PAM estimates. This allocation is "unconstrained" because:

  - there are no limitations on the final number of personnel that can be assigned to each APA (i.e., each APA may gain or lose personnel), and

  - all personnel, both current and new, are eligible for reassignment.

- Constrained (Section 9.2) - The values recorded in Column 8 of Table 4-1 indicate a reallocation of personnel by APA based on the limitation that none of the personnel currently assigned to an APA can be reassigned. Application of this limitation produces the following effects:

  - Only personnel being added to the current staff are considered for allocation. As a result, no APA will lose personnel because of the reallocation. (New personnel are only added to APAs that are understaffed and no personnel are added to APAs that are overstaffed.) Under this limitation, however, it is possible that some APAs that were understaffed before the reallocation will continue be understaffed even after the staff additions.

  - If a reduction in the total number of current personnel is considered, no reassignment of the remaining personnel is permitted. As a result, no APA will gain personnel because of the reallocation. (Personnel are only taken from APAs that are overstaffed and no personnel are taken from APAs that are understaffed.) It is possible, however, that some APAs that were overstaffed before the personnel reductions will continue to be overstaffed even after the reallocation.

The derivations of the formulas for both unconstrained and constrained allocations are presented in Section D.9 in Appendix D in the Guide.

Although Worksheet 9 and Table 4-1 are designed for the allocation of patrol staff over geographic areas (i.e., over several APAs), the procedure described in Worksheet 9 can also be used to allocate staff over several time periods (e.g., shifts or days of the week). Such allocations require that PAM staffing estimates be determined for each time period (e.g., for each of three shifts).

Instructions for Individual Steps

9.1 Unconstrained Allocation

9.1.1 Indicate either the total number of personnel that is to be added to the APAs or the total number of personnel to be subtracted. Typically, the number of new personnel is determined by the number of graduates from the training academy. The number of personnel to be added is entered as a positive number in 9.1.1. If personnel reductions are planned, the total size of the staff reduction is entered as a negative number in 9.1.1.

The value entered in 9.1.1 (TA) should also be entered in Table 4-1 in the following locations: at the top of the page in the box labeled (TA), in the Sum Check row for columns 6 and 7, and, after being multiplied by minus one, in the Sum Check row for Column 4.

9.1.2 Determine the total number of current personnel in the APAs. The value is entered in 9.1.2 and in the Sum Check row for column 1 in Table 4-1.

The sum of (9.1.1) and (9.1.2) is entered in the Sum Check row for columns 3 and 8.

9.1.3 Determine the current number of personnel in each APA and enter the values in column 1 in Table 4-1.

9.1.4 The sum of column 1 should equal the Sum Check amount (9.1.2).

9.1.5 Determine the number of personnel estimated by the PAM model for each APA and enter the values in column 2 in Table 4-1.

9.1.7 The unconstrained allocation results for each APA are recorded in column 3 in Table 4-1. If a value of

zero is entered for (9.1.1) (i.e., TA = 0), then the results in column 3 will indicate the unconstrained allocation of the current number of personnel assigned to the APAs.

9.1.8 The sum of column 3 must equal the Sum Check amount given by (9.1.1) + (9.1.2).

9.2 Constrained Allocation

9.2.1 The values in column 4 are computed by taking the difference between the current number of personnel (column 1) and the unconstrained allocation of personnel (column 3) for each APA. A positive value indicates that the APA is overstaffed when compared to the reallocation based on the adjusted number of personnel (TC + TA). A negative value indicates that the APA is understaffed.

9.2.2 The sum of the values in column 4 must equal the number of personnel, multiplied by minus one (-1), to be added or reduced (i.e., -1 x (9.1.1)). As an example, if the number of personnel to be added is 10, then the sum of column 4 must equal -10.

9.2.3 Additional Personnel (TA(9.1.1) $\geq$ 0)

9.2.3.1 Based on the values in column 4, identify which APAs are overstaffed (indicated by a positive value in column 4) and which APAs are understaffed (indicated by a negative value in column 4). If an APA is overstaffed, a zero is entered in column 5. If an APA is understaffed, the negative value in column 4 is entered in column 5. When completed, every entry in column 5 should either be zero or a negative number.

9.2.3.3 Based on the formula given in Step 9.2.3.3, determine the number of personnel to be added to each APA and enter the values in column 6.

9.2.4 Personnel Reduction (TA(9.1.1) < 0)

9.2.4.1 Based on the values in column 4, identify which APAs are overstaffed (a positive value in column 4) and which APAs are understaffed (a negative value in column 4). If an APA is

overstaffed, the positive value in column 4 is entered in column 5. If an APA is understaffed, a zero is entered in column 5. When completed, every entry in column 5 should either be zero or a positive number.

9.2.4.3 Based on the formula given in Step 9.2.4.3, determine the number of personnel to be subtracted from each APA and enter the values in column 6.

9.2.5 The sum of column 6 must equal the Sum Check amount (9.1.1) (**TA**).

9.2.6 Determine the number of personnel to be added or subtracted from each APA by rounding each value in column 6 to a whole number and entering the result in column 7.

9.2.7 The sum of the values in column 7 must equal the Sum Check amount (9.1.1) (**TA**). If the sum does not equal (9.1.1), then one or more the rounded values must be changed.

9.2.8 Determine the number of personnel in each APA for the constrained allocation by adding the values in columns 1 and 7 and entering the result in column 8.

9.2.9 The sum of the values in column 8 must equal the number of current personnel plus the number of persons to be added or subtracted.

WORKSHEET 9: Allocation of Patrol Personnel Among Several APAs

Objective: Determine the appropriate number of personnel to be assigned to each APA based on the estimated PAM staffing levels for each APA.

Method: Based on the number of personnel estimated for each APA, two reallocations of current and new personnel are determined. The unconstrained allocation redistributes all personnel, both current and new, among the APAs in the same proportion as the PAM estimates. The constrained allocation restricts the allocation to only new (or reduced) personnel insuring that no APA loses staffing when new personnel are added (or that no APA gains staffing when personnel reductions are applied).

9.1 Unconstrained Allocation

9.1.1 Total number of new personnel for all APAs, (enter zero if none or a negative value for personnel reductions) . . . . . Table 4-1 **(TA)**

(9.1.1)

Enter (9.1.1) in Table 4-1 at four locations: in the box labeled (**TA**), in the Sum Check row for columns 6 and 7, and multiplied by -1 in the Sum Check row for column 5.

9.1.2 Total number of current personnel for all APAs . . . . . Column 1 **(TC)**

(9.1.2)

Enter (9.1.2) in the Sum Check row for column 1 in Table 4-1.

9.1.3 Number of current personnel for each APA, enter in column 1 in Table 4-1 . . . . . Column 1 (9.1.3)

9.1.4 Sum the values in column 1 and enter in the Col. Sum row . . . Column 1 (9.1.4)

Compare (9.1.4) with the Sum Check value (9.1.2) in column 1. If values agree, continue with Step 9.1.5.

9.1.5 Number of personnel estimated by PAM for each APA, enter in column 2 in Table 4-1 . . . . Column 2 (9.1.5)

9.1.6 Sum the values in column 2 and enter in the Col. Sum row . . . Column 2 (9.1.6) **(TE)**

9.1.7 The unconstrained reallocation for each APA, use the formula below and enter in column 3 in Table 4-1 . . . . . Column 3 (9.1.7)

$$\text{Column 3 Entry (9.1.7)} = \frac{\text{TA (9.1.1)} + \text{TC (9.1.2)}}{\text{TE (9.1.6)}} \times \text{PAM APA Est. Column 2 (9.1.5)}$$

9.1.8 Sum the values in column 3 and enter in the Col. Sum row . . . Column 3 (9.1.8)

Compare (9.1.8) with the Sum Check value in column 3 (equal to the sum (9.1.1) + (9.1.2)). If the values agree, continue with Section 9.2.

9.2 Constrained Allocation

9.2.1 Difference in personnel between the current staffing and the unconstrained allocation for each APA, subtract: Col. 1. (9.1.3) - Col. 3. (9.1.5) and enter in column 4 . . . . . | Column 4 | (9.2.1)

9.2.2 Sum the values in column 4 and enter in the Col. Sum row . . . . | Column 4 | (9.2.2)

Compare (9.2.2) with the Sum Check value in column 4 (equal to -1 x (9.1.1)). If the values agree, continue with Step 9.2.3 or Step 9.2.4.

Note: Complete Section 9.2.3 or Section 9.2.4. If TA (9.1.1) is greater than or equal to zero, continue with Step 9.2.3. If TA (9.1.1) is less than zero, continue with Step 9.2.4.

9.2.3 Additional Personnel (TA(9.1.1) ≥ 0)

9.2.3.1 Understaffing indicator for each APA, use rules below and enter in column 5 . . . . . | Column 5 | (9.2.3.1)

If column 4 entry is:

- greater than or equal to zero, enter 0 in column 5.
- less than zero, enter column 4 value in column 5.

9.2.3.2 Sum the values in column 5 and enter in the Col. Sum row . . . . . Column 5 **(TN)**

(9.2.3.2)

9.2.3.3 Number of personnel to be added to each APA, use the formula below and enter in column 6 . . Column 6

(9.2.3.3)

$$\text{Column 6 Entry (9.2.3.3)} = \frac{\text{TA (9.1.1)} \times \text{Column 5 (9.2.3.1)}}{\text{TN (9.2.3.2)}}$$

Continue with Step 9.2.5.

OR

9.2.4 Personnel Reduction (TA(9.1.1) < 0)

9.2.4.1 Overstaffing indicator for each APA, use rules below and enter in column 5 . . . . . Column 5

(9.2.4.1)

If column 4 entry is:

- greater than zero, enter column 4 value in column 5.
- less than or equal to zero, enter 0 in column 5.

