Contra
Costa
County

# EMERGENCY COMMUNICATIONS CONSOLIDATION 911 STUDY

## PHASE ONE REPORT

# CONTRA COSTA COUNTY

# EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

# PHASE I REPORT

Prepared by :

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April 3, 1978

# PREFACE

The County of Contra Costa, in response to requests from the Emergency Telephone System Committee, Cities, Districts, Law Enforcement and Fire Safety Agencies, is sponsoring a study of methods of improving emergency communications systems used by public safety agencies in the County. It is titled the Emergency Communications Consolidation and 911 Study. To conduct this study the County hired a project team; Mr. Willard W. Wehe, a communications system designer, and Mr. David L. Holcombe, a computer applications specialist and cost analyst. As an independent research group, the team is equally responsible and dedicated to all public safety agencies in the County.

The Study Team has prepared this Phase I report setting forth four improved emergency communications system alternatives, with each alternative being complete in terms of preliminary design, engineering, organizational structure, costs and funding considerations. The report is in sufficient depth and detail to be the basis for decision as to what avenue of improvement will be taken by the County and its public service agencies.

The problem of emergency communications and dispatch has concerned cities, districts and the County for a number of years. In 1972, Booz-Allen and Hamilton Management Consultants, under a grant from the Criminal Justice Agency of Contra Costa County, conducted a Countywide study on Police Services. Communications was a major area of study. This study indicated that the fragmented communications "systems" operated by the County's law enforcement agencies resulted in significant duplication of personnel and equipment resources and underutilization of communications personnel in local law enforcement agencies. In addition, such decentralized systems do not lend themselves well to to incorporation of the Emergency Telephone Number 911.

Assembly Bill 515, dated August, 1972, and Assembly Bill 416, signed into law in July, 1976, mandated the installation of the three-digit emergency telephone number 911 by December, 1984. This new telephone number provides easier access to emergency services by citizens and is being installed on a national basis. However, in a complex County such as Contra Costa, installation requires complex and costly engineering and/or some degree of consolidation of public safety - police, fire and emergency medical communications systems. Prior to this study, there has only been minimal research into methods of establishing 911 service in the County.

Each of the County's agencies has been contacted by the State Division of Communications and given suggestions as to how 911 service could be established. In 1974 the Criminal Justice Agency of Contra Costa County engaged a professional communications consulting firm, Aerospace Corporation, to provide a

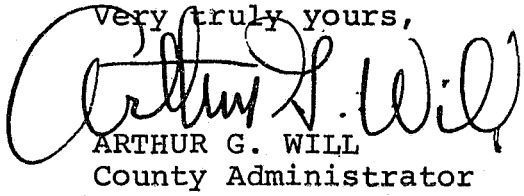
description of methods for providing 911 service to the public through the use of regional law enforcement dispatch centers. Five options were identified and set forth ranging from a single Countywide facility to five dispersed geographically located centers. The current study is based largely on the findings of the Aerospace and the earlier Booz-Allen and Hamilton reports, but places greater emphasis on the engineering and other requirements needed to implement 911 service.

The Emergency Communications Consolidation and 911 Study completes the preliminary engineering and estimated costs required for each of the alternative dispatching plans. It does this in two phases. Phase I explores the options spelled out in the earlier studies with full detail and documentation and provides advantages and disadvantages of each option. This allows each agency to determine which plan best suits their needs. Phase II of the Study will be the development of the option chosen into a fully engineered final design ready for implementation.

Public safety agencies of Contra Costa County have needed improvements to their emergency communications systems for more than a decade. This need, coupled with the State of California law requiring submission of a final plan by July 1, 1978 showing how 911 service is to be provided, indicates that it is time to reach a decision as to which dispatch system alternative is to be adopted. It is recognized that if Proposition 13, the Jarvis Gann Initiative, passes, there is serious doubt that any city or county in California can comply with the 911 mandate. It is essential that all agencies rendering public safety services reach agreement on a plan concerning the number of Public Safety Answering Points (PSAPs), the type of operating organization, the method of funding and the police radio frequency plan which will best serve the public.

The Emergency Communications Consolidation and 911 Study Team is available to every agency to participate in presentations and to help in the evaluation process.

Very truly yours,



ARTHUR G. WILL
County Administrator

## ACKNOWLEDGMENTS

The Phase I report presented by the Study Team could not have been completed without the assistance of service chiefs of the police and fire services and their staffs, who unstintingly provided their time and effort to collect statistics and information - often at great personal inconvenience. While the Study Team accepts full responsibility for the accuracy of all data analysis, the overall success of the project this far is due to the interest and cooperation of the public safety agencies.

In providing background information and an awareness of past courses of action relative to public safety, communications officers of the County Departments of Public Works, Administrator, and the Sheriff have been of inestimable value to the Study Team. Without their help, a great deal of time would have been spent in acquiring facts that were immediately available through these departments.

The report would not have been accurate without the extensive aid provided by service representatives and engineers of the Pacific Telephone Company. Determining costs of the 911 systems studied would have been much more difficult without the aid of the telephone company's staff.

Interpretations of the State of California law governing emergency telephone systems was generously provided by the State General Services Agency Division of Communications 911 program manager and staff. Constant examination of the Phase I report during its creation has assured that all alternative dispatch centers comply with State requirements.

Many others contributed to the production of the Phase I report, and more importantly, to the concept of improved public safety communication for the County and its agencies. Emergency medical providers; ambulance operators, hospital administrators - public and private, revealed important communications shortcomings and requirements. Communications Directors of sister counties were most helpful in supplying facts and data which the Study Team used for validity cross-checking. Engineers from Stanford Research Institute and Booz-Allen and Hamilton were very cooperative in suggesting sources of additional information.

The most important acknowledgment should go to the Contra Costa County Criminal Justice Agency, who was instrumental in channeling Law Enforcement Assistance Administration funds to finance the Study. The Phase I report, as well as the entire Study, was made possible through Grant Number G-2780-1-76, as authorized by the Federal Government under provisions of the Omnibus Crime Control and Safe Streets Act of 1968 through the California Council on Criminal Justice.

April 3, 1978

Willard W. Wehe
David L. Holcombe

Concord, California

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## EXECUTIVE SUMMARY

In the early seventies, the County's law enforcement service chiefs, realizing that their police radio systems needed improvement and that they were required to establish 911 service, requested an LEAA funded study to provide a sense of direction. Booz-Allen-Hamilton completed their Police Services Study in 1973. This was followed by a shorter work by the Aerospace Corporation. Both studies indicated that improvement of the police radio system was necessary and that one good alternative would be consolidation.

The need still existed to establish 911 service and neither of the prior studies was definitive enough to use as an absolute guideline for system overhaul, so another study of a specialized nature was requested in early 1976. This was the Communications Consolidation and 911 Study - also LEAA funded, but with a specific charge of researching four alternative methods of providing 911 service, three of which adopt the idea of consolidation.

The Study Team has found that existing police dispatch facilities require substantial re-engineering in order to be fully supportive of field units. There is little ability to talk car-to-car and if a departmental unit is away from its base station, it has no back-up police communication. None of the law agencies have made use of the computer for assisting dispatchers, although four departments now have the equipment to proceed. There is a lack of security at most of the dispatch centers. Only three have protection for the dispatchers.

The fire service, perhaps due to the district configuration, has an existing communications plan that supports multi-agency mutual aid functions and has embarked on a plan to acquire even more fire radio channels. Fire operates in the low band, or 46mHz range, and it is still possible to add channels. Only one of the fire districts has plans for a computer aided dispatch system; however, these plans are fully funded and a system is being acquired of sufficient capacity as to be the backbone for the entire County fire service forces.

California State Law requires 911 service to be established by 1984, but in the interim there are certain actions that must be taken. Of principal importance is the filing, by July 1, 1978, of a final service plan. This time frame is common knowledge among the service chiefs and has served to stimulate thinking and planning of how not only 911 service is to be provided, but how future dispatching is to be done.

The principal value of 911 is the reduction of time between the discovery of the incident and the call for aid. This time loss cannot be measured accurately, but is known to exceed the time it takes for a police or fire unit to arrive at the scene in most cases. The problem is that everyone uses the telephone to call for help and rarely does the caller have the correct number. In many cases, the caller dials the telephone operator, "0".

Telephone operators in the early days of telephone network design, were usually located nearby at one of the central offices. No longer. For the entire "415" calling area there are only ten operator locations and only one of them is in Contra Costa County. This means that the operator no longer has intimate knowledge of the area where the call is coming from. Dialing "0" for assistance is not satisfactory.

In a developed area such as Contra Costa County, it is difficult to establish 911 service because of the boundary mismatch problem. There is no match between city boundaries and telephone exchanges. Therefore, with many jurisdictions, there is no simple way to route the 911 call to the correct agency.

A dispatch center that receives all calls for service from citizens of the entire County processes these calls and dispatches the correct police, fire or emergency medical service agency, can operate very efficiently. It is also the ideal way to establish 911 service. The economies are chiefly through a more constant rate of use of dispatching personnel, which means that fewer complaint board operators and dispatchers are needed.

The single consolidated dispatch center concept does not enjoy overwhelming acceptance for two reasons: danger of losing the center and losing all communications, and loss of local control of an important part of a police and fire department activity. The ultimate sensitivity is whether a service chief will allow professional communicators to receive calls from his citizens and transmit them to his field units, realizing that the communicators are not under his direct control. The question must be answered before any progress can be made toward using a consolidated dispatch center. There are precedents; Santa Clara and Monterey Counties both function efficiently and have proven themselves.

Contra Costa County has unique geographical divisions. In a sense, there are three self-contained areas. This has suggested that consolidated dispatch centers could be developed for all-County, for West and East-Central, or three centers for West, East and Central. Technically, this is possible. The rate of use of dispatchers changes quickly - the greatest saving is with one center, and there is a problem with the Sheriff's Department who, naturally, does not want their forces split and controlled by more than one center.

While the fire service chiefs have taken steps to acquire more radio frequencies and improve their systems, the police chiefs only now realize that there is room for improvement. It is late and very difficult to acquire police channels. Only two options exist: utilize UHF (ultra high frequency) channels formerly assigned to television broadcasting, or attempt on a share basis to obtain more UHF channels in the more commonly used part of the spectrum.

UHF TV channels are available only if action is taken quickly, but their use requires a complete changeout of all radio equipment in the County. The TV frequency is just high enough so that none of the existing radio gear will be re-usable. This is expensive, but is the only plan that includes the Sheriff's Department with its need for County-wide area coverage.

Plan Two is based on the fact that over half of the County's police agencies now use UHF equipment in the 460mHz band and that with some adroit engineering and sharing, more channels may be acquired so that the entire County will have car-to-car, car-to-station communication, no matter where a vehicle is located.

An operating organization is needed to run any plan for consolidated dispatch centers. This organization must have provision for immediate input from a system user so that difficulties with calls, levels of service and other matters can have a hearing and be resolved. The organization must be responsive to its participants.

Findings of the Study Team indicate that the two most plausible administrative structures for an Emergency Communication Complex are a County Department of Communications or a Joint Powers Authority. Both have been used as organizational umbrellas for multi-agency dispatch complexes throughout the nation.

A Department of Communications of the County of Contra Costa is easy to create, requiring only an action by the Board of Supervisors, can be structured with an advisory board of dispatch center users to provide guidance and assist with policy and, in addition, can be a host for an engineering and maintenance support group. This plan is now the basis for the communications centers of Santa Clara and Monterey Counties.

The Joint Powers Authority has been used as a method of management in most of the Eastern consolidated dispatch centers. It is popular chiefly due to the high level of end user participation in setting policy. It has no direct taxing power and is not automatically recognized by the Federal Communications Commission.

A Communications Department, as an organ of local government, can apply for and hold federal radio licenses and through the County has taxing power. There is little to choose between the two organizations except the additional recognized power that the Department will have in dealing with State and Federal agencies on regulatory and funding matters.

There are cases where 911 service must be installed and the local governments cannot agree on the use of some degree of consolidation. Typical of this situation are the Counties of Orange and Los Angeles, both highly developed, both required to establish 911 service.

For these cases, the telephone companies have developed a mechanical solution to the boundary problem - called selective routing. It makes use of the telephone company central office computer to route the 911 call to the appropriate jurisdiction. Since most 911 calls are for police assistance, the call is first routed to the appropriate police agency who screens the call, services it if for police aid, and transfers it to a fire department if for fire assistance.

Selective routing is expensive, both in terms of the rental of complicated telephone central office equipment and the need to create and perpetually maintain a file for the telephone company showing the police and fire jurisdiction of every telephone in the County.

Economies of operation notwithstanding, selective routing will work well in Contra Costa County and in its elementary form is re-imbursable by the State of California under the 911 funding law.

From the earliest days of the project, the most often heard comment was: "who pays for the system?". This question transcends all concern over control, level of service, or type of managing organization. It is of crucial importance and applies to all 911 service plans including selective routing.

Three factors are generally used in cost apportioning multi-agency consolidations: assessed valuation, population, and rate of use or call volumes. None of these by themselves is fair, and a mix of the three becomes subjective and difficult to defend. It must be realized, however, that assessed valuation is the basis for paying for existing police and fire dispatch centers.

According to Interim Report Number Two of the Stanford Research Institute, commissioned by the County of Santa Clara, there is provision in Assembly Bill 2008 passed by the 1972-73 session of the State Legislature, for the transfer of a tax load in instances of "functional consolidation". Stanford researchers indicate that Article 8 functional consolidation is defined as the transfer, from one agency to another, of the responsibility for providing a service, as well as the responsibility for levying a tax to pay for it. AB 2008 also provides that the agency which surrenders the service, and consequently the fiscal responsibility, must reduce its property tax rate by the amount that was necessary to pay for the service in the last full year that it was retained. This enabling legislation has been used in the 1974 Stanford Research Institute report as the recommended method by which Santa Clara County should fund the improvement of its public safety communications facilities.

Initial costs, however, are considerable and it will take the full resources of all participants over several budget cycles to establish the Emergency Communications Complex. Since existing dispatch centers are now funded on the basis of assessed valuation, the levy for the construction of the Emergency Communications Complex could be on the same basis.

## COMPARISONS AND RECOMMENDATIONS

### Number of Public Safety Answering Points (PSAPs)

Alternative A - Single Dispatch Center (Chapter VII, Page 62)

Advantages:

1) Requires fewest number of personnel for operation

2) Least expense for maintenance of building and equipment

3) Best "rate of use" of dispatch personnel

4) Lowest expense for supervision

5) Simplified computer design and application

6) Highest degree of interservice coordination

7) Highest degree of interagency coordination

8) Least County-wide capital and operating expenditure

Disadvantages:

1) Greatest potential for damage to the center resulting in a loss of communications

2) Greatest travel time for public safety administrators to coordinate operations during a disaster situation

3) Tendency to "even out" level of service, requiring smaller agencies to accept the policies of larger agencies

4) Greatest loss of local control

COMPARISONS AND RECOMMENDATIONS (Cont'd)

Number of Public Safety Answering Points (PSAPs)

Alternative B - Two Dispatch Centers (Chapter VII, Page 75)

Advantages:

1) Can back each other up

2) Greater regional identification

3) Reduces reliance on long wire and microwave communications links

4) Reduced travel time for disaster communications teams

Disadvantages:

1) Greater cost

2) More personnel required

3) Need for construction and maintenance of two expensive buildings

Alternative C - Three Dispatch Centers (Chapter VII, Page 77)

Advantages:

1) Greatest degree of regional identification

2) Ability to back each other up

3) Utilizes shorter communications links

Disadvantages:

1) Highest cost of all consolidated plans

2) Lowest "rate of use" of dispatchers

3) Lowest degree of interservice and interagency coordination

COMPARISONS AND RECOMMENDATIONS (Cont'd)

Number of Public Safety Answering Points (PSAPs)

Alternative C - Three Dispatch Centers

Disadvantages: (Cont'd)

4) Requires construction and maintenance of three high cost buildings

5) Most difficult of consolidation plans to utilize computer aided dispatching

6) Most complex and expensive supervision structure

Alternative D - Station Selective Routing
(See Chapter VI, Page 51 )

Advantages:

1) Maximum control over selection of dispatching personnel

2) Greatest degree of independence from other departments

3) Minimum initial capital outlay

Disadvantages:

1) No economies in reduction of personnel

2) Least degree of interservice of coordination

3) Least degree of interdepartment coordination

4) Requires each agency to provide for computer aided dispatching individually at great expense

5) Totally dependent on telephone company equipment to route calls

6) Highest ongoing costs of all plans

7) Every fire service call must be transferred

8) Need to develop and maintain ARG (Automatic Routing Guide) file

COMPARISONS AND RECOMMENDATIONS (Cont'd)

Number of Public Safety Answering Points (PSAPs)

Recommendation: The Study Team finds that due to the cost effectiveness and capability for interservice and inter-department communication, that a single dispatch center is the best choice.

COMPARISONS AND RECOMMENDATIONS

OPERATING ORGANIZATION

Alternative A - County Department of Communications

Advantages:

1) Simple to establish

2) Can be vehicle for other communications assignments; maintenance, telephones

3) Direct access to other County Services

4) Administrative machinery for shared cost collection already available

5) End user control through both the Board of Supervisors and Users' Advisory Council direction

6) Dedicated to communications

7) Easiest worker transition

Disadvantages:

1) Creation of additional department broadens Board of Supervisors' span of control

2) User sensitivity to increased County control

3) Pay and classification disparities

Alternative B - Operation by a County Department of General Services

Advantages:

1) Can be vehicle for other communications assignments; maintenance, telephones

2) Direct access to other County services

3) Administrative machinery for shared cost collection already available

4) End user control through both the Board of Supervisors and Users' Advisory Council direction

COMPARISONS AND RECOMMENDATIONS (Cont'd)

OPERATING ORGANIZATION

Alternative B - Operation by a County Department of General Services

Advantages: (Cont'd)

5) Easy worker transition

Disadvantages:

1) Depends upon Board of Supervisors creating a Department of General Services

2) Communications would have to compete for resources with other functions within the Department of General Services

3) Additional layer of management inserted between users and communications operation

4) Pay and classification disparities

Alternative C - Joint Powers Authority

Advantages:

1) Maximum system user guidance

2) Widely used elsewhere

3) No election required

Disadvantages:

1) Difficulty in resolving conflicts between many different users

2) Ability to support is dependent upon existing taxing powers of each participant

3) Not totally recognized by Federal Communications Commission

4) No direct access to support services

5) Requires agreement between a large number of agencies

6) Pay and classification disparities

OPERATING ORGANIZATION

Alternative D - Communications Service District

Advantages:

1) Would have direct taxing power
2) Would have broad based representation
3) Separate and defined costs on tax bills

Disadvantages:

1) Requires an election to establish
2) Creates another layer of government
3) Requires State of California approval to establish
4) Requires staffing of a larger number of support services
5) Pay and classification disparities

Alternative E - Operation by Sheriff's Department

Advantages:

1) Organization already exists
2) Presently handles police and emergency medical communications for a large portion of the County

Disadvantages:

1) Reluctance of other agencies to accept operating policies set by Sheriff's Department
2) Will require extensive modification of existing Sheriff's Department dispatch facility
3) Question of user input to elected official
4) Load upon Sheriff's Department operation caused by processing other agencies' calls
5) Reluctance of fire insurance rating bureau to accept the dispatching of fire services by police agencies
6) Pay and classification disparities

COMPARISONS AND RECOMMENDATIONS (Cont'd)

OPERATING ORGANIZATION

Alternative F - Operation by Existing Police Department

Advantages:

1) Organization already exists

2) Already capable of handling law enforcement communications

Disadvantages:

1) Reluctance of other agencies to accept operating policies of a police department

2) No existing center can handle communications load without modification

3) No extensive support facilities

4) Fire insurance rating bureau is reluctant to rate highly fire departments who are dispatched by police agencies

OPERATING ORGANIZATION (Cont'd)

Recommendation: Due to its ease to establish, ability to draw on extensive support services and high level of control by participating end users, the Study Team feels that a County Department of Communications is the best type of organizational structure to operate any of the alternatives for consolidated communication systems.

ESTABLISHMENT AND OPERATIONAL FUNDING
FOR CONSOLIDATED CENTERS

Alternative A - Total County Support (Chapter X, Page 118)

Advantages:

1) Precedent set by Santa Clara County

2) Costs distributed in approximate proportion to existing tax ratios

3) Fair to both cities and districts

4) No subjective formulas involved

5) Independent of growth shift and population changes

6) Compatible with County operating dispatch center complex

Disadvantages:

1) Fear of County domination of center operation through fiscal control

2) Complicated tax readjustment required

3) County Board of Supervisors may be reluctant to accept additional tax burden

ESTABLISHMENT AND OPERATIONAL FUNDING
FOR CONSOLIDATED CENTERS (Cont'd)

Alternative B - Charges to Agencies Based on Assessed Valuation (Chapter X, Page 117)

Advantages:

1) Assessed valuation is now the basis for paying for existing centers

2) Costs spread over broad base

Disadvantages:

1) No relation between use of center and assessed valuation

2) Difficulty in separating police/fire service costs

3) Assessed valuations do not change County-wide at the same time

Alternative C - Charges to Agencies Based on Population (Chapter X, Page 117)

Advantages:

1) Population has a relationship to activity

2) Population statistics are current and readily available

Disadvantages:

1) Population does not recognize the day-night population fluctuations caused by people working in industrial centers and residing in suburbs

2) Population does not reflect fire service requirements to protect valuable property which is often located in sparsely populated areas

3) Unequal levy on heavily and sparsely populated areas

ESTABLISHMENT AND OPERATIONAL
FUNDING FOR CONSOLIDATED CENTERS (Cont'd)

Alternative D - Call Volumes (Chapter X, Page 117)

Advantages:

1) Ability to exactly measure by using computer reports

2) Each agency pays only for the service it receives

Disadvantages:

1) Police bear most of cost

2) Requires billing in arrears

3) Totally dependent on computer for accurate cost determination

Recommendation Concerning Establishment Costs:

The Study Team finds that assessed valuation is the most commonly used basis for funding the present assembly of public safety dispatch centers; therefore, it should be the base for apportioned cost participation to defray initial equipment acquisition and constructions costs. This initial cost should be reduced to the extent possible by the pursuance of grant funding from all available sources.