9.2.4.2 Sum the values in column 5 and enter in the Col. Sum row . . . . . Column 5 (9.2.4.2) **(TN)**

9.2.4.3 Number of personnel to be added to each APA, use the formula below and enter in column 6 . . Column 6 (9.2.4.3)

$$\text{Column 6 Entry (9.2.4.3)} = \frac{\text{TA (9.1.1)} \times \text{Column 5 (9.2.4.1)}}{\text{TN (9.2.4.2)}}$$

9.2.5 Sum the values in column 6 and enter in the Col. Sum row . . . . Column 6 (9.2.5)

Compare (9.2.5) with the Sum Check value in column 6 (equal to (9.1.1)). If the values agree, continue with Step 9.2.6.

9.2.6 Adjust the value for each APA in column 6 to a whole number and enter in column 7 . . Column 7 (9.2.6)

9.2.7 Sum the values in column 7 and enter in the Col. Sum row . . . . Column 7 (9.2.7)

Compare (9.2.7) with the Sum Check value in column 7 (equal to (9.1.1). If the values agree, continue with Step 9.2.8.

9.2.8 Constrained reallocation for each APA, add: Col. 1. (9.1.3) + Col. 7. (9.2.6) and enter in column 8 . . . . . | Column 8 | (9.2.8)

9.2.9 Sum the values in column 8 and enter in the Col. Sum row . . . . | Column 8 | (9.2.9)

Compare (9.2.9) with the Sum Check value in column 8 (equal to (9.1.1) + (9.1.2)). If the values agree, Worksheet 9 is completed.

Table 4 - 1

Worksheet for the Allocation of Patrol Personnel Among Several APAs Based on PAM Staff Estimates

Total Number of Additional (or Reduced) Personnel for All APAs (9.1.1) . . . . . [ ] **(TA)**

APA	Current Staff (9.1.3) Col. 1	PAM Staff Est. (9.1.5) Col. 2	**Unconst Reallo.** (9.1.7) Col. 3	Diff. Col. 1 -Col. 3 (9.2.1) Col. 4	(9.2.3.1) or (9.2.4.1) Col. 5	To Be Added (9.2.3.3) or Reduced (9.2.4.3) Col. 6	Rounded (9.2.6) Col. 7	**Constr. Reallo.** Col. 1 +Col. 7 (9.2.8) Col. 8
1								
2								
3								
4								
5								
6								
Col. Sum	(9.1.4) **(TC)**	(9.1.6) **(TE)**	(9.1.8)	(9.2.2)	(9.2.3.2) or (9.2.4.2) **(TN)**	(9.2.5)	(9.2.7)	(9.2.9)
Sum Check	(9.1.2) **(TC)**		(9.1.1) + (9.1.2) **(TA+TC)**	-1 x (9.1.1) **(-TA)**		(9.1.1) **(TA)**	(9.1.1) **(TA)**	(9.1.1) + (9.1.2) **(TA+TC)**

APPENDIX A: Supplemental Worksheet for Worksheet 5, Section 5.2

Instructions for Supplemental Worksheet: Uncommitted Patrol Availability - Immediate Response

The supplemental worksheet for Section 5.2 can be used to determine the number of patrol officers (N_{air}) that will be required to insure that the probability (specified by the user) that at least one officer will be available for immediate response to an emergency accident or other CFS.

The number of patrol officers (N_{air}) is based on:

- the number of on-duty officers required for reactive activities (N_r) determined in Worksheet 3;
- the fraction of administrative, reactive, and self-initiated/COP activities on each shift that are non-preemptable;
- the average number of administrative minutes per hour per officer (m_a) determined in Worksheet 2;
- the average number of minutes per hour per officer spent on self-initiated/COP activities (m_s) determined in Worksheet 4; and
- the estimated patrol staffing distribution by time of day (i.e., by shift).

The number of patrol officers is determined using a queuing model that assumes randomly occurring accidents and other CFS with exponentially-distributed service times.

The procedure for determining N_{air} in Section 5.2 in Worksheet 5 relies on the following assumptions:

- the agency has uniform patrol staffing on all shifts,
- the fraction of preemptable activities is constant throughout the day, and

- the same user-specified immediate response performance requirement applies to each shift.

These assumptions simplify the determination of N_{air} by permitting the use of one table lookup.

If any of the assumptions cited above are not valid, the supplement worksheet presented below can be used in place of Section 5.2. The supplement worksheet determines the number of patrol officers per day by estimating the number required for each shift and adding the results. The number of patrol officers required for each shift (N_{ir1}, N_{ir2}, and N_{ir3}) is determined with a table look-up based on the number of on-duty officers required for reactive activities on each shift (N_{r1}, N_{r2}, and N_{r3}) and the fraction of non-preemptable reactive activities. The appropriate table to be used is based on the values for m_a and m_s determined in worksheets 2 and 4 respectively, and the fraction of non-preemptable administrative and self-initiated/COP activities.

The derivations of the formulas and procedures used in Section 5.2 and in the supplemental worksheet are presented in Section D.3 in Appendix D in the Guide.

Instructions for Individual Steps

A.2 Patrol Staffing Level By Shift

The values entered for (A.2.1), (A.2.4), and (A.2.7) represent the percentage of the patrol staff that will be on duty on each shift for the APA. The sum of the percents over all shifts must equal 100. (Section 5.2 assumes the same percent for each shift.)

A.3 Accident Levels By Shift

The values entered for (A.3.1), (A.3.4), and (A.3.7) represent the percentage of accidents on each shift in the APA during the sample period. The sum of the percents over all shifts must equal 100. (Section 5.2 assumes the same total obligated time for accidents and other CFS for each shift.)

A.4 Other CFS Levels By Shift

The values entered for (A.4.1), (A.4.4), and (A.4.7) represent the percentage of other CFS on each shift in the APA during the sample period. The sum of the percents over all shifts must equal 100. (Section 5.2 assumes the same total obligated time for accidents and other CFS for each shift.)

A.5 Number of Patrol Officers Required for Shift 1

A.5.1 Steps A.5.1.1 through A.5.1.3 are used to record the percentage of other CFS, administrative, and self-initiated/COP activities that are non-preemptable on Shift 1.

A.5.1.1 Percentage of other CFS on Shift 1 that are non-preemptable. All accidents are considered non-preemptable.

A.5.2 Steps A.5.2.1 through A.5.2.3 are used to determine the fraction of all reactive activities that are non-preemptable. All accidents are treated as non-preemptable and the percentage of non-preemptable other CFS on Shift 1 is entered by the user in Step A.5.1.1.

Steps A.5.2.4 through A.5.2.14 are used to determine an adjusted number of officers required for reactive activities per day. The adjusted number accounts for officers assigned to preemptable activities who are available for emergency calls.

A.5.3 Select the appropriate table based on the K_{nsa} value.

A.5.4 Determine the number of officers required to meet the immediate response performance objective for Shift 1.

A.5.4.1 The supplemental worksheet permits the user to select, if desired, a different immediate response performance objective percentage for each shift. (Section 5.2 uses the same performance objective value for all shifts.)

A.5.4.2 The table look-up process consists of the following steps:

- Locate the table identified in Step A.5.3.

- Examine the left-hand column of the table and select the row that is closest to the adjusted average number of reactive officers per day for Shift 1 (A.5.2.14).

- Read across the row until the percentage at the top of the column equals or exceeds the performance objective percent for Shift 1 (A.5.4.1).

- The table entry indicates the average total number of patrol officers that are needed on Shift 1 to meet the performance objective. Enter the table value in (A.5.4.2).

A.5.4.4 The actual number of additional officers required to meet the immediate response performance objective on Shift 1 depends on the total number of officers required (A.5.4.2) and the number of officers who are "available" because they are assigned to preemptable activities. A positive value for Step A.5.4.4 the additional number of officers that must be present on uncommitted patrol to meet the immediate response requirement. A zero or negative value indicates that there are enough officers on preemptable activities to meet the immediate response requirement and that no additional officers are needed.

A.6 Number of Patrol Officers Required for Shift 2

Read A.5 above.

A.7 Number of Patrol Officers Required for Shift 3

Read A.5 above.

A.8 Total number of additional officers required is obtained by adding together the results for Shift 1 (A.5.4.5), Shift 2 (A.6.4.5), and Shift 3 (A.7.4.5).

SUPPLEMENTAL WORKSHEET: Uncommitted Patrol Availability - Immediate Response

Objective: Determine the additional number of officers required within the APA to provide an immediate response to a user-specified percent of all emergency accidents and other CFS.

Method: A queuing model formulation for each shift based on randomly-occurring accidents and other CFS with exponentially-distributed service times. Input data for each shift includes the number of on-duty officers required per day for reactive activities; the percentage of non-preemptable administrative, reactive, and self-initiated/COP activities; the estimated patrol staffing by shift; the average number of minutes per hour per officer spent on administrative and self-initiated/COP activities; and a user-specified performance objective for each shift.