Recommendation Concerning Operational Costs:

The Study Team recommends that the ongoing costs be borne by the County of Contra Costa. This would parallel the action of Santa Clara County whereby consolidated public safety dispatching systems are County funded. According to the Stanford Research Institute, in their interim study of Santa Clara County dated 1974, Assembly Bill 2008 passed by the 1972-73 California Legislature provides in Article 8, that: "In instances of functional consolidation, the tax rate may be increased to pay the actual cost of providing the consolidated service". Functional Consolidation is defined as the transfer, from one agency to another, of the responsibility for providing a service, as well as the responsibility for levying a tax to pay for it. AB 2008 also provides, according to the SRI report, that the agency which surrenders the service, and consequently the fiscal responsibility, must reduce its property tax rate by the amount that was necessary to pay for the service in the last full year that it was retained.

POLICE RADIO CHANNELS

Alternative A - Use of UHF channels in the TV 16 and 17 range (Chapter III, Page 21)

Advantages:

1) Places all police and Sheriff's Department communications on same part of spectrum

2) Makes use of clear channel frequencies

3) Provides for digital radio channel

Disadvantages:

1) Requires total equipment changeout

2) Difficulty in acquiring enough channels to implement

3) High cost

Alternative B - Use of UHF channels in the 460mHz range

Advantages:

1) Maximizes re-use of existing equipment

2) Recognizes capital outlay recently made by Richmond Police

Disadvantages:

1) Requires sharing channels with other users

2) Splits Sheriff's Department from other police users

3) Requires waiver from Federal Communications Commission

Recommendation: The Study Team, principally because of the difficulty in operating the Sheriff's Department in a different band from all other police departments, recommends adoption of Plan One; the use of UHF TV 16 and 17 channels.

# CHAPTER I

## BACKGROUND

# CHAPTER I

# BACKGROUND

## The Need for a Study

In December, 1976 Contra Costa County was requested by the Emergency Telephone System Committee to sponsor a study of alternatives to the present method of conducting public safety communication by cities, districts and the County. This study was to finalize system design, technical specifications, operational structure and financial arrangements for several alternative plans, all but one effecting some degree of multi-department consolidation. By direction of the committee, each of the plans was to employ the three digit emergency telephone number 911 as an integral part of the plan.

The committee is a broadly based group of service chiefs, city managers and representatives of the County and districts of the County who have sensed shortcomings in existing systems and who have spearheaded action designed to rectify these problems. These actions include earlier studies of the County's police communication capabilities; the Booz-Allen-Hamilton and Aerospace studies of 1973 and 1974.

Both of these studies concluded that an improvement in police communication was possible through consolidation of resources and that consolidation was feasible. Neither, however, treated the communication problems of fire and emergency medical services, nor did they dwell on the difficulties of establishing the emergency telephone number, 911, in a developed county such as Contra Costa.

## Purpose of Report

In view of these shortcomings, the committee felt that a study of a specialized nature was required to accurately identify the benefits that can be realized through pooling of communications resources and to indicate the best way to establish 911 service. This Phase I Report is the product of the specialized study.

Purpose of Report (Continued)

It provides engineered and costed alternatives to the existing multiple dispatch centers now serving public safety services. The information provided is reliable and should be the basis for decisions by service chiefs, city councils and managers; district commissioners, the County Administrator and Board of Supervisors as to the type of dispatch system or systems to be used in the future.

Scope of Report

The scope of the Phase I Report includes research done on the communications facilities; telephone and radio, of each police department, fire department and district; and emergency medical service providers, public and private. It includes investigation into existing radio frequency assignments, remote transmit relay sites, and areas of base-mobile radio coverage. The County Microwave System has been examined for capability of expansion to include the extremes, east and west, of the County limits.

Personnel complements and organizational structures now being used for dispatch centers were reviewed and cataloged. Methods of supervisions, work shift schedules, salaries and benefits have been itemized foruse as decision factors in the selection of alternative dispatch systems.

Architectural conceptions, costs and locations for specialized, protected buildings necessary to house dispatch personnel and facilities have been procured from the County Engineering Staff in concert with the Building Industry Consultants of Pacific Telephone Company. Costs of refurbishing existing buildings to comply with State and Federal emergency operating center standards have been calculated.

Continuous involvement in any legislation relative to the State of California 911 Law has kept the study team intimately aware of exactly what it required to comply with State Dictates. This involvement has extended to the Pacific Telephone Company so that the newest offerings in 911 service can be included in the dispatch center alternatives.

The study includes methods of funding the construction and operation of the alternative dispatch systems. Research on funding includes not only a determination of the most equitable formula for internal, user based support, but also all known sources of possible grant assistance.

## Methodology

The methodology of the Study Team has been to utilize as much of the prior studies (Booz-Allen-Hamilton and Aerospace) as possible and to concentrate on providing more detail on cost, system engineering, and the impact of alternative dispatching methods on service departments.

Since the Communications Consolidation Study is largely the product of the County's police and fire service agencies every effort has been made to envelop this group and their staffs in the research required by the Study. This technique has been very successful and has resulted in a more in-depth awareness of the complexity of the undertaking.

Each public service department and district service chief has been contacted by the Study Team and provided with an overview of the Study; its intent and purpose. The present and two former County Communications Directors have been interviewed in order to learn of faults and problems with earlier attempts to improve public safety communications in the County. Close liaison has been maintained with the Federal Communications Commission Safety and Special Services Section so that the effect of new dockets on the future of local government radio systems would be included in the Study. Constant contact has been maintained with Pacific Telephone and State of California representatives so that the latest developments in 911 technologies will be considered.

Aware that independent efforts are now under way with goals parallel to those of the Study in the fields of radio and computer engineering, meetings have been held with these other study groups to exchange plans so that a compatible direction will be taken by all agencies.

## Summary

Departmental service chiefs and communications managers are aware of the need to upgrade their public safety communications facilities and the Communications Consolidation Study Team has received a high level of support from all agency chiefs in the preparation of alternatives to existing dispatch centers.

It is inescapable that there will be costs for any improvements to emergency communications systems, both initial and ongoing. But the problem is severe and priorities must be adjusted to provide funding for the improvement of public safety dispatching.

Summary (Cont'd)

The 911 time frame, inflation affecting the cost of equipment and its installation, coupled with the absolute need to correct existing system deficiencies, show that action must be taken soon by authorities of the County, its cities and districts.

# CHAPTER II

## ANALYSIS OF EXISTING DISPATCH CENTERS

## CHAPTER II

## ANALYSIS OF EXISTING DISPATCH CENTERS

### PART A - POLICE SERVICES

The Study Team finds that police dispatch centers of Contra Costa County, its cities and districts, are becoming outmoded. They have, for the most part, not been modernized to keep pace with developments in the public safety communications field. Although there has been an upgrading of the components - mobile and portable radios, consoles and other hardware - the operating systems are functioning as they have been for the last 15 years.

Principal deficiencies were noted in the areas of:

* Limited use of computer science to aid dispatchers, produce reports and measure workloads.

* Questionable protection of dispatchers from interference at many dispatch centers.

* No provision for 911, emergency telephone number.

Police service chiefs indicate that they are aware that their radio dispatch systems have not been upgraded beyond immediate short term needs and that improvement is needed. The chief reason given is lack of funds, but a second reason is repeatedly heard that there is no guide - line general plan to follow in an upgrading process.

The Team observed, however, that even departments with only marginal dispatch facilities have good patrol cars, top quality police equipment such as firearms, and that their personnel are well trained and capable. This suggests to the Team that at least some funding is available, and that the second reason, no Countywide guiding policy, is the more important reason why most Contra Costa police dispatch centers now require substantial re-engineering. It appears that without guidance, each agency has proceeded to establish dispatch facilities based on the needs of the day without any realization that the future will place demands on these small systems that cannot be met.

Use of Computers

The Team has found Contra Costa's police service chiefs to be aware, although with varying levels of understanding, of the value and importance of using computer science in their law enforcement activities. Despite this awareness, no department is "on line" with full function system. Certain police departments - Pleasant Hill, Martinez and Concord - are developing computer aided dispatching, record control and management information, using as a base partitioned city business computers.

Richmond Police Department and the Sheriff's Department are seeking funding for computer data handling systems; Richmond stressing the prisoner booking and record process on a scale large enough for all of West County. The Sheriff's plan is for a full function system with the beginning thrust toward improving base-mobile communications.

Walnut Creek Police Department has gone beyond planning and as a first function of their system, interfaced computer-to-computer with the Alameda County PIN (Police Information Network). This allows Walnut Creek dispatchers to have direct access to the regional warrant file as well as other CLETS (California Law Enforcement Telecommunications System ) switched information resources.

But these actions by individual departments are not coordinated...each department is developing its own system without regard to the areawide needs of law enforcement. It is the feeling of the Study Team that lack of an overall plan has left departments with no alternative but to proceed independently in equipping their communications centers with computer power.

Radio Frequencies - A Shortage

There are not enough police radio frequencies assigned to law enforcement agencies of the County to support efficient police communications. Certain cities, realizing this, have acted unilaterally to augment their own systems. Walnut Creek and Concord Police Departments each have two radio channels - Richmond has three, along with the Sheriff's Department. In contrast there are six cities - Antioch, Brentwood, Martinez, Pinole, San Pablo and Pleasant Hill - all operating on a single channel.

The Contra Costa police radio frequency problem is typical of most developed California counties and is due in part to the political structure of the State. This

structure grants considerable power to cities and counties and does not foster the acceptance of non-stipulated responsibilities such as controlling the sub-assignment of public safety radio frequencies. As a result, California local governments have established their own small facilities without regard to the efficient management of the radio frequency spectrum.

The situation is abetted by the policy of the Federal Communications Commission in granting radio licenses to any eligible local governmental entity without any overall area system plan. This policy is born of a belief that there must be separation between the Federal and local governments; it has done little to insure the best use of the radio spectrum. For Contra Costa County it has created an unbalanced ratio of radio communications channels relative to the actual need of channels by service agencies of the County.

Exhibit 2A sets forth in chart form the radio channels now assigned to County agencies in terms of population and CFS (calls for service) numbers. It can be seen that police departments that have, by their own volition, acquired more channels now have nearly adequate resources for present traffic loads. Many departments, however, do not have sufficient transmission capacity for present traffic loads, and certainly not enough for the future.

The shortage of frequencies is an extremely serious problem since call volumes are relatively unaffected by the configuration of dispatch centers. For example, whether the County's law agencies retain individual dispatch centers or merge into a more efficient consolidated plan, there are still too few radio channels.

EXHIBIT 2A

Contra Costa County
Emergency Consolidated Communication (911) Project
Radio Channel Loading
January 1, 1978

| Radio Frequency ( mhz ) | Community | Population | Approximate Annual Case Load |
|---|---|---|---|
| 155.310 | Antioch | 34,700 | 22,611 |
| | Brentwood | 3,800 | 1,317 |
| | Martinez | 20,000 | 18,300 |
| | Pinole | 15,500 | 13,062 |
| | Hercules | 850 | |
| | Pleasant Hill | 25,200 | 18,132 |
| | San Pablo | 18,850 | 19,597 |
| | | 119,030 | 93,019 |
| 155.190 & 155.640 | Unincorporated | 172,336 | 65,653* |
| | Clayton | 2,640 | 1,006* |
| | Lafayette | 19,450 | 7,410* |
| | Moraga | 14,950 | 5,695* |
| | | 209,376 | 79,764 |
| 460.150 & 460.250 | Concord | 97,700 | 51,688 |
| 460.300, 460.400 & 400.475 | Richmond | 70,000 | 91,100 |
| 460.325 & 460.425 | Walnut Creek | 48,200 | 15,952 |
| 460.375 | El Cerrito | 22,650 | 12,585 |
| | Kensington | 5,294 | 1,968 |
| | Pittsburg | 26,450 | 22,827 |
| | | 54,394 | 37,380 |
| | Total County | 598,700 | 368,903 |

* Apportioned based on population

Dispatcher Duties

Not all of the Contra Costa police departments have enough radio traffic to keep their dispatchers fully occupied. To remain productive, other duties such as prisoner booking, fingerprinting, answering business telephones and even servicing the "drop in" public are assigned. This practice promotes the statistically efficient use of dispatch personnel, but has an adverse effect on field officers. Field personnel, particularly patrol persons, realize that their link to assistance may be slowed because the dispatcher is busy with some other duty.