A.1 Average daily number of on-duty officers for reactive activities (N_r) use (3.3.3) . . . . . [ ] (N_r)
(A.1)

A.2 Patrol staffing levels by shift

A.2.1 Percentage of on-duty staff on Shift 1, (a number between 0 and 100) . . . . . [ ]
(A.2.1)

A.2.2 Fraction of on-duty staff on Shift 1, divide: (A.2.1) ÷ 100 . . . . . [ ]
(A.2.2)

A.2.3 Number of on-duty staff on Shift 1 (N_{r1}), multiply: (A.2.2) x (A.1) . . . . [ ] (N_{r1})
(A.2.3)

A.2.4 Percentage of on-duty staff on Shift 2, (a number between 0 and 100) . . . . . [ ]
(A.2.4)

A.2.5 Fraction of on-duty staff on Shift 2, divide: (A.2.4) ÷ 100 . . . . . [ ]
(A.2.5)

A.2.6 Number of on-duty staff on Shift 2 (N_{r2}), multiply: (A.2.5) x (A.1) . . . . [ ] (N_{r2})
(A.2.6)

A.2.7 Percentage of on-duty staff on Shift 3, (a number between 0 and 100) . . . . . [ ]
(A.2.7)

A.2.8 Fraction of on-duty staff on Shift 3, divide: (A.2.7) ÷ 100 . . . . . [ ]
(A.2.8)

A.2.9 Number of on-duty staff on Shift 3 (N_{r3}), multiply: (A.2.8) x (A.1) . . . . [ ] (N_{r3})
(A.2.8)

NOTE: The sum of the percents for (A.2.1), (A.2.4), and (A.2.7) must equal 100.

A.3 Accident levels by shift

A.3.1 Percentage of accidents on Shift 1, (a number between 0 and 100) . . . . . [ ]
(A.3.1)

A.3.2 Fraction of accidents on Shift 1, divide: (A.3.1) ÷ 100 . . . . . [ ] (A.3.2)

A.3.3 Number of accidents on Shift 1, multiply: (A.3.2) x (1.3.2) . . . . . [ ] (A.3.3)

A.3.4 Percentage of accidents on Shift 2, (a number between 0 and 100) . . . . . [ ] (A.3.4)

A.3.5 Fraction of accidents on Shift 2, divide: (A.3.4) ÷ 100 . . . . . [ ] (A.3.5)

A.3.6 Number of accidents on Shift 2, multiply: (A.3.5) x (1.3.2) . . . . . [ ] (A.3.6)

A.3.7 Percentage of accidents on Shift 3, (a number between 0 and 100) . . . . . [ ] (A.3.7)

A.3.8 Fraction of accidents on Shift 3, divide: (A.3.7) ÷ 100 . . . . . [ ] (A.3.7)

A.3.9 Number of accidents on Shift 3, multiply: (A.3.8) x (1.3.2) . . . . . [ ] (A.3.9)

NOTE: The sum of the percents for (A.3.1), (A.3.4), and (A.3.7) must equal 100.

A.4 Other CFS levels by shift

A.4.1 Percentage of other CFS on Shift 1, (a number between 0 and 100) . . . . . [ ] (A.4.1)

A.4.2 Fraction of other CFS on Shift 1, divide: (A.4.1) ÷ 100 . . . . . [ ] (A.4.2)

A.4.3 Number of other CFS on Shift 1, multiply: (A.4.2) x (1.3.4) . . . . . [ ] (A.4.3)

A.4.4 Percentage of other CFS on Shift 2, (a number between 0 and 100) . . . . . [ ] (A.4.4)

A.4.5 Fraction of other CFS on Shift 2, divide: (A.4.4) ÷ 100 . . . . . [ ] (A.4.5)

A.4.6 Number of other CFS on Shift 2, multiply: (A.4.5) x (1.3.4) . . . . . [ ] (A.4.6)

A.4.7 Percentage of other CFS on Shift 3, (a number between 0 and 100) . . . . . [ ] (A.4.7)

A.4.8 Fraction of other CFS on Shift 3, divide: (A.4.7) ÷ 100 . . . . . [ ] (A.4.8)

A.4.9 Number of other CFS on Shift 3, multiply: (A.4.8) x (1.3.4) . . . . . [ ] (A.4.9)

NOTE: The sum of the percents for (A.4.1), (A.4.4), and (A.4.7) must equal 100.

A.5 Number of patrol officers required for Shift 1

A.5.1 Non-preemptable activities - Shift 1

A.5.1.1 Percentage of other CFS on Shift 1 that are non-preemptable . . . . . [ ] (A.5.1.1)

A.5.1.2 Percentage of administrative activities on Shift 1 that are non-preemptable . . . . . [ ] (A.5.1.2)

A.5.1.3 Percentage of self-initiated/COP activities on Shift 1 that are non-preemptable . . . . . [ ] (A.5.1.3)

A.5.2 Adjusted average number of on-duty officers for reactive activities per day - Shift 1

A.5.2.1 Fraction of non-preemptable other CFS on Shift 1, divide: (A.5.1.1) ÷ 100 . . [ ] (A.5.2.1)

A.5.2.2 Number of non-preemptable other CFS, Shift 1, multiply (A.5.2.1) x (A.4.3) . . . . [ ] (A.5.2.2)

A.5.2.3 Calculate the fraction of non-preemptable reactive activities on Shift 1 (f_{npr1}), use the the formula below . . . . . [ ] (f_{npr1}) (A.5.2.3)

$$\text{Fraction of Non-Preemptable Reactive Act. on Shift 1 } (f_{npr1}) \text{ (A.5.2.3)} = \frac{\text{Number of Accidents (A.3.3)} + \text{Number of Non-Preemptable Other CFS (A.5.2.2)}}{\text{Number of Accidents (A.3.3)} + \text{Number of Other CFS (A.4.3)}}$$

A.5.2.4 Fraction of non-preemptable administrative activities on Shift 1, f_{npa1}), divide: (A.5.1.2) ÷ 100 . . . . . [ ] (f_{npa1})
(A.5.2.4)

A.5.2.5 Fraction of non-preemptable self-initiated/COP act. on Shift 1, (f_{nps1}), divide: (A.5.1.3) ÷ 100 . . . . . [ ] (f_{nps1})
(A.5.2.5)

A.5.2.6 Administrative time - minutes per hour per officer (m_a), use (2.3) . [ ] (m_a)
(A.5.2.6)

A.5.2.7 Self-initiated/COP time - minutes per hour per officer (m_s), use (4.6) . [ ] (m_s)
(A.5.2.7)

A.5.2.8 Calculate K_{a1}, use the formula below . . . . . [ ] (K_{a1})
(A.5.2.8)

$$K_{a1} \text{ (A.5.2.8)} = \frac{\text{Administrative Activities, Minutes per Hour Per Officer } m_a \text{ (A.5.2.6)}}{60 - \text{Admin. Minutes Per Hour Per Off., } m_a \text{ (A.5.2.6)} - \text{S.I./COP Minutes Per Hour Per Off., } m_s \text{ (A.5.2.7)}}$$

A.5.2.9 Calculate $\mathbf{K_{s1}}$, use the formula below . . . . . [ ] ($\mathbf{K_{s1}}$)
(A.5.2.9)

$$K_{s1} \text{ (A.5.2.9)} = \frac{\text{Self-Initiated Activities, Minutes per Hour Per Officer } m_s \text{ (A.5.2.7)}}{60 - \text{Admin. Minutes Per Hour Per Off., } m_a \text{ (A.5.2.6)} - \text{S.I./COP Minutes Per Hour Per Off., } m_s \text{ (A.5.2.7)}}$$

A.5.2.10 Calculate $\mathbf{K_{sa1}}$, add: (A.5.2.8) + (A.5.2.9) . . [ ] ($\mathbf{K_{sa1}}$)
(A.5.2.10)

A.5.2.11 Calculate $\mathbf{K_{na1}}$, multiply: (A.5.2.4) x (A.5.2.8) . . . [ ] ($\mathbf{K_{na1}}$)
(A.5.2.11)

A.5.2.12 Calculate $\mathbf{K_{ns1}}$, multiply: (A.5.2.5) x (A.5.2.9) . . . [ ] ($\mathbf{K_{ns1}}$)
(A.5.2.12)

A.5.2.13 Calculate $\mathbf{K_{nsa1}}$, add: (A.5.2.11) + (A.5.2.12) . [ ] ($\mathbf{K_{nsa1}}$)
(A.5.2.13)

A.5.2.14 Calculate the adjusted average number of officers ($\mathbf{N_{ar1}}$) required for reactive activities per day on Shift 1, use the formula below . . . . . [ ] ($\mathbf{N_{ar1}}$)
(A.5.2.14)

$$\text{Adjusted Average Number of Officers for Reactive Act. Per Day on Shift 1 } (N_{ar1})\ (A.5.2.14) = \frac{\text{No. of Officers, Reactive Act. per Shift } (N_{r1})\ (A.2.3) \times (f_{npr1}\ (A.5.2.3) + K_{nsa1}\ (A.5.2.13))}{1 + K_{nsa1}\ (A.5.2.13)}$$

A.5.3 Select table in Appendix A based on $\mathbf{K_{nsa1}}$ (A.5.2.13) from from the chart below . . . . . [Table A-]
(A.5.3)

If K_{nsa1} (A.5.2.13) is in the range	Use Table (A.5.3)
0.0 - .099	A-1
0.1 - .199	A-2
0.2 - .299	A-3
0.3 - .399	A-4
0.4 - .499	A-5
0.5 - .599	A-6
0.6 - .699	A-7
0.7 - .799	A-8
0.8 - .899	A-9
0.9 - .999	A-10
1.0 - 1.099	A-11
1.1 - 1.199	A-12
1.2 - 1.299	A-13

A.5.4 Total number of additional officers required for patrol per shift to provide immediate response for the performance objective percentage of emergency accidents and other CFS on Shift 1

A.5.4.1 Performance objective (**IR%1**), percentage of emergency accidents and other CFS activities on Shift 1, immediate resp. (a number between 50 and 99) . . . . [ ] (**IR%1**)
(A.5.4.1)

A.5.4.2 Total number of on-duty officers (N_{ir1}) required on Shift 1, use N_{ar1} (A.5.2.14), the table selected for (A.5.3), and (**IR%1**) (A.5.4.1) . . . [ ] (N_{ir1})
(A.5.4.2)