There is a strong economic reason for this type of operation; however, there are as many potential dangers facing police personnel in small departments as in the larger entities. For this reason communication centers, large or small, should be equally responsive to the needs of field forces or they should be redesigned to assure full support.

Certain of the County's small departments have already taken such steps. For example, Clayton and Brentwood Police Departments receive dispatching service from the Sheriff's Department. Kensington and El Cerrito have not only merged their respective police, but also their fire (dispatching) facilities into a single complex.

Security - Dispatch Centers

Having dispatchers serve in several capacities compromises the physical security of the dispatch center. The Team found that in the smaller departments where the dispatcher was required to serve the public, the dispatcher, and often control equipment, were in jeopardy. A malcontent with harmful intentions could break the most critical link in the police command and control chain.

Only two of Contra Costa's police dispatch centers can claim some degree of security; Richmond, with its operation on the third floor accessible only through the front office, and Concord, with its underground dispatch and emergency operating center. The Sheriff's Center is or is not readily accessible, depending on how the elevators are used.

Paradoxically, Concord, with the best security, is in a difficult position with respect to expansion. It is extremely difficult and costly to expand underground space, but this will be necessary to accommodate growth of the City.

## 911 - Emergency Telephone Number

State legislation requires the establishment of 911 telephone service by all emergency service providers in California. In Contra Costa County this will have the greatest impact on the police dispatch centers. Statistically, 85 percent of all calls for service are for police services. For this reason, it is axiomatic that in nonconsolidated dispatch centers police complaint operators will answer the call first since the probability is that the call is for police assistance. Non-police calls are transferred to the appropriate service agency.

But this means that all calls to a dispatch center of traditional police design, including those formerly first received by fire and medical services, are now to be received by a police dispatch center. There is a predictable increase in all nature of calls to 911 equipped centers due to the ease by which the public can access a source of assistance. Nationwide, this increase ranges between 18 and 40 percent.

The Team finds that none of the existing police dispatch centers in Contra Costa can accommodate this increase in workload without major redesign.

## PART B - FIRE SERVICE DISPATCH CENTERS

### Overview

The Study Team finds that there are wide variations in the communications capability of Contra Costa's fire dispatch centers. Capability ranges from well equipped and staffed complexes to a single line telephone with extensions answered by on-call fire personnel. Predictably, there is a close relationship between the financial base of the agency and the sophistication of its dispatch centers.

In terms of communications capability, only two of Contra Costa's fire protection agencies are operating full scale dispatch centers; Richmond Fire Department and Contra Costa County Consolidated Fire Protection District. In both of these cases, the agencies had the funding base to develop dispatch systems fully supporting field forces.

Riverview, a relatively new fire district, has plans and funding for a fire service communications facility. Research and planning which includes the possibility of a multi-service police/fire common dispatch center serving more than just the fire district is well under way. Timing is crucial for Riverview as the department does not, despite its responsibilities, have an adequate fire dispatch system to serve its multiple fire station jurisdiction. The Riverview Administration, however, is aware of the impact of the emergency number 911, and does not wish to expend money for a system that will not be adequate.

Within the County there are four fire districts; Danville, Moraga, Orinda and West County, that are not large but do have more than a single fire station. This requires some method of receiving and retransmitting a fire alarm. All of these districts have developed methods of operation that are suitable for two or three outlying fire stations, but will not work well for bigger systems. In most cases, reliance is placed on having fire personnel in all stations monitoring the initial call from the citizen and if the fire or other emergency is in their area, responding directly without awaiting instructions from the prime answering point.

Small Districts

It is the small fire districts of the County that require re-engineering of their dispatch centers. In many cases, there are no dispatch centers - just a party line telephone that is answered by a gamut of people ranging from a volunteer fireman to the Livermore Radiation Laboratory.

In the recent past, this has been adequate, but two changes have taken place that mandate reduced and guaranteed response time. These are: Fire service becoming "first in" for medical emergencies, and higher density populations such as the City of Brentwood in the Brentwood District and Discovery Bay in the Byron District. Those districts that touch water recreation areas - Byron, Oakley, Brentwood, and especially Bethel Island - also face the problem of high holiday, weekend and summer vacation populations being served by the public service agencies that do not pay a proportion of operating costs.

Funding

On an individual basis it does not appear that any but the largest of the fire protection agencies are able to afford improved communications facilities. In most cases, tax ceilings have been reached and fire commissions and city councils are hard pressed to provide money for salaries and fire fighting apparatus - always high priority items.

This funding difficulty appears to be of a long term duration and comes at a time when increased call volumes due to the imminence of 911 and the standards of the ISO (Insurance Service Organization) create a demand for more communications capability.

Combined Centers

The Study Team finds that a strong justification exists for the pooling of dispatch center resources in order to acquire greater capability and has learned that some merging of dispatch facilities has already taken place. For example, Orinda and Moraga Fire Districts operate a joint system; El Cerrito and Pinole Police Departments provide service to their fire departments - in addition, El Cerrito serves the Kensington District. These combined systems all show economies.

The Brentwood District Chief is researching a plan to have one of the larger districts answer and retransmit its alarms and a plan exists to have the Contra Costa County Consolidated Fire Protection District dispatch center serve Riverview and Danville Fire Districts.

Fire Radio Frequencies

These actions indicate to the Team that fire service chiefs are aware of the potential economies and improvements in services that are available through consolidation and that a well engineered cooperative system will be an acceptable alternative to existing dispatch centers.

The path taken by Contra Costa's fire service chiefs concerning radio frequencies removes one of the chief blocks to creating a large multi-department dispatch center for the fire service. With three exceptions - Riverview, El Cerrito and Kensington - all departments and districts are operating in the "VHF low band" part of the radio spectrum...46 mHz.

Traditionally, the "high band" channels in the 150 mHz range have been the most popular for both police and fire service radio systems. However, their popularity has also caused their shortage. At this time, it is impossible to procure a clear channel in this range in the Central California area. Conversely, the low band channels, due to the longer antennas required, susceptibility to ignition interference and sensitivity to "skip" interference from distant stations, have been less used in the fire service. As a result, there is still the chance that additional 46 mHz frequencies can be procured to augment the Contra Costa Fire Service radio network.

Fire Chiefs' Actions

Under the auspice of the Fire Chiefs Association, action has already been taken to obtain more channels and, on a voluntary basis, to reassign and reprioritize assignments according to sectors. The Team can add little to

Fire Chiefs' Actions (Continued)

this action except to state that if other services were able to cooperate to this degree, there would be much less trauma ahead in correcting radio system deficiencies.

Mutual Aid

With a consolidated dispatch system, it is less important for each department to have radios switchable to allow interdepartment communication during mutual aid activities. Coordination can be accomplished at the command room of the dispatch center. However, there are always smaller activities which are field officer controlled and for these, it is valuable to have all departmental fire suppression, or at least command vehicles, equipped with switchable radios allowing interdepartmental coordination.

This poses a problem for the three fire agencies who remain on VHF high band; specifically the frequency 154.35 mHz - Riverview, El Cerrito and Kensington. The Team recommends that instead of changing out all equipment, that the pattern already followed by Riverview be followed... that of carrying two radios in vehicles that will be used for mutual aid activities.

Computer Aided Dispatching

The Team has found that fire service chiefs are well versed in the capabilities of using a computer to aid alarm operators. Many of them have seen demonstrations either of operating systems or vendor presentations and recognize the advantages of using some degree of automation to reduce operator mistakes and maintain apparatus status. Fire service chiefs, particularly of the smaller departments and districts, are equally aware that the cost of computer equipment is difficult to justify due to the initial capital outlay. As a result, no fire service agency of the County is presently using computer aided dispatching.

The largest district, Contra Costa Consolidated, has fiscal 1978-79 funding for a computer dispatch system and this District has started documenting their needs - an essential first step - for developing a computer dispatch system. As in the case of the police service, the Study Team has engaged in this documentation for the specific purpose of having a basis and plan for the recommendation and justification for the use of computer aided dispatching in a large scale multi-agency communications center.

Fire Dispatch Centers (Continued)

It is apparent that most of the County's fire service agencies operate in about the same way. They keep essentially the same records, receive and dispatch alarms similarly, and have about the same administrative problems. With this realization, the Team has been able to develop a framework of fire service requirements that, with minor modifications, will fit most fire service agencies within the County of Contra Costa. This preparation and research will reduce to a considerable degree the time and cost necessary to establish automated dispatching for the entire County's fire services.

## PART C - EMERGENCY MEDICAL SERVICE DISPATCH FACILITIES

The Sheriff's Department Communications Center is the control point for all Contra Costa County emergency ambulance calls. The Countywide emergency ambulance telephone number, 228-5006, terminates at this center and ambulance status and audit trails are maintained for each call.

In operation, all calls are coordinated through the center irregardless of where the call originated. Most calls are generated by: 1) ambulance company, 2) fire department, 3) police department, 4) doctor, 5) hospital, or 6) private citizen. This allows direct single center liaison between the originating authority and the ambulance. Except that there is no medical telemetry in use, the Sheriff's Center is operating as a CMED (Centralized Medical Emergency Dispatch).

The system is working well, except for difficulties in the following areas:

* The all-County telephone number is not toll-free from all areas of the County.

* There is no rapid communication link between police and fire agencies and the CMED (medical information in some cases is being carried on fire channels).

* Ambulances communicating with hospitals generally require longer transmissions - this interferes with CMED ambulance coordination.

### Single Ambulance Number

The problem with the single number will be resolved automatically with the advent of the emergency number 911. The only alternative at the present time is to install FEX (Foreign Exchange telephone numbers), using "800" toll-free service or accepting collect calls. All of these solutions have certain drawbacks - FEX service is quite expensive; Operator-handled "800" service is slow, and by the time the public was made aware that the CMED will accept collect calls, 911 service will be in operation.