A.5.4.3 Calculate K_{dsa1}, subtract: (A.5.2.10) - (A.5.2.13) . . [ ] (K_{dsa1})
(A.5.4.3)

A.5.4.4 Calculate the <u>additional</u> number of officers needed per day on Shift 1 to meet the immediate response performance object. (**IR%1**), use the formula below . . . [ ]
(A.5.4.4)

$$\underline{\text{Additional}} \text{ No. Of Officers Needed On Shift 1 For Immediate Resp. (A.5.4.4)} = \frac{N_{ir1}\ (A.5.4.2) - N_{r1}\ (A.2.3) \times (1 - f_{npr1}\ (A.5.2.3) + K_{das1}\ (A.5.4.3))}{1 + K_{dsa1}\ (A.5.4.3)}$$

A.5.4.5 Determine the actual <u>additional</u> number of officers needed on Shift 1 (N_{air1}) per day to meet the immediate response performance object. (**IR%1**), select the larger of zero and (A.5.4.4) . . . . . [ ] (N_{air1})

A.6 Number of patrol officers required for Shift 2

A.6.1 Non-preemptable activities - Shift 2

A.6.1.1 Percentage of other CFS on Shift 2 that are non-preemptable . . . . . [ ]
(A.6.1.1)

A.6.1.2 Percentage of administrative activities on Shift 2 that are non-preemptable . . . . . [ ] (A.6.1.2)

A.6.1.3 Percentage of self-initiated/COP activities on Shift 2 that are non-preemptable . . . . . [ ] (A.6.1.3)

A.6.2 Adjusted average number of on-duty officers for reactive activities per day - Shift 2

A.6.2.1 Fraction of non-preemptable other CFS on Shift 2, divide: (A.6.1.1) ÷ 100 . . [ ] (A.6.2.1)

A.6.2.2 Number of non-preemptable other CFS, Shift 2, multiply (A.6.2.1) x (A.4.6) . . . . [ ] (A.6.2.2)

A.6.2.3 Calculate the fraction of non-preemptable reactive activities on Shift 2 ($\mathbf{f}_{npr2}$), use the the formula below . . . . . [ ] (A.6.2.3) ($\mathbf{f}_{npr2}$)

$$\text{Fraction of Non-Preemptable Reactive Act. on Shift 2 } (f_{npr2}) \text{ (A.6.2.3)} = \frac{\text{Number of Accidents (A.3.6)} + \text{Number of Non-Preemptable Other CFS (A.6.2.2)}}{\text{Number of Accidents (A.3.6)} + \text{Number of Other CFS (A.4.6)}}$$

A.6.2.4 Fraction of non-preemptable administrative activities on Shift 2, f_{npa2}), divide: (A.6.1.2) ÷ 100 . . . . . [ ] (f_{npa2})
(A.6.2.4)

A.6.2.5 Fraction of non-preemptable self-initiated/COP act. on Shift 2, (f_{nps2}), divide: (A.6.1.3) ÷ 100 . . . . . [ ] (f_{nps2})
(A.6.2.5)

A.6.2.6 Administrative time - minutes per hour per officer (m_a), use (2.3) . [ ] (m_a)
(A.6.2.6)

A.6.2.7 Self-initiated/COP time - minutes per hour per officer (m_s), use (4.6) . [ ] (m_s)
(A.6.2.7)

A.6.2.8 Calculate K_{a2}, use the formula below . . . . . [ ] (K_{a2})
(A.6.2.8)

$$K_{a2\ (A.6.2.8)} = \frac{\text{Administrative Activities, Minutes per Hour Per Officer } m_a \text{ (A.6.2.6)}}{60 - \text{Admin. Minutes Per Hour Per Off., } m_a \text{ (A.6.2.6)} - \text{S.I./COP Minutes Per Hour Per Off., } m_s \text{ (A.6.2.7)}}$$

A.6.2.9 Calculate K_{s2}, use the formula below . . . . . [ ] (K_{s2})
(A.6.2.9)

$$K_{s2} \text{ (A.6.2.9)} = \frac{\text{Self-Initiated Activities, Minutes per Hour Per Officer } m_s \text{ (A.6.2.7)}}{60 - \text{Admin. Minutes Per Hour Per Off., } m_a \text{ (A.6.2.6)} - \text{S.I./COP Minutes Per Hour Per Off., } m_s \text{ (A.6.2.7)}}$$

A.6.2.10 Calculate K_{sa2}, add: (A.6.2.8) + (A.6.2.9) . . [ ] (K_{sa2})
(A.6.2.10)

A.6.2.11 Calculate K_{na2}, multiply: A.6.2.4) x (A.6.2.8) . . . [ ] (K_{na2})
(A.6.2.11)

A.6.2.12 Calculate K_{ns2}, multiply: (A.6.2.5) x (A.6.2.9) . . . [ ] (K_{ns2})
(A.6.2.12)

A.6.2.13 Calculate K_{nsa2}, add: (A.6.2.11) + (A.6.2.12) . [ ] (K_{nsa2})
(A.6.2.13)

A.6.2.14 Calculate the <u>adjusted</u> average number of officers (N_{ar2}) required for reactive activities per day on Shift 2, use the formula below . . . . . [ ] (N_{ar2})
(A.6.2.14)

$$\text{Adjusted Average Number of Officers for Reactive Act. Per Day on Shift 2 } (N_{ar2})\ (A.6.2.14) = \frac{\text{No. of Officers, Reactive Act. per Shift } (N_{r2})\ (A.6.2.6) \times (f_{npr2}\ (A.6.2.3) + K_{nsa2}\ (A.6.2.13))}{1 + K_{nsa2}\ (A.6.2.13)}$$

A.6.3 Select table in Appendix A based on K_{nsa2} (A.6.2.13) from from the chart below . . . . . Table A- (A.6.3)

If K_{nsa2} (A.6.2.13) is in the range	Use Table (A.6.3)
0.0 - .099	A-1
0.1 - .199	A-2
0.2 - .299	A-3
0.3 - .399	A-4
0.4 - .499	A-5
0.5 - .599	A-6
0.6 - .699	A-7
0.7 - .799	A-8
0.8 - .899	A-9
0.9 - .999	A-10
1.0 - 1.099	A-11
1.1 - 1.199	A-12
1.2 - 1.299	A-13

A.6.4 Total number of additional officers required for patrol per shift to provide immediate response for the performance objective percentage of emergency accidents and other CFS on Shift 2

A.6.4.1 Performance objective (**IR%2**), percentage of emergency accidents and other CFS activities on Shift 2, immediate resp. (a number between 50 and 99) . . . . [ ] **(IR%2)**
(A.6.4.1)

A.6.4.2 Number of additional on-duty officers officers ($\mathbf{N_{ir2}}$) required on Shift 2, use $\mathbf{N_{ar2}}$ (A.6.2.14), the table selected for (A.6.3), and (**IR%2**) (A.6.4.1) . . . [ ] **(N_{ir2})**
(A.6.4.2)

A.6.4.3 Calculate $\mathbf{K_{dsa2}}$, subtract: (A.6.2.10) - (A.6.2.13) . . [ ] **(K_{dsa2})**
(A.6.4.3)

A.6.4.4 Calculate the <u>additional</u> number of officers needed per day on Shift 2 to meet the immediate response performance object. (**IR%2**), use the formula below . . . [ ]
(A.6.4.4)

$$\underline{\text{Additional}}\ \text{No. Of Officers Needed On Shift 2 For Immediate Resp.}\ (\text{A.6.4.4}) = \frac{N_{ir2}\ (\text{A.6.4.2}) - N_{r2}\ (\text{A.2.6}) \times (1 - f_{npr2}\ (\text{A.6.2.3}) + K_{das2}\ (\text{A.6.4.3}))}{1 + K_{dsa2}\ (\text{A.6.4.3})}$$

A.6.4.5 Determine the actual <u>additional</u> number of officers needed on Shift 2 (N_{air2}) per day to meet the immediate response performance object. (**IR%2**), select the larger of zero and (A.6.4.4) . . . . . [ ] (N_{air2})

A.7 Number of patrol officers required for Shift 3

A.7.1 Non-preemptable activities - Shift 3

A.7.1.1 Percentage of other CFS on Shift 3 that are non-preemptable . . . . . [ ] (A.7.1.1)

A.7.1.2 Percentage of administrative activities on Shift 3 that are non-preemptable . . . . . [ ] (A.7.1.2)

A.7.1.3 Percentage of self-initiated/COP activities on Shift 3 that are non-preemptable . . . . . [ ] (A.7.1.3)

A.7.2 Adjusted average number of on-duty officers for reactive activities per day - Shift 3

A.7.2.1 Fraction of non-preemptable other CFS on Shift 3, divide: (A.7.1.1) ÷ 100 . . [ ] (A.7.2.1)

A.7.2.2 Number of non-preemptable other CFS, Shift 3, multiply (A.7.2.1) x (A.4.9) . . . . [ ] (A.7.2.2)

A.7.2.3 Calculate the fraction of non-preemptable reactive activities on Shift 3 (f_{npr3}), use the the formula below . . . . . [ ] (f_{npr3}) (A.7.2.3)

$$\text{Fraction of Non-Preemptable Reactive Act. on Shift 3 } (f_{npr3})\ (A.7.2.3) = \frac{\text{Number of Accidents } (A.3.9) + \text{Number of Non-Preemptable Other CFS } (A.7.2.2)}{\text{Number of Accidents } (A.3.9) + \text{Number of Other CFS } (A.4.9)}$$

A.7.2.4 Fraction of non-preemptable administrative activities on Shift 3, f_{npa3}), divide: (A.7.1.2) ÷ 100 . . . . . [ ] (f_{npa3}) (A.7.2.4)

A.7.2.5 Fraction of non-preemptable self-initiated/COP act. on Shift 3, (f_{nps3}), divide: (A.7.1.3) ÷ 100 . . . . . [ ] (f_{nps3}) (A.7.2.5)

A.7.2.6 Administrative time - minutes per hour per officer (m_a), use (2.3) . [ ] (m_a) (A.7.2.6)

A.7.2.7 Self-initiated/COP time - minutes per hour per officer (m_s), use (4.6) . [ ] (m_s) (A.7.2.7)

A.7.2.8 Calculate K_{a3}, use the formula below . . . . . [ ] (K_{a3})
(A.7.2.8)

$$K_{a3} \text{ (A.7.2.8)} = \frac{\text{Administrative Activities, Minutes per Hour Per Officer } m_a \text{ (A.7.2.6)}}{60 - \text{Admin. Minutes Per Hour Per Off., } m_a \text{ (A.7.2.6)} - \text{S.I./COP Minutes Per Hour Per Off., } m_s \text{ (A.7.2.7)}}$$

A.7.2.9 Calculate K_{s3}, use the formula below . . . . . [ ] (K_{s3})
(A.7.2.9)

$$K_{s3} \text{ (A.7.2.9)} = \frac{\text{Self-Initiated Activities, Minutes per Hour Per Officer } m_s \text{ (A.7.2.7)}}{60 - \text{Admin. Minutes Per Hour Per Off., } m_a \text{ (A.7.2.6)} - \text{S.I./COP Minutes Per Hour Per Off., } m_s \text{ (A.7.2.7)}}$$

A.7.2.10 Calculate K_{sa3}, add: (A.7.2.8) + (A.7.2.9) . . [ ] (K_{sa3})
(A.7.2.10)

A.7.2.11 Calculate K_{na3}, multiply: (A.7.2.4) x (A.7.2.8) . . . [ ] (K_{na3})
(A.7.2.11)

A.7.2.12 Calculate K_{ns3}, multiply: (A.7.2.5) x (A.7.2.9) . . . [ ] (K_{ns3})
(A.7.2.12)

A.7.2.13 Calculate K_{nsa3}, add: (A.7.2.11) + (A.7.2.12) . [ ] (K_{nsa3})
(A.7.2.13)

A.7.2.14 Calculate the adjusted average number of officers (N_{ar3}) required for reactive activities per day on Shift 3, use the formula below . . . . . [ ] (N_{ar3})
(A.7.2.14)

$$\text{Adjusted Average Number of Officers for Reactive Act. Per Day on Shift 3 } (N_{ar3}) \text{ (A.7.2.14)} = \frac{\text{No. of Officers, Reactive Act. per Shift } (N_{r3}) \text{ (A.2.6)} \times (f_{npr3} \text{ (A.7.2.3)} + K_{nsa3} \text{ (A.7.2.13)})}{1 + K_{nsa3} \text{ (A.7.2.13)}}$$

A.7.3 Select table in Appendix A based on K_{nsa3} (A.7.2.13) from from the chart below . . . . . [Table A-]
(A.7.3)

If K_{nsa3} (A.7.2.13) is in the range	Use Table (A.7.3)
0.0 - .099	A-1
0.1 - .199	A-2
0.2 - .299	A-3
0.3 - .399	A-4
0.4 - .499	A-5
0.5 - .599	A-6
0.6 - .699	A-7
0.7 - .799	A-8
0.8 - .899	A-9
0.9 - .999	A-10
1.0 - 1.099	A-11
1.1 - 1.199	A-12
1.2 - 1.299	A-13

A.7.4 Total number of additional officers required for patrol per shift to provide immediate response for the performance objective percentage of emergency accidents and other CFS on Shift 3

A.7.4.1 Performance objective (**IR%3**), percentage of emergency accidents and other CFS activities on Shift 3, immediate resp. (a number between 50 and 99) . . . . [ ] **(IR%3)**

(A.7.4.1)

A.7.4.2 Number of additional on-duty officers officers (N_{ir3}) required on Shift 3, use N_{ar3} (A.7.2.14), the table selected for (A.7.3), and (**IR%3**) (A.7.4.1) . . . [ ] **(N_{ir3})**

(A.7.4.2)

A.7.4.3 Calculate K_{dsa3}, subtract: (A.7.2.10) - (A.7.2.13) . . [ ] (K_{dsa3})
(A.7.4.3)

A.7.4.4 Calculate the additional number of officers needed per day on Shift 3 to meet the immediate response performance object. (IR%3), use the formula below . . . [ ]
(A.7.4.4)

$$\text{Additional No. Of Officers Needed On Shift 3 For Immediate Resp. (A.7.4.4)} = \frac{N_{ir3}\ (\text{A.7.4.2}) - N_{r3}\ (\text{A.2.6}) \times (1 - f_{npr3}\ (\text{A.7.2.3}) + K_{das3}\ (\text{A.7.4.3}))}{1 + K_{dsa3}\ (\text{A.7.4.3})}$$

A.7.4.5 Determine the actual additional number of officers needed on Shift 3 (N_{air3}) per day to meet the immediate response performance object. (IR%3), select the larger of zero and (A.7.4.4) . . . . . [ ] (N_{air3})

A.8 Actual number of additional patrol officers (N_{air}) required per day within the APA to provide immediate response at the performance objective percents for each shift, add: each shift, add: (A.5.4.5) + (A.6.4.5) + (A.7.4.5) . . . . . [ ] (N_{air})
(A.8)

Enter (A.8) in (5.2.4.6) in Worksheet 5.

Table A-1

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 0.05)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.2	0.3	0.4	0.5	0.7	0.8	1.0	1.3	1.6	1.7	2.0
0.30	0.3	0.5	0.7	0.8	1.0	1.1	1.4	1.7	2.0	2.2	2.6
0.50	0.5	0.7	0.9	1.0	1.1	1.3	1.6	2.0	2.3	2.6	3.0
0.70	0.6	0.8	1.0	1.1	1.3	1.5	1.8	2.3	2.6	2.9	3.3
1.00	0.7	0.9	1.1	1.3	1.5	1.7	2.0	2.6	2.9	3.2	3.7
1.50	0.8	1.0	1.3	1.5	1.7	2.0	2.4	3.0	3.4	3.7	4.3
2.00	0.9	1.2	1.5	1.7	1.9	2.2	2.6	3.3	3.8	4.1	4.7
2.50	1.0	1.3	1.6	1.8	2.1	2.4	2.9	3.6	4.1	4.5	5.1
3.00	1.1	1.4	1.8	2.0	2.3	2.6	3.1	3.9	4.4	4.8	5.5
3.50	1.1	1.5	1.9	2.1	2.4	2.8	3.3	4.1	4.7	5.1	5.8
4.00	1.2	1.5	2.0	2.2	2.6	3.0	3.5	4.4	5.0	5.4	6.2
5.00	1.3	1.7	2.2	2.5	2.8	3.3	3.8	4.8	5.4	5.9	6.7
6.00	1.4	1.8	2.4	2.7	3.1	3.5	4.2	5.2	5.9	6.4	7.3
7.00	1.5	2.0	2.5	2.9	3.3	3.8	4.4	5.5	6.3	6.8	7.7
8.00	1.6	2.1	2.7	3.0	3.5	4.0	4.7	5.8	6.6	7.2	8.2
10.00	1.8	2.3	3.0	3.4	3.8	4.4	5.2	6.4	7.3	8.0	9.0
12.00	2.0	2.5	3.2	3.7	4.2	4.8	5.6	7.0	7.9	8.6	9.7
14.00	2.1	2.7	3.5	3.9	4.5	5.1	6.0	7.5	8.5	9.2	10.4
16.00	2.2	2.9	3.7	4.2	4.8	5.5	6.4	7.9	9.0	9.8	11.0
18.00	2.4	3.0	3.9	4.4	5.0	5.8	6.8	8.4	9.5	10.3	11.6
20.00	2.5	3.2	4.1	4.6	5.3	6.1	7.1	8.8	9.9	10.8	12.2

Table A-2

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 0.15)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.2	0.4	0.6	0.7	0.9	1.0	1.3	1.7	2.0	2.3	2.8
0.30	0.4	0.6	0.8	0.9	1.1	1.3	1.6	2.1	2.4	2.7	3.2
0.50	0.6	0.7	1.0	1.1	1.3	1.5	1.8	2.3	2.7	3.0	3.6
0.70	0.6	0.8	1.1	1.2	1.4	1.7	2.0	2.6	3.0	3.3	3.9
1.00	0.7	0.9	1.2	1.4	1.6	1.9	2.2	2.9	3.3	3.7	4.3
1.50	0.8	1.1	1.4	1.6	1.9	2.2	2.6	3.3	3.8	4.2	4.8
2.00	0.9	1.2	1.6	1.8	2.1	2.4	2.9	3.6	4.2	4.6	5.3
2.50	1.0	1.3	1.7	2.0	2.3	2.6	3.1	3.9	4.5	5.0	5.7
3.00	1.1	1.4	1.9	2.1	2.4	2.8	3.4	4.2	4.8	5.3	6.1
3.50	1.2	1.5	2.0	2.3	2.6	3.0	3.6	4.5	5.1	5.6	6.4
4.00	1.3	1.6	2.1	2.4	2.7	3.2	3.8	4.7	5.4	5.9	6.8
5.00	1.4	1.8	2.3	2.6	3.0	3.5	4.1	5.2	5.9	6.4	7.4
6.00	1.5	1.9	2.5	2.8	3.2	3.8	4.4	5.6	6.3	6.9	7.9
7.00	1.6	2.1	2.7	3.0	3.5	4.0	4.7	5.9	6.7	7.4	8.4
8.00	1.7	2.2	2.8	3.2	3.7	4.3	5.0	6.3	7.1	7.8	8.9
10.00	1.9	2.4	3.1	3.6	4.1	4.7	5.5	6.9	7.8	8.5	9.7
12.00	2.1	2.7	3.4	3.9	4.4	5.1	6.0	7.4	8.4	9.2	10.5
14.00	2.2	2.9	3.7	4.1	4.7	5.4	6.4	8.0	9.0	9.8	11.2
16.00	2.3	3.0	3.9	4.4	5.0	5.8	6.8	8.4	9.6	10.4	11.8
18.00	2.5	3.2	4.1	4.6	5.3	6.1	7.2	8.9	10.1	11.0	12.5
20.00	2.6	3.4	4.3	4.9	5.6	6.4	7.5	9.3	10.6	11.5	13.0