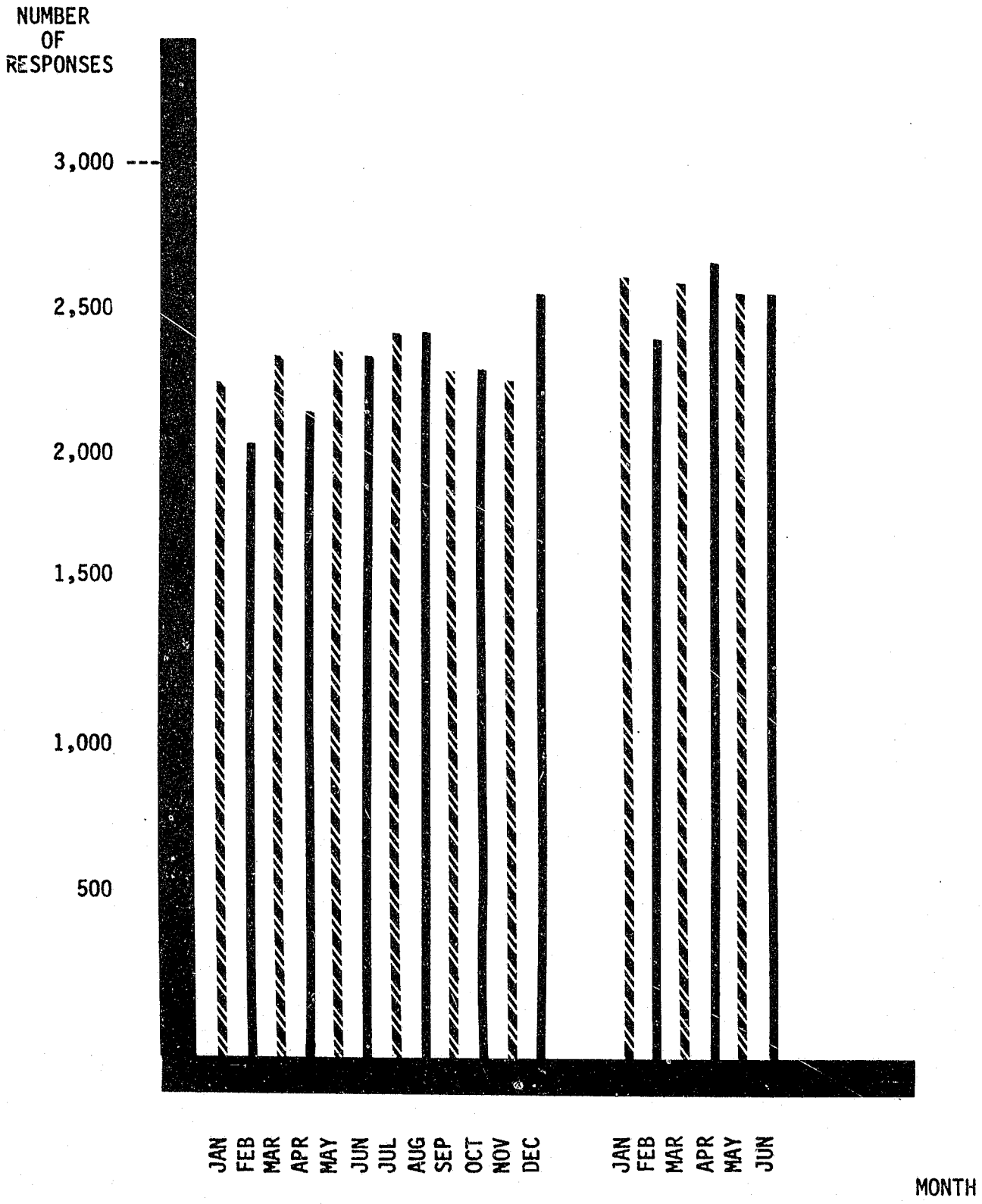
### Missing Link

The biggest problem with police and fire access to CMED is in West County; particularly El Cerrito, due to the fact that this City is one of the few that does not use the common "low band" fire channels. It appears that the only link between El Cerrito and CMED is the "dial up" telephone.

EXHIBIT 2B

AMBULANCE RESPONSE ACTIVITY

BY MONTH



Missing Link (Continued)

There has been planning, the Team has learned, to install a fire channel system at El Cerrito to provide medical communications. This is a tire-patch solution and is questionable in terms of the Federal Communications Commission's definition of permissible communications on a fire channel. Operationally, however, it would work. The ultimate answer is expansion of the County Microwave System, part of the communications consolidation engineering, which will incorporate a "TACFONE" circuit directly to the dispatch center.

With the completion of the MEDARS medical radio system (Medical Emergency Disaster Aid Radio System) begun in 1973, a second UHF radio channel will be available allowing ambulance-to-CMED and ambulance-to-hospital communications on separate, dedicated radio channels.

## PART D - NON-EMERGENCY DISPATCH CENTERS

### Day Time Systems

Typical of most California entities, Contra Costa's city and County non-emergency radio systems are operated during the business day by the users themselves. For example, the County Road, Flood Control and Animal Control operations all have their dispatch points which are operated by clerical workers. At night these functions are transferred to the Sheriff's Communication Center. The telephone books list after hours and weekend numbers to be used for reporting problems.

Experience has shown that this is a good arrangement and should be retained when the County's police, fire and medical service communications are combined into a multi-function complex. Present day engineering allows the transfer of calls from the public after hours to the consolidated center, thus simplifying listings in the telephone books.

The large common dispatch center would be the focal point for all communications, including the supportive services of Road, Flood Control and Animal Control, and all others during any emergency. This greatly facilitates inter-service coordination.

### Summary

Existing police and fire communications systems serving public safety agencies of the County and its entities seem to have been developed without regard to the true need of law enforcement and fire suppression forces. As a result, they are in arrears in terms of traffic capacity, security, and in the use of new technologies. Public safety communications systems should be viewed as functions as essential as the field forces being served.

The first steps in this recognition have been taken. The Study Team, in analyzing each of the existing dispatch centers, received clear indication from dispatchers, managers, service chiefs and administrators that improvements were needed. Of great importance were the comments indicating that future designs for communications centers did not need to be patterned after the existing systems.

# CHAPTER III

## POLICE RADIO FREQUENCIES REQUIRED FOR CONTRA COSTA COUNTY LAW ENFORCEMENT AGENCIES

# CHAPTER III

## POLICE RADIO FREQUENCIES REQUIRED FOR CONTRA COSTA COUNTY LAW ENFORCEMENT AGENCIES

### PART A - POLICE RADIO FREQUENCY SHORTAGE

#### Affect on Law Enforcement

There is an acute shortage of police radio channels assigned to Contra Costa's law enforcement agencies. Too, there is a great difference in the channel capacity from one city to the next. Certain police departments have sufficient radio capacity for their own needs through the next decade, but others are already past the point of having sufficient day-to-day capacity. No department has a channel for non-voice intelligence transmission, nor are there any channels or even a common radio spectrum available for inter-department or mutual aid type of police communication.

Technically, the police frequency shortage is not an integral part of the Communications Consolidation Study... more base mobile communication capacity is needed irrespective of the course taken by the Study. But the Study has engineered and examined certain features - chiefly digital base-mobile communication - that can not be easily accomplished without additional radio channel capacity.

#### Status Today

In Central California there are no unassigned police radio channels in the conventional spectrums: 45, 155, 453 and 460 mHz. All systems developed since 1965 have shared channels with some other agency. Today, congestion and channel occupancy are so great that even sharing requires extensive engineering for even the smallest system. Channel sharing, however, is still one method of augmenting Contra Costa's frequency resources.

Status Today (Cont'd)

The Federal Communications Commission is well aware of the shortage problem. It exists nation-wide. Two steps have been taken by the Commission to provide relief; opening of the much higher frequencies formerly used by the military, and re-assigning UHF TV channels in certain areas to land mobile. Use of the former military channels in the 890 to 960 mHz range affords little relief to Contra Costa; however, the UHF TV channels, if procurable, are directly usable for system re-engineering.

PART B - SOLUTIONS

Plan One

Central to Plan One is the use of UHF TV channels 16 and 17 as the basis for a complete re-engineering of the law enforcement radio systems of the County, its cities and districts.

Design parameters will be:

* Ability to take any police car to any part of the County and be in communication with its own or a central dispatch center.

* Ability to communicate directly with any other police unit over any distance.

* A County-wide police radio channel for conducting large scale activities.

* A non-voice channel for digital base-mobile transmission (for full mobile digital, two radios will be required).

* Each departmental mobile and portable will have its own, plus coordinating, frequencies.

* Through remote satellite receivers, provide total area coverage for mobile and portable units.

Plan One envisions the complete change-out of all existing police radio equipment, base and mobile. This is necessary as the TV channels 16 and 17 are in the range 482 through 488 mHz, which is just out of reach of present 460 mHz UHF radios and completely unusable by any of the 155 mHz radios. This is, of course, the most expensive way to accomplish total police communication.

Exhibit 3A shows how this plan would work for Contra Costa's law agencies.

Technically, Plan One will work very well for Contra Costa's police agencies. It is not original. The County of San Mateo has established almost the identical system for their police departments. The difficulty with the plan is one of timing. Unless the plan is set in motion soon, the frequencies necessary to construct the system will be beyond reach.

EXHIBIT 3A
Contra Costa County
Emergency Communications Consolidation (911) Study
Police Frequency Plan One
March 1, 1978

# PLAN ONE

| AGENCY | FREQUENCIES | PA 488.3375 CLEMARS | SHERIFF PB 488.XXX1 EAST | SHERIFF PC 488.XXX2 WEST | SHERIFF PD 488.XXX3 CENTRAL | PE 488.XXX4 | PF 488.XXX5 | PG 488.XXX6 | PH 488.XXX7 | PI 488.XXX8 | PJ 488.XXX9 | PK 488.XXX10 | PL 488.XXX11 | PM 488.XXX12 | ZONE FREQUENCIES PX 488.XXX13 EAST | PY 488.XXX14 WEST | PZ 488.XXX15 CENTRAL | L5 155.040 LG DATA CHANNEL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANTIOCH PD | | M | M | | | P | | | | | | | M | M | Z | M | M | D |
| BRENTWOOD PD | | M | M | | | M | | | | | | | P | M | Z | M | M | D |
| PITTSBURG PD | | M | M | | | M | | | | | | | M | P | Z | M | M | D |
| EL CERRITO PD | | M | | M | | | P | | M | M | | | | | M | Z | M | D |
| HERCULES PD | | M | | M | | | | P | M | M | | | | | M | Z | M | D |
| KENSINGTON PD | | M | | M | | | P | | M | M | | | | | M | Z | M | D |
| PINOLE PD | | M | | M | | | | P | M | M | | | | | M | Z | M | D |
| RICHMOND PD | | M | | M | | | | | P | T | | | | S | M | Z | M | D |
| SAN PABLO PD | | M | | M | | | M | | M | P | | | | | M | Z | M | D |
| CONCORD PD | | M | | | M | | S | | | | P | M | | | M | M | Z | D |
| MARTINEZ PD | | M | | | M | M | | | | | M | | P | | M | M | Z | D |
| PLEASANT HILL PD | | M | | | M | P | | | | | M | M | | | M | M | Z | D |
| WALNUT CREEK PD | | M | | | M | | | S | | | M | P | | | M | M | Z | D |
| SHERIFF | | M | PE | PW | PC | | | | | | | | | | Z | Z | Z | D |
| CLAYTON PD | | M | M | | P | | | | | | M | M | | | M | Z | M | D |
| LAFAYETTE PC | | M | M | M | P | | | | | | | M | | | M | Z | M | D |
| MORAGA PC | | M | M | M | P | | | | | | | M | | | M | Z | M | D |

Utilization Code Table

P= Primary
S= Secondary
T= Tertiary
Z= Home Zone
M= Available to Mobiles
D= Data only

SHERIFF ONLY
- PC= Primary - Central County
- PW= Primary - West County
- PE= Primary - East County

Plan Two

The elements of Plan Two are the re-use of existing UHF police radio channels augmented by additional shared channels and a waiver by the FCC to use UHF channels assigned to the fire service for law enforcement communications.

Design parameters are:

* Three zone frequencies for geographical areas of the County.

* Use of remote satellite receivers to provide total area coverage for mobiles and portable units.

* County-wide use of CLEMARS channel for category 4 coordination use intra- and intra-County.

* Each departmental mobile and portable will have its own, plus all coordinating, frequencies.

Plan Two is attractive economically, but it is an engineering compromise that bears principally on the Sheriff's Department. To provide the wide area coverage needed by the Sheriff's Patrol, radio transmitters and receivers operating in the 155 mHz range are located at high mountain-top elevations.

Basic to Plan Two is the use of UHF channels in the 460 mHz range, since this is the only part of the spectrum that will provide additional frequencies through sharing. These UHF channels cannot be used from high elevations because to do so would cause interference with many of the Central California co-channel police users.

For the Sheriff's Department to have the same features and facilities as the rest of the County's law agencies, each car must carry two radios; one VHF and one UHF. This becomes an exceptional problem if digital transmission is adopted and the Sheriff's vehicles are required to carry three radios.

If consolidated dispatching is adopted, there is a partial solution - that would be to rely on "circuit patching" by the consolidated dispatchers. In this case, upon command, the dispatcher will set up a circuit allowing the Sheriff's vehicle and any police department unit to be in contact. Although not as convenient as simply changing mobile radio channels, this system will work.

Exhibit 3B shows how Plan Two will allocate frequencies.

EXHIBIT 3B
Contra Costa County
Emergency Communications Consolidation (911) Study
Police Frequency Plan Two
March 1, 1978

# PLAN TWO

| AGENCY | FREQUENCIES P1 155.190 | P2 155.640 | P3 154.920 CLEMARS VHF | P4 155.310 | P5 154.935 CLEMARS LOW | P6 460.150 | P7 460.375 | P8 460.300 | P9 460.400 | P10 460.025 CLEMARS UHF | P11 39.060 (FARGO) | P12 460.425 | P13 460.325 | P14 460.250 | P15 460.475 | ZONE FREQUENCIES PA 460.600 EAST | PB 460.625 WEST | PC 460.200 CENTRAL | PD 460.350 | PE 460.175 | L5 155.040 LG DATA CHANNEL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANTIOCH PD | | | | * | | | M | | | M | | | | | | Z | M | M | | P | D |
| BRENTWOOD PD | | | | * | | | M | | | M | | | | | | Z | M | M | | P | D |
| PITTSBURG PD | | | | | | | P | | | M | | | | | | Z | M | M | | M | D |
| EL CERRITO PD | | | | | | | P | M | | M | | | | | | M | Z | M | | | D |
| HERCULES PD | | | | * | | | | M | | M | | | | P | M | M | Z | M | | | D |
| KENSINGTON PD | | | | | | | P | M | | M | | | | | | M | Z | M | | | D |
| PINOLE PD | | | | * | | | | M | | M | | | | P | M | M | Z | M | | | D |
| RICHMOND PD | | | | | | | M | P | S | M | | | | | T | M | Z | M | | | D |
| SAN PABLO PD | | | | * | | | | M | | M | | | | | P | M | Z | M | | | D |
| CONCORD PD | | | | | | P | | | | M | | M | | S | | M | M | Z | M | | D |
| MARTINEZ PD | | | | * | | M | | | | M | | M | | | | M | M | Z | P | | D |
| PLEASANT HILL PD | | | | * | | M | | | | M | | M | | | | M | M | Z | P | | D |
| WALNUT CREEK PD | | | | | | M | | | | M | | P | S | | | M | M | Z | M | | D |
| SHERIFF | PW | PC | M | PE | | | | | | | | | | | | | | | | | D |
| CLAYTON PD | M | P | M | M | | | | | | | | | | | | | | | | | D |
| LAFAYETTE PC | M | P | M | M | | | | | | | | | | | | | | | | | D |
| MORAGA PC | M | P | M | M | | | | | | | | | | | | | | | | | D |

Needs Fire Waiver

Needs Fire Waiver

Utilization Code Table:

- P= Primary
- S= Secondary
- T= Tertiary
- Z= Home Zone
- M= Available to Mobiles
- *= Relinquished to Sheriff

Sheriff Only:
- PC= Primary - Central County
- PW= Primary - West County
- PE= Primary - East County

- D= Data Only

Exhibit 3C

Contra Costa County
Emergency Communications Consolidation (911) Study
Police Frequency Plan Two - Frequency Sharing
March 1, 1978

| Designation | Frequency | OTHER USERS | USES * |
|---|---|---|---|
| P1 | 155.190 | Lassen C. | |
| | | Elko C. NV | BM |
| | | Yerrington, NV | |
| | | Shasta Co. | MO |
| P2 | 155.640 | None | |
| P3 | 154.920 | CLEMARS (VHF) | |
| P4 | 155.310 | Siskiyou | BMR-M |
| | | Bakersfield | BMR |
| | | Reno, NV | M |
| | | Henderson, NV | BMR |
| | | Arizona (Statewide) | |
| P5 | 154.935 | CLEMARS (10W) | |
| P6 | 460.150 | Santa Clara City - Primary | BMR |
| P7 | 460.375 | Santa Rosa | BMR |
| | | Modesto - Primary | |
| | | State Police - So. California | |
| P8 | 460.300 | Univ of Nevada - Las Vegas | |
| P9 | 460.400 | Stockton | BMR |
| | | San Jose | |

* KEY:

M Mobile
BM Base-Mobile
BMR Base-Mobile-Relay
MO Mobile Only
BMC Base Mobile Control

Frequency Sharing



| Designation | Frequency | OTHER USERS | USES * |
|---|---|---|---|
| P10 | 460.025 | CLEMARS (UHF) | |
| P11 | 39.060 | FARGO | |
| P12 | 460.425 | San Jose | B |
| | | Sacramento PD. | BMR |
| P13 | 460.325 | San Jose PD. | B |
| | | Sacramento PD. | BMR |
| P14 | 460.250 | Stockton - Primary | BMR |
| | | Berkeley | BMC |
| P15 | 460.475 | San Jose | B |
| | | Sacramento PD. | BMR |
| | | Nevada H.P. | |
| | | Berkeley | |
| Fire PA | 460.600 | City of Hayward | BMR |
| Fire PB | 460.625 | Stockton Fire | |
| PC | 460.200 | Albany PD. | |
| | | San Jose PD. | B |
| | | Sacramento PD. | BMR |
| | | Las Vegas, NV. | |
| PD | 460.350 | San Francisco | BMR |
| | | San Joaquin Co. | BMR |
| | | Coalinga | BMR |
| | | Nevada H.P. | |
| PE | 460.175 | Berkeley - Primary | BMR |
| | | Salinas | BMR |
| | | Monterey Co. | BM |
| | | Yuba - Sutter | |
| | | Nevada H.P. | |

* (See Key on Page )

POLICE RADIO CHANNELS

Alternative A - Use of UHF channels in the TV 16 and 17 range

Advantages:

1) Places all police and Sheriff's Department communications on same part of spectrum

2) Makes use of clear channel frequencies

3) Provides for digital radio channel

Disadvantages:

1) Requires total equipment changeout

2) Difficulty in acquiring enough channels to implement

3) High cost

Alternative B - Use of UHF channels in the 460mHz range

Advantages:

1) Maximizes re-use of existing equipment

2) Recognizes capital outlay recently made by Richmond Police

Disadvantages:

1) Requires sharing channels with other users

2) Splits Sheriff's Department from other police users

3) Requires waiver from Federal Communications Commission

Recommendation: The Study Team, principally because of the difficulty in operating the Sheriff's Department in a different band from all other police departments, recommends adoption of Plan One; the use of UHF TV 16 and 17 channels.

# CHAPTER IV

## 911 - THE UNIVERSAL EMERGENCY TELEPHONE NUMBER

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## 911 - THE UNIVERSAL EMERGENCY TELEPHONE NUMBER

### PART A - REASON FOR ONE NUMBER

#### Citizens and Emergencies

Citizens of Contra Costa County, in common with the rest of the nation, rely almost entirely on use of the telephone to call for help from police, fire, emergency medical and other safety services. Use of the telephone, however, requires that the caller know who to call and have the correct number. Studies reveal that few callers know their police department number; fewer still know their fire department number and many, including visitors and new residents, don't even know their jurisdictions.

In Contra Costa County, a land area of only 733 square miles with a population of less than 600,000, there are 16 law enforcement and 20 fire protection agencies. A total of 46 emergency numbers are listed to reach these entities. Experience has shown that no amount of advertisement and education can assure that citizens will know who to call in an emergency and, as a result, callers dial "0" and trust the telephone company operator to get required help.

#### "0" For Operator

Telephone company operators have rendered good service in handling emergency calls; however, there are a number of reasons why the telephone company will never be able to provide service good enough to support police, fire, medical and other public safety services that are engaged in the protection of life and property.

Chief among these reasons is the physical location of the telephone operator. In the past, the operator answering the "0" calls was located within the local telephone office and the calls received were from citizens living in an area surrounding the telephone office. This meant that the operator often had some knowledge of where to transfer an emergency call.

Telephone companies have, in the last decade, taken great steps to automate their facilities. This has included combining "0" operator service centers. Today, for the entire "415" telephone calling area, with its population of

"0" For Operator (Cont'd)

millions, there are just ten "0" TSPS (Traffic Service Position Stations) locations. They are located in the counties of San Mateo (4), Santa Clara (3), San Francisco (1), Alameda (1), and Contra Costa, with one station in Walnut Creek.

In operation, all calls are automatically directed to an ACDS (Automatic Call Distribution System) located in San Francisco, which redirects each call to the least busy of the TSPS centers. This means that a citizen of Antioch dialing "0" will probably be put in contact with an operator that is not even in Contra Costa County.

Telephone operators are not specifically trained to handle emergency calls. An operator's primary workload is in handling person-to-person, credit card and conference calls and is not expected to recognize a potential suicide, mental defective or social variant. Nor can the operator stay on the line for long periods of time...calls must be processed rapidly, and at best, the operator can only transfer the call to what is hoped to be the appropriate public safety dispatcher.

The worst factor is that the operator never knows which incoming call is of an emergency nature. Calls are automatically placed in queue by the telephone company computer and the operator selects the next call in sequence, never knowing whether it will be an emergency or routine message. This means that the life or death call is actually competing with all other traffic for an operator's attention. According to the telephone company, only 1 in 300 calls is of an emergency nature.