Table A-3

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 0.25)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.3	0.5	0.7	0.8	1.0	1.2	1.5	2.1	2.5	2.8	3.4
0.30	0.5	0.7	0.9	1.0	1.2	1.5	1.8	2.4	2.8	3.2	3.8
0.50	0.6	0.8	1.0	1.2	1.4	1.7	2.0	2.7	3.1	3.5	4.2
0.70	0.7	0.9	1.2	1.3	1.5	1.8	2.2	2.9	3.4	3.8	4.4
1.00	0.8	1.0	1.3	1.5	1.7	2.0	2.5	3.2	3.7	4.1	4.8
1.50	0.9	1.2	1.5	1.7	2.0	2.3	2.8	3.6	4.2	4.6	5.4
2.00	1.0	1.3	1.7	1.9	2.2	2.6	3.1	4.0	4.6	5.0	5.9
2.50	1.1	1.4	1.8	2.1	2.4	2.8	3.4	4.3	4.9	5.4	6.3
3.00	1.2	1.5	2.0	2.3	2.6	3.0	3.6	4.6	5.2	5.8	6.7
3.50	1.2	1.6	2.1	2.4	2.8	3.2	3.8	4.8	5.5	6.1	7.0
4.00	1.3	1.7	2.2	2.5	2.9	3.4	4.0	5.1	5.8	6.4	7.4
5.00	1.5	1.9	2.4	2.8	3.2	3.7	4.4	5.5	6.3	6.9	8.0
6.00	1.6	2.0	2.6	3.0	3.4	4.0	4.7	5.9	6.8	7.4	8.5
7.00	1.7	2.2	2.8	3.2	3.7	4.2	5.0	6.3	7.2	7.9	9.0
8.00	1.8	2.3	3.0	3.4	3.9	4.5	5.3	6.7	7.6	8.3	9.5
10.00	2.0	2.6	3.3	3.7	4.3	4.9	5.9	7.3	8.3	9.1	10.4
12.00	2.1	2.8	3.6	4.1	4.6	5.4	6.3	7.9	9.0	9.8	11.2
14.00	2.3	3.0	3.8	4.4	5.0	5.7	6.8	8.4	9.6	10.5	11.9
16.00	2.5	3.2	4.1	4.6	5.3	6.1	7.2	8.9	10.2	11.1	12.6
18.00	2.6	3.4	4.3	4.9	5.6	6.4	7.6	9.4	10.7	11.7	13.2
20.00	2.7	3.5	4.5	5.1	5.8	6.7	7.9	9.9	11.2	12.2	13.8

Table A-4

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 0.35)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.3	0.5	0.8	0.9	1.1	1.4	1.7	2.4	2.9	3.3	4.1
0.30	0.5	0.7	1.0	1.1	1.3	1.6	2.0	2.7	3.2	3.7	4.4
0.50	0.6	0.8	1.1	1.3	1.5	1.8	2.2	3.0	3.5	4.0	4.7
0.70	0.7	0.9	1.2	1.4	1.7	2.0	2.4	3.2	3.8	4.2	5.0
1.00	0.8	1.1	1.4	1.6	1.9	2.2	2.7	3.5	4.1	4.6	5.4
1.50	0.9	1.2	1.6	1.8	2.1	2.5	3.0	3.9	4.6	5.1	5.9
2.00	1.0	1.4	1.8	2.0	2.4	2.8	3.3	4.3	5.0	5.5	6.4
2.50	1.1	1.5	1.9	2.2	2.6	3.0	3.6	4.6	5.3	5.9	6.8
3.00	1.2	1.6	2.1	2.4	2.7	3.2	3.8	4.9	5.6	6.2	7.2
3.50	1.3	1.7	2.2	2.5	2.9	3.4	4.1	5.2	6.0	6.6	7.6
4.00	1.4	1.8	2.3	2.7	3.1	3.6	4.3	5.4	6.2	6.9	7.9
5.00	1.5	2.0	2.6	2.9	3.4	3.9	4.7	5.9	6.8	7.4	8.6
6.00	1.6	2.1	2.8	3.2	3.6	4.2	5.0	6.3	7.2	8.0	9.1
7.00	1.8	2.3	3.0	3.4	3.9	4.5	5.3	6.7	7.7	8.4	9.7
8.00	1.9	2.4	3.1	3.6	4.1	4.7	5.6	7.1	8.1	8.9	10.2
10.00	2.1	2.7	3.5	3.9	4.5	5.2	6.2	7.7	8.8	9.7	11.1
12.00	2.2	2.9	3.7	4.3	4.9	5.6	6.7	8.3	9.5	10.4	11.9
14.00	2.4	3.1	4.0	4.6	5.2	6.0	7.1	8.9	10.1	11.1	12.6
16.00	2.6	3.3	4.3	4.8	5.5	6.4	7.5	9.4	10.7	11.7	13.3
18.00	2.7	3.5	4.5	5.1	5.8	6.7	7.9	9.9	11.3	12.3	14.0
20.00	2.8	3.7	4.7	5.3	6.1	7.0	8.3	10.4	11.8	12.9	14.6

Table A-5

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 0.45)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.4	0.6	0.9	1.0	1.2	1.5	1.9	2.7	3.3	3.8	4.7
0.30	0.6	0.8	1.0	1.2	1.5	1.8	2.2	3.0	3.6	4.1	5.0
0.50	0.7	0.9	1.2	1.4	1.6	2.0	2.4	3.3	3.9	4.4	5.3
0.70	0.7	1.0	1.3	1.5	1.8	2.1	2.6	3.5	4.2	4.7	5.6
1.00	0.8	1.1	1.5	1.7	2.0	2.4	2.9	3.8	4.5	5.0	6.0
1.50	1.0	1.3	1.7	1.9	2.3	2.7	3.2	4.2	4.9	5.5	6.5
2.00	1.1	1.4	1.9	2.2	2.5	2.9	3.5	4.6	5.4	6.0	7.0
2.50	1.2	1.6	2.0	2.3	2.7	3.2	3.8	4.9	5.7	6.3	7.4
3.00	1.3	1.7	2.2	2.5	2.9	3.4	4.1	5.2	6.1	6.7	7.8
3.50	1.4	1.8	2.3	2.7	3.1	3.6	4.3	5.5	6.4	7.0	8.2
4.00	1.4	1.9	2.4	2.8	3.2	3.8	4.5	5.8	6.7	7.4	8.5
5.00	1.6	2.1	2.7	3.1	3.5	4.1	4.9	6.2	7.2	7.9	9.2
6.00	1.7	2.2	2.9	3.3	3.8	4.4	5.3	6.7	7.7	8.5	9.8
7.00	1.8	2.4	3.1	3.5	4.0	4.7	5.6	7.1	8.1	8.9	10.3
8.00	1.9	2.5	3.3	3.7	4.3	5.0	5.9	7.5	8.6	9.4	10.8
10.00	2.1	2.8	3.6	4.1	4.7	5.4	6.5	8.1	9.3	10.2	11.7
12.00	2.3	3.0	3.9	4.4	5.1	5.9	7.0	8.8	10.0	11.0	12.6
14.00	2.5	3.2	4.2	4.8	5.4	6.3	7.5	9.3	10.7	11.7	13.4
16.00	2.7	3.4	4.4	5.0	5.8	6.7	7.9	9.9	11.3	12.3	14.1
18.00	2.8	3.6	4.7	5.3	6.1	7.0	8.3	10.4	11.8	12.9	14.8
20.00	2.9	3.8	4.9	5.6	6.4	7.4	8.7	10.9	12.4	13.5	15.4