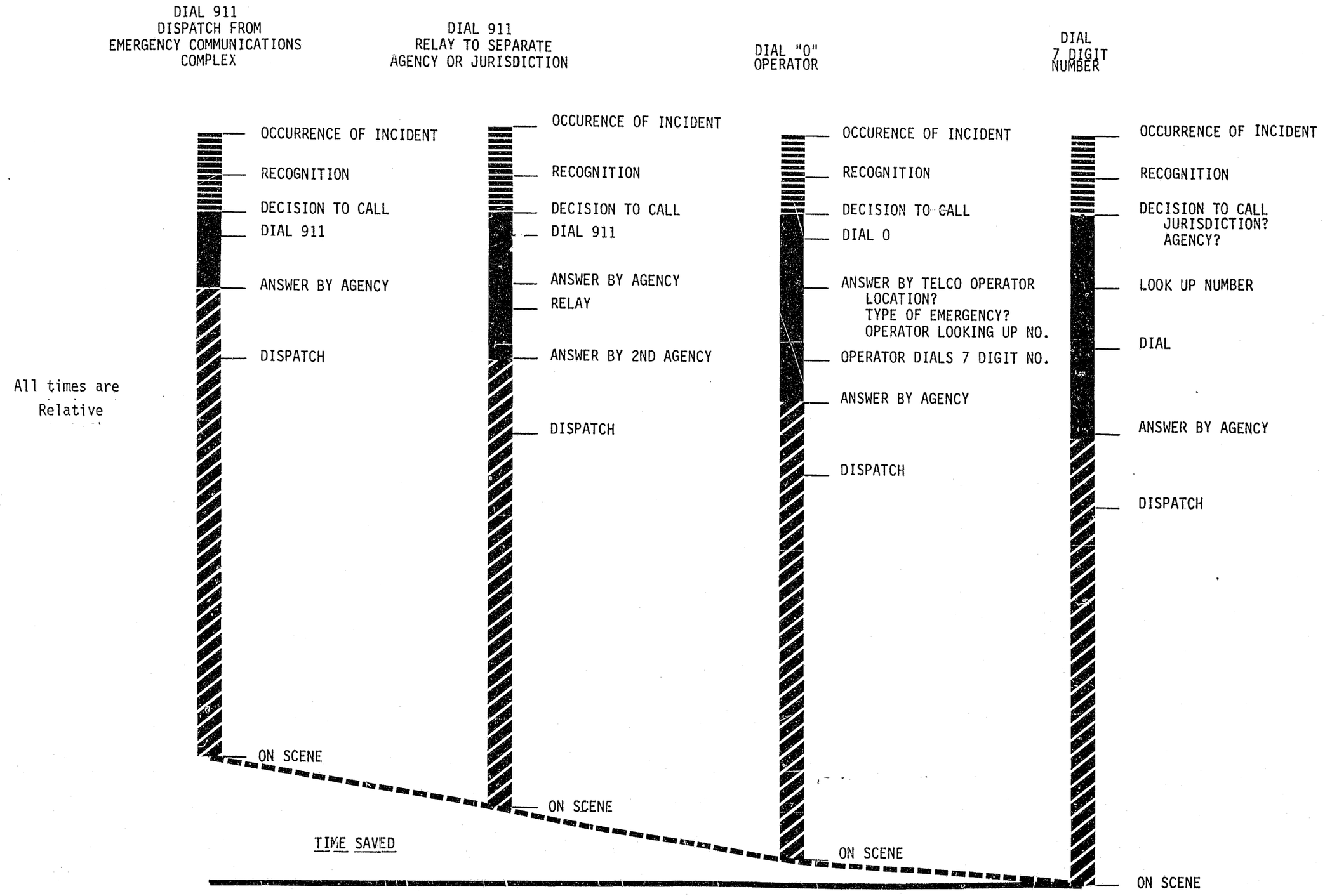
Lost Time

Police and fire agencies have precisely documented statistics on how long it takes their forces to respond to emergencies. But all of these statistics are measured from the time the call is received. There are no statistics on the amount of time lost between discovery of an incident and the receipt of the alert by the safety agency. Exhibit 4-A sets forth in graph form an analysis of this lost time.

This lost time is crucial. These are the early minutes when a police apprehension can be made, the minutes when a heart patient will be saved or lost. And the more pressure that exists, the more time will be taken to find the correct number and the greater the chance to make a mistake in dialing.

EXHIBIT 4A

Estimated Comparative Time Savings Attributable to Telephone System Design




SOURCE: OFFICE OF TELECOMMUNICATIONS POLICY

## PART B - ONE SINGLE EMERGENCY NUMBER: 911

### 911 Nationwide

Recognizing that citizens would always have trouble in knowing the correct number to call in an emergency and that the "0" operator service is not good enough for life and property protection, the American Telephone and Telegraph Company, in 1968, offered a plan for a single number to be used Nationwide. The number "911" was selected for two reasons: all telephone company equipment could be modified to use it, and it was an easy number for the populace to remember.

The American Telephone and Telegraph Company was stimulated to offer this number by a 1967 recommendation of the President's Commission on Law Enforcement and Administration of Justice which stated, "A single number should be established for use over the entire United States". Less well publicized was the desire of the telephone industry to remove themselves from the responsibility of making a mistake in the handling of an emergency call.

American Government and the Telephone Industry were not pioneering in their move toward a three digit, easy to remember, emergency telephone number. Great Britain has "999", Belgium uses "900", and citizens of Sweden dial "000". The English system has been in operation for more than 30 years.

### Ten Years Later

European countries had a relatively easy job of establishing three digit emergency telephone service due to the centralized nature of their governments. When a citizen calls on an emergency, the call goes to the public safety agency and there is no conflict with city, county and district boundaries and the telephone company exchanges. In the United States, particularly in California, with its multiplicity of local governments, the problem becomes formidable. It is so difficult, that ten years after the announcement of 911 capability, only 22 percent of the Nation's citizens have 911 service. And California can only boast of 4 percent coverage. Exhibit sets forth percentages of 911 coverage for each state.

EXHIBIT 4B

| Rank | State | % Covered | Rank | State | % Covered |
|---|---|---|---|---|---|
| 1 | Alaska | 83 | 26 | Nevada | 10 |
| 2 | Nebraska | 62 | 26 | New Jersey | 10 |
| 2 | New York | 62 | 26 | North Dakota | 10 |
| 4 | Alabama | 61 | 29 | Oklahoma | 8 |
| 5 | Wyoming | 55 | 30 | Georgia | 7 |
| 6 | Colorado | 52 | 30 | Iowa | 7 |
| 7 | New Mexico | 45 | 30 | Minnesota | 7 |
| 8 | Tennessee | 41 | 33 | Missouri | 6 |
| 9 | Utah | 39 | 33 | Wisconsin | 6 |
| 10 | Illinois | 38 | 35 | Maine | 5 |
| 11 | Massachusetts | 37 | 35 | Oregon | 5 |
| 12 | Indiana | 34 | 35 | Texas | 5 |
| 12 | Maryland | 34 | 38 | Arkansas | 4 |
| 12 | South Dakota | 34 | 38 | California | 4 |
| 15 | Connecticut | 29 | 38 | North Carolina | 4 |
| 16 | Washington | 27 | 38 | South Carolina | 4 |
| 17 | Michigan | 26 | 38 | Virgina | 4 |
| 18 | Arizona | 25 | 38 | West Virginia | 4 |
| 18 | Mississippi | 25 | 44 | Delaware | 3 |
| 20 | Pennsylvania | 24 | 44 | Kentucky | 3 |
| 21 | Montana | 19 | 44 | Ohio | 3 |
| 22 | Florida | 18 | 47 | New Hampshire | 0.3 |
| 23 | Idaho | 15 | 50 | Hawaii | 0 |
| 23 | Louisiana | 15 | 50 | Rhode Island | 0 |
| 25 | Kansas | 11 | 50 | Vermont | 0 |

Table 1. Number of 911 Systems Installed by 1976

## PART C - DIFFICULTIES IN ESTABLISHING 911 SERVICE

### The Boundary Problem

The biggest technical obstacle to the establishment of 911 service is the mismatch that exists between jurisdictions and telephone company exchanges. In all of California there is only one place where a city boundary coincides perfectly with the telephone exchange - The City of Alameda and the Lakehurst exchange. In each other instance an exchange is bigger than the entity, or the entity is bigger than one exchange but only takes part of another exchange or, as in the case of Contra Costa and Alameda Counties, two exchanges-San Ramon and East Bay -cross County lines. Alameda County's two exchanges; San Ramon and East Bay, cross County lines. Exhibit 4C, using the City of Brentwood and the Brentwood telephone exchange, and Exhibit 4D, using the City of Pleasant Hill served by the Concord and Walnut Creek exchanges, graphically show the importance of this problem.

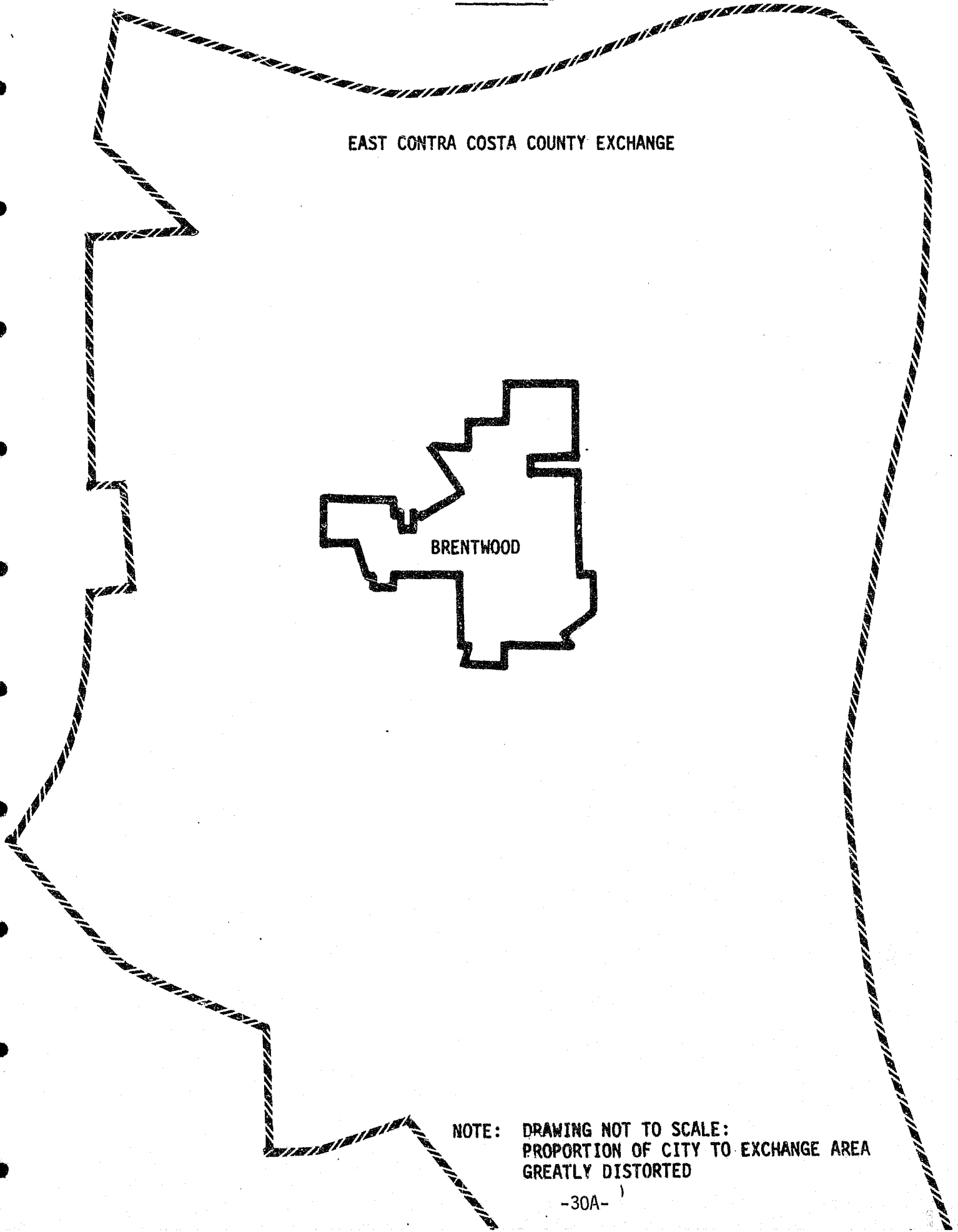
The effect of this mismatch is to have a jurisdiction answer emergency calls from citizens who are not residents of that jurisdiction. Some cities of California, notably Sunnyvale, Palo Alto, Santa Clara, Gustine, Benicia and Tracy, for example, have installed 911 systems which do encompass areas that are beyond their municipal boundaries. In these cases, it is preagreed that the city will receive the calls, screen them, and transfer them to an appropriate authority. In each of these cities the predominant number of potential callers live within city limits and the number of errant callers is less than ten percent of the total number of calls.