Table A-6

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 0.55)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.4	0.7	0.9	1.1	1.4	1.7	2.2	3.0	3.7	4.3	5.3
0.30	0.6	0.8	1.1	1.3	1.6	1.9	2.4	3.3	4.0	4.6	5.6
0.50	0.7	0.9	1.3	1.5	1.8	2.1	2.6	3.6	4.3	4.9	5.9
0.70	0.8	1.0	1.4	1.6	1.9	2.3	2.8	3.8	4.5	5.1	6.2
1.00	0.9	1.2	1.5	1.8	2.1	2.5	3.1	4.1	4.9	5.5	6.5
1.50	1.0	1.3	1.8	2.0	2.4	2.8	3.5	4.5	5.3	6.0	7.1
2.00	1.1	1.5	2.0	2.3	2.6	3.1	3.8	4.9	5.7	6.4	7.5
2.50	1.2	1.6	2.1	2.5	2.8	3.3	4.0	5.2	6.1	6.8	8.0
3.00	1.3	1.7	2.3	2.6	3.0	3.6	4.3	5.5	6.5	7.2	8.4
3.50	1.4	1.9	2.4	2.8	3.2	3.8	4.5	5.8	6.8	7.5	8.8
4.00	1.5	2.0	2.6	2.9	3.4	4.0	4.8	6.1	7.1	7.8	9.1
5.00	1.6	2.2	2.8	3.2	3.7	4.3	5.2	6.6	7.6	8.4	9.8
6.00	1.8	2.3	3.0	3.4	4.0	4.6	5.5	7.0	8.1	9.0	10.4
7.00	1.9	2.5	3.2	3.7	4.2	4.9	5.9	7.5	8.6	9.5	10.9
8.00	2.0	2.6	3.4	3.9	4.5	5.2	6.2	7.8	9.0	9.9	11.4
10.00	2.2	2.9	3.7	4.3	4.9	5.7	6.8	8.6	9.8	10.8	12.4
12.00	2.4	3.1	4.1	4.6	5.3	6.1	7.3	9.2	10.5	11.6	13.3
14.00	2.6	3.4	4.3	4.9	5.7	6.6	7.8	9.8	11.2	12.3	14.1
16.00	2.7	3.6	4.6	5.2	6.0	7.0	8.2	10.3	11.8	12.9	14.8
18.00	2.9	3.8	4.9	5.5	6.3	7.3	8.7	10.9	12.4	13.6	15.5
20.00	3.0	4.0	5.1	5.8	6.6	7.7	9.1	11.4	13.0	14.2	16.2

Table A-7

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 0.65)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.5	0.7	1.0	1.2	1.5	1.8	2.4	3.4	4.1	4.8	5.9
0.30	0.6	0.9	1.2	1.4	1.7	2.1	2.6	3.7	4.4	5.1	6.2
0.50	0.7	1.0	1.3	1.6	1.9	2.3	2.9	3.9	4.7	5.3	6.5
0.70	0.8	1.1	1.5	1.7	2.0	2.4	3.0	4.1	4.9	5.6	6.7
1.00	0.9	1.2	1.6	1.9	2.2	2.7	3.3	4.4	5.2	5.9	7.1
1.50	1.0	1.4	1.9	2.2	2.5	3.0	3.7	4.8	5.7	6.4	7.6
2.00	1.2	1.6	2.1	2.4	2.8	3.3	4.0	5.2	6.1	6.9	8.1
2.50	1.3	1.7	2.2	2.6	3.0	3.5	4.3	5.6	6.5	7.3	8.5
3.00	1.4	1.8	2.4	2.7	3.2	3.7	4.5	5.9	6.9	7.6	9.0
3.50	1.5	1.9	2.5	2.9	3.4	4.0	4.8	6.2	7.2	8.0	9.3
4.00	1.5	2.0	2.7	3.1	3.5	4.1	5.0	6.4	7.5	8.3	9.7
5.00	1.7	2.2	2.9	3.3	3.9	4.5	5.4	6.9	8.0	8.9	10.4
6.00	1.8	2.4	3.1	3.6	4.1	4.8	5.8	7.4	8.6	9.5	11.0
7.00	2.0	2.6	3.3	3.8	4.4	5.1	6.1	7.8	9.0	10.0	11.5
8.00	2.1	2.7	3.5	4.0	4.6	5.4	6.5	8.2	9.5	10.4	12.1
10.00	2.3	3.0	3.9	4.4	5.1	5.9	7.1	9.0	10.3	11.3	13.0
12.00	2.5	3.3	4.2	4.8	5.5	6.4	7.6	9.6	11.0	12.1	13.9
14.00	2.7	3.5	4.5	5.1	5.9	6.8	8.1	10.2	11.7	12.9	14.8
16.00	2.8	3.7	4.8	5.4	6.2	7.2	8.6	10.8	12.4	13.5	15.5
18.00	3.0	3.9	5.0	5.7	6.6	7.6	9.0	11.3	13.0	14.2	16.3
20.00	3.1	4.1	5.3	6.0	6.9	8.0	9.4	11.8	13.5	14.8	16.9

Table A-8

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 0.75)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.5	0.8	1.1	1.3	1.6	2.0	2.6	3.7	4.5	5.2	6.5
0.30	0.7	0.9	1.3	1.5	1.8	2.2	2.8	4.0	4.8	5.5	6.8
0.50	0.8	1.0	1.4	1.7	2.0	2.4	3.1	4.2	5.1	5.8	7.0
0.70	0.8	1.1	1.5	1.8	2.1	2.6	3.3	4.4	5.3	6.0	7.3
1.00	0.9	1.3	1.7	2.0	2.4	2.8	3.5	4.7	5.6	6.4	7.6
1.50	1.1	1.5	1.9	2.3	2.6	3.2	3.9	5.2	6.1	6.9	8.2
2.00	1.2	1.6	2.1	2.5	2.9	3.4	4.2	5.5	6.5	7.3	8.7
2.50	1.3	1.8	2.3	2.7	3.1	3.7	4.5	5.9	6.9	7.7	9.1
3.00	1.4	1.9	2.5	2.9	3.3	3.9	4.8	6.2	7.3	8.1	9.5
3.50	1.5	2.0	2.6	3.0	3.5	4.1	5.0	6.5	7.6	8.4	9.9
4.00	1.6	2.1	2.8	3.2	3.7	4.3	5.2	6.8	7.9	8.8	10.3
5.00	1.8	2.3	3.0	3.5	4.0	4.7	5.7	7.3	8.5	9.4	11.0
6.00	1.9	2.5	3.3	3.7	4.3	5.0	6.1	7.8	9.0	10.0	11.6
7.00	2.0	2.7	3.5	4.0	4.6	5.3	6.4	8.2	9.5	10.5	12.2
8.00	2.2	2.8	3.7	4.2	4.8	5.6	6.8	8.6	9.9	11.0	12.7
10.00	2.4	3.1	4.0	4.6	5.3	6.2	7.4	9.3	10.8	11.9	13.7
12.00	2.6	3.4	4.4	5.0	5.7	6.6	7.9	10.0	11.5	12.7	14.6
14.00	2.8	3.6	4.7	5.3	6.1	7.1	8.4	10.7	12.2	13.4	15.5
16.00	2.9	3.8	4.9	5.6	6.5	7.5	8.9	11.2	12.9	14.1	16.2
18.00	3.1	4.0	5.2	5.9	6.8	7.9	9.4	11.8	13.5	14.8	17.0
20.00	3.2	4.2	5.5	6.2	7.1	8.3	9.8	12.3	14.1	15.4	17.7

Table A-9

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 0.85)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.6	0.8	1.2	1.4	1.7	2.2	2.8	4.0	4.9	5.7	7.0
0.30	0.7	1.0	1.3	1.6	1.9	2.4	3.1	4.3	5.2	6.0	7.3
0.50	0.8	1.1	1.5	1.8	2.1	2.6	3.3	4.5	5.5	6.2	7.6
0.70	0.9	1.2	1.6	1.9	2.3	2.8	3.5	4.7	5.7	6.5	7.9
1.00	1.0	1.3	1.8	2.1	2.5	3.0	3.7	5.0	6.0	6.8	8.2
1.50	1.1	1.5	2.0	2.4	2.8	3.3	4.1	5.5	6.5	7.3	8.7
2.00	1.3	1.7	2.2	2.6	3.0	3.6	4.4	5.8	6.9	7.8	9.2
2.50	1.4	1.8	2.4	2.8	3.3	3.9	4.7	6.2	7.3	8.2	9.7
3.00	1.5	2.0	2.6	3.0	3.5	4.1	5.0	6.5	7.7	8.6	10.1
3.50	1.6	2.1	2.7	3.1	3.7	4.3	5.2	6.8	8.0	8.9	10.5
4.00	1.7	2.2	2.9	3.3	3.8	4.5	5.5	7.1	8.3	9.2	10.9
5.00	1.8	2.4	3.1	3.6	4.2	4.9	5.9	7.6	8.9	9.9	11.5
6.00	2.0	2.6	3.4	3.9	4.5	5.2	6.3	8.1	9.4	10.4	12.2
7.00	2.1	2.8	3.6	4.1	4.7	5.6	6.7	8.6	9.9	11.0	12.8
8.00	2.2	2.9	3.8	4.3	5.0	5.9	7.0	9.0	10.4	11.5	13.3
10.00	2.4	3.2	4.2	4.8	5.5	6.4	7.7	9.7	11.2	12.4	14.3
12.00	2.7	3.5	4.5	5.1	5.9	6.9	8.2	10.4	12.0	13.2	15.3
14.00	2.8	3.7	4.8	5.5	6.3	7.3	8.8	11.1	12.7	14.0	16.1
16.00	3.0	3.9	5.1	5.8	6.7	7.8	9.2	11.7	13.4	14.7	16.9
18.00	3.2	4.2	5.4	6.1	7.0	8.2	9.7	12.2	14.0	15.4	17.7
20.00	3.3	4.4	5.6	6.4	7.4	8.5	10.1	12.8	14.6	16.1	18.4

Table A-10

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 0.95)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.6	0.8	1.2	1.5	1.8	2.3	3.0	4.3	5.3	6.2	7.6
0.30	0.7	1.0	1.4	1.7	2.1	2.5	3.3	4.6	5.6	6.4	7.9
0.50	0.8	1.1	1.6	1.9	2.2	2.7	3.5	4.8	5.9	6.7	8.2
0.70	0.9	1.2	1.7	2.0	2.4	2.9	3.7	5.0	6.1	6.9	8.4
1.00	1.0	1.4	1.9	2.2	2.6	3.1	3.9	5.3	6.4	7.3	8.8
1.50	1.2	1.6	2.1	2.5	2.9	3.5	4.3	5.8	6.9	7.8	9.3
2.00	1.3	1.7	2.3	2.7	3.2	3.8	4.6	6.2	7.3	8.2	9.8
2.50	1.4	1.9	2.5	2.9	3.4	4.0	4.9	6.5	7.7	8.6	10.2
3.00	1.5	2.0	2.7	3.1	3.6	4.3	5.2	6.8	8.1	9.0	10.7
3.50	1.6	2.1	2.8	3.3	3.8	4.5	5.5	7.2	8.4	9.4	11.1
4.00	1.7	2.3	3.0	3.4	4.0	4.7	5.7	7.4	8.7	9.7	11.4
5.00	1.9	2.5	3.2	3.7	4.3	5.1	6.2	8.0	9.3	10.3	12.1
6.00	2.0	2.7	3.5	4.0	4.6	5.4	6.6	8.5	9.8	10.9	12.8
7.00	2.2	2.8	3.7	4.3	4.9	5.8	6.9	8.9	10.4	11.5	13.4
8.00	2.3	3.0	3.9	4.5	5.2	6.1	7.3	9.3	10.8	12.0	13.9
10.00	2.5	3.3	4.3	4.9	5.7	6.6	7.9	10.1	11.7	12.9	15.0
12.00	2.7	3.6	4.6	5.3	6.1	7.1	8.5	10.8	12.5	13.8	15.9
14.00	2.9	3.8	5.0	5.7	6.5	7.6	9.1	11.5	13.2	14.6	16.8
16.00	3.1	4.1	5.3	6.0	6.9	8.0	9.6	12.1	13.9	15.3	17.6
18.00	3.3	4.3	5.5	6.3	7.3	8.4	10.0	12.7	14.6	16.0	18.4
20.00	3.4	4.5	5.8	6.6	7.6	8.8	10.5	13.2	15.2	16.7	19.2

Table A-11

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 1.05)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.6	0.9	1.3	1.6	2.0	2.5	3.2	4.6	5.7	6.6	8.2
0.30	0.7	1.1	1.5	1.8	2.2	2.7	3.5	4.9	6.0	6.9	8.5
0.50	0.9	1.2	1.6	1.9	2.3	2.9	3.7	5.1	6.2	7.2	8.7
0.70	0.9	1.3	1.8	2.1	2.5	3.1	3.9	5.3	6.5	7.4	9.0
1.00	1.0	1.4	1.9	2.3	2.7	3.3	4.1	5.6	6.8	7.7	9.3
1.50	1.2	1.6	2.2	2.6	3.0	3.6	4.5	6.1	7.3	8.2	9.9
2.00	1.3	1.8	2.4	2.8	3.3	3.9	4.9	6.5	7.7	8.7	10.4
2.50	1.5	1.9	2.6	3.0	3.5	4.2	5.2	6.8	8.1	9.1	10.8
3.00	1.6	2.1	2.8	3.2	3.7	4.4	5.4	7.2	8.4	9.5	11.2
3.50	1.7	2.2	2.9	3.4	3.9	4.7	5.7	7.5	8.8	9.8	11.6
4.00	1.8	2.3	3.1	3.5	4.1	4.9	5.9	7.8	9.1	10.2	12.0
5.00	1.9	2.5	3.3	3.9	4.5	5.3	6.4	8.3	9.7	10.8	12.7
6.00	2.1	2.7	3.6	4.1	4.8	5.6	6.8	8.8	10.3	11.4	13.4
7.00	2.2	2.9	3.8	4.4	5.1	6.0	7.2	9.3	10.8	12.0	14.0
8.00	2.4	3.1	4.0	4.6	5.4	6.3	7.6	9.7	11.3	12.5	14.5
10.00	2.6	3.4	4.4	5.1	5.9	6.8	8.2	10.5	12.2	13.4	15.6
12.00	2.8	3.7	4.8	5.5	6.3	7.4	8.8	11.2	13.0	14.3	16.6
14.00	3.0	3.9	5.1	5.8	6.7	7.8	9.4	11.9	13.7	15.1	17.5
16.00	3.2	4.2	5.4	6.2	7.1	8.3	9.9	12.5	14.4	15.9	18.3
18.00	3.4	4.4	5.7	6.5	7.5	8.7	10.4	13.1	15.1	16.6	19.1
20.00	3.5	4.6	6.0	6.8	7.8	9.1	10.8	13.7	15.7	17.3	19.9

Table A-12

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 1.15)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.6	0.9	1.4	1.7	2.1	2.6	3.4	4.9	6.1	7.1	8.8
0.30	0.8	1.1	1.6	1.9	2.3	2.8	3.7	5.2	6.4	7.4	9.1
0.50	0.9	1.2	1.7	2.0	2.5	3.0	3.9	5.4	6.6	7.6	9.3
0.70	1.0	1.3	1.8	2.2	2.6	3.2	4.1	5.6	6.9	7.8	9.6
1.00	1.1	1.5	2.0	2.4	2.8	3.4	4.3	5.9	7.2	8.2	9.9
1.50	1.2	1.7	2.3	2.7	3.1	3.8	4.7	6.4	7.6	8.7	10.4
2.00	1.4	1.9	2.5	2.9	3.4	4.1	5.1	6.8	8.1	9.1	10.9
2.50	1.5	2.0	2.7	3.1	3.7	4.4	5.4	7.1	8.5	9.5	11.4
3.00	1.6	2.1	2.9	3.3	3.9	4.6	5.7	7.5	8.8	9.9	11.8
3.50	1.7	2.3	3.0	3.5	4.1	4.8	5.9	7.8	9.2	10.3	12.2
4.00	1.8	2.4	3.2	3.7	4.3	5.1	6.2	8.1	9.5	10.6	12.6
5.00	2.0	2.6	3.5	4.0	4.6	5.5	6.6	8.6	10.1	11.3	13.3
6.00	2.1	2.8	3.7	4.3	5.0	5.8	7.1	9.2	10.7	11.9	14.0
7.00	2.3	3.0	3.9	4.5	5.2	6.2	7.5	9.6	11.2	12.5	14.6
8.00	2.4	3.2	4.2	4.8	5.5	6.5	7.8	10.1	11.7	13.0	15.2
10.00	2.7	3.5	4.6	5.2	6.0	7.1	8.5	10.9	12.6	14.0	16.2
12.00	2.9	3.8	4.9	5.6	6.5	7.6	9.1	11.6	13.4	14.9	17.2
14.00	3.1	4.0	5.3	6.0	6.9	8.1	9.7	12.3	14.2	15.7	18.1
16.00	3.3	4.3	5.6	6.4	7.3	8.5	10.2	13.0	14.9	16.5	19.0
18.00	3.5	4.5	5.9	6.7	7.7	9.0	10.7	13.6	15.6	17.2	19.8
20.00	3.6	4.7	6.1	7.0	8.1	9.4	11.2	14.1	16.2	17.9	20.6

Table A-13

Number of Patrol Officers Required To Provide Immediate Response Capability Based On the Adjusted Average Number of Reactive Officers and the Immediate Response Percentage (K_{nsa} = 1.25)

Adjusted Number of Reactive Officers Per Shift	Performance Objective Immediate Response Percentage										
	50	60	70	75	80	85	90	95	97	98	99
0.10	0.7	1.0	1.4	1.8	2.2	2.8	3.6	5.3	6.5	7.5	9.4
0.30	0.8	1.1	1.6	2.0	2.4	3.0	3.9	5.5	6.8	7.8	9.6
0.50	0.9	1.3	1.8	2.1	2.6	3.2	4.1	5.7	7.0	8.1	9.9
0.70	1.0	1.4	1.9	2.3	2.7	3.4	4.3	5.9	7.2	8.3	10.1
1.00	1.1	1.5	2.1	2.5	3.0	3.6	4.5	6.2	7.5	8.6	10.5
1.50	1.3	1.7	2.4	2.8	3.3	3.9	4.9	6.7	8.0	9.1	11.0
2.00	1.4	1.9	2.6	3.0	3.5	4.3	5.3	7.1	8.5	9.6	11.5
2.50	1.5	2.1	2.8	3.2	3.8	4.5	5.6	7.5	8.9	10.0	11.9
3.00	1.7	2.2	3.0	3.4	4.0	4.8	5.9	7.8	9.2	10.4	12.4
3.50	1.8	2.3	3.1	3.6	4.2	5.0	6.2	8.1	9.6	10.8	12.8
4.00	1.9	2.5	3.3	3.8	4.4	5.2	6.4	8.4	9.9	11.1	13.2
5.00	2.0	2.7	3.6	4.1	4.8	5.6	6.9	9.0	10.5	11.8	13.9
6.00	2.2	2.9	3.8	4.4	5.1	6.0	7.3	9.5	11.1	12.4	14.6
7.00	2.3	3.1	4.1	4.7	5.4	6.4	7.7	10.0	11.6	13.0	15.2
8.00	2.5	3.3	4.3	4.9	5.7	6.7	8.1	10.4	12.1	13.5	15.8
10.00	2.7	3.6	4.7	5.4	6.2	7.3	8.8	11.3	13.1	14.5	16.9
12.00	3.0	3.9	5.1	5.8	6.7	7.8	9.4	12.0	13.9	15.4	17.9
14.00	3.2	4.2	5.4	6.2	7.1	8.3	10.0	12.7	14.7	16.2	18.8
16.00	3.4	4.4	5.7	6.5	7.5	8.8	10.5	13.4	15.4	17.0	19.7
18.00	3.5	4.6	6.0	6.9	7.9	9.2	11.0	14.0	16.1	17.8	20.5
20.00	3.7	4.9	6.3	7.2	8.3	9.6	11.5	14.6	16.8	18.5	21.3