There is one very large 911 system that is an example of a municipality agreeing to transfer large numbers of calls-Omaha, Nebraska. Since Omaha is larger than the total population of the surrounding three counties, it receives all 911 calls for the three county area. If the call is from an Omaha caller, it is directly serviced. If it is not, the call is transferred to the correct jurisdiction.

### More Than One Emergency Number

There are other difficulties with the idea of a single emergency number and one of these is the effect on non-police services. A frequently asked question is: Why not have 911 for police, 912 for fire and 913 for emergency medical?

EXHIBIT 4C

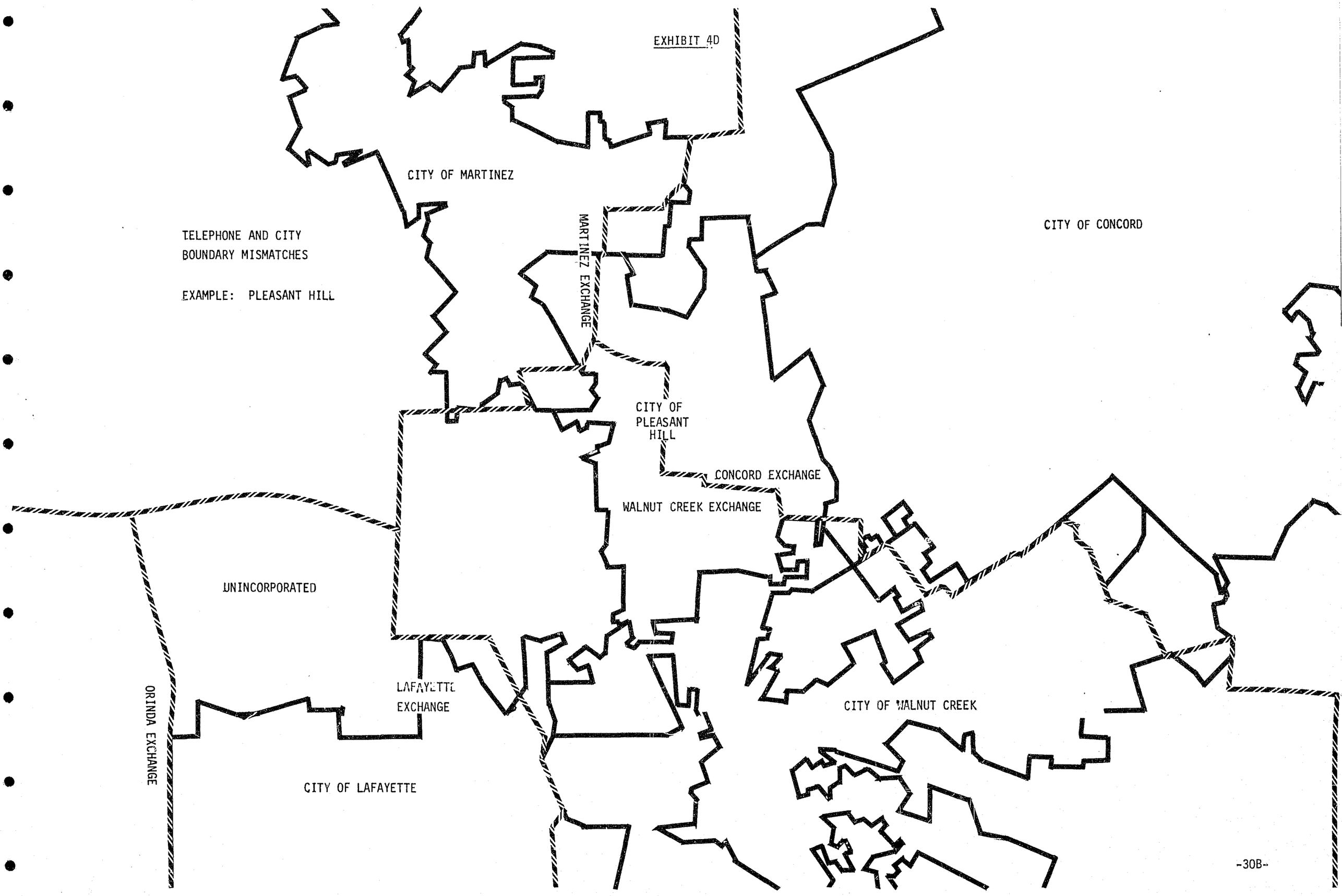



NOTE: DRAWING NOT TO SCALE:
PROPORTION OF CITY TO EXCHANGE AREA
GREATLY DISTORTED

EXHIBIT 4D

TELEPHONE AND CITY
BOUNDARY MISMATCHES

EXAMPLE: PLEASANT HILL



More Than One Emergency Number (Continued)

The Nation's telephone companies provide this retort:

> The purpose of a single emergency number is defeated by this proposition. The major intent of 911 is to give one nationwide code for the public's direct access to an emergency answering center. The effect of other codes would be to cause inconvenience and confusion, particularly to those away from their home communities.

A more practical reason is that the numbers 912 and 913 have already been used in the telephone network; 912 is the area code for part of the State of Georgia and 913 is the area code for the State of Kansas. The cost of changing these codes is tremendous.

Change Dispatch Centers

Police and fire services have always had their own 7 digit "hot" lines - all Contra Costa services are structured this way. Incoming calls almost always come to the correct service agency and except for the need for interservice liaison (washdowns, protection from snipers, rooftop access or assistance with traffic, for example), there was no mixing of dispatching activities.

The Study Team does not believe that there will ever be any segregation of calls by initial number - there is only 911 for all emergency services. That was the plan from the beginning; that is the California State Law and there is no movement to change it. The use of a single number, however, necessitates a change in the way calls have been traditionally received and processed.

With only a single number for calls of all types to all emergency services, existing dispatch centers must be re-designed in one of five basic ways. These are:

* Police receive all 911 calls, screen them, service police, and transfer fire and medical calls to appropriate agencies.

* Fire receive all calls, screen them, service fire, and transfer police and medical calls to appropriate agencies.

* Medical receive all calls, screen the, service medical, and transfer police and fire to appropriate agencies.

Change Dispatch Centers (Continued)

* Establish a "front end" (sometimes called a "call laundry") to receive all calls, service none, and transfer each call to the appropriate agency.

* Combine existing centers into one or more centers that receive all calls and directly dispatch police, fire and medical units.

What Others Have Done

In almost all small agencies such as cities, service districts and even county Sheriff's Departments, the initial call comes into the police or sheriff's department. The reason for this is that statistically throughout the state and even nationwide, 85% of all calls are for police service. There is a considerable difference in the nature of police and fire calls. A police call often consists of a citizen complaining of a neighbor's stereo being too loud, a strange car parked in front of the house, motorcycles racing up and down the street or being bothered by peddlers. Intermixed with this great volume of calls is an occasional shooting, rape or other serious complaint.

Fire services, on their "hot lines", usually have calls in fewer categories; wrong number, business call (referred to a business number), or a working fire. Fire, however, receives many calls for medical assistance and there is a strong community of interest between the fire and medical services. Still - police services get most of the calls.

In a few cases fire departments have received the first 911 call, but these have been specialized and not applicable to Contra Costa County. Rarely has a medical dispatch center been the call recipient, nor would this be sensible for Contra Costa County.

Exhibit 4E shows the breakdown of 911 call recipients nationwide.

The "call laundry" plan is used in Salt Lake City, Utah, Denver, and until recently, was planned for Marin and Los Angeles Counties. In operation, a battery of trained call interrogators receive each 911 call, screen it as to the type of emergency, and transfer it to the appropriate service agency. The system works quite well, but suffers from the fact that no action can be taken directly. Everything is transferred - this delays the process for police, but has relatively little effect on fire or medical, who receive their calls on a transfer base with all but one system design.

EXHIBIT 4E

| Agency | No. | % of Total |
|---|---|---|
| Sheriff's Department | 58 | 11 |
| Police Department | 399 | 73 |
| Combined Police/Fire | 51 | 9 |
| Fire Department | 17 | 3 |
| Rescue Squad | 1 | - |
| Hospital | 1 | - |
| Civil Defense | 3 | 1 |
| City Hall Switchboard | 13 | 2 |
| Other | 3 | 1 |
| TOTAL | 546 | 100 |

Table 3. Type of Agency Receiving 911 Calls.

What Others Have Done (Continued)

The one system that lends itself to 911 without any major adjustment is the combination dispatch center. By merging the dispatch functions of all or at least of all the geographically located police and fire dispatch centers into one large full function operation, 911 service can be established easily.

In operation, the 911 trunks from each sector of the County terminate on equipment answered by fully trained communicators who receive and determine the nature and location of the emergency. This information is, depending on the level of sophistication of the system, entered on paper or a computer mask and is instantly conveyed to dispatchers.

The dispatchers are grouped to serve police or fire-medical services. The radio dispatchers, having constant status of all field forces, transmit directly to police units. In the case of a fire call, the dispatcher communicates directly with the fire station or stations assigned the response.

This system is used in several of the Eastern States and in California by the County of Monterey. Santa Clara County has completed its communications building and is now completing check-out of its computer system, both of which were specifically designed for a consolidated communications system.

## PART D - 911 AND THE STATE OF CALIFORNIA

### California - A Complex State

California, with its 58 counties, 412 cities and hundreds of fire and special service districts, presents a "worst case" for the establishment of 911 service. Realizing this, the Legislature adopted, in 1972, a law that would hopefully become an impetus for public safety services to install the service. This legislation was Assembly Bill 515, authored by Assemblyman Charles Warren, and stated: Every public service provider must have 911 systems installed and working by 1982 and that the State will pay for some of the cost.

### Funding

AB 515 was qualified by the statement that, "For each year that the Legislature fails to enact funding, the implementation date will be slipped one year". The Legislature did not provide funds for the 911 Program until 1976 - a two-year slippage. The funding legislation was Assembly Bill 416, also authored by Assemblyman Warren. The requirement that safety agencies provide 911 service by 1984 is now the law of the land.

Although 1984 is some time away, there are some actions that must be taken in the interim; specifically, by June 30, 1978, a final plan must be filed with the Division of Communications of the State of California. And by June 30, 1979, an order for equipment must be placed with the telephone company.

### Surcharge

The California 911 program, being mandated, must be subvented. To acquire this funding, Assembly Bill 416 was signed into law in 1976 and established a half percent surcharge on intrastate telephone usage. The surcharge does not apply to out-of-state calls nor to equipment such as key telephones or PBX apparatus. The surcharge has been in effect since July, 1977 and is expected to raise thirteen million dollars in its first year.

These funds are to be used for the payment of two categories of system costs: charges by the telephone companies to be paid directly by the State, and a broad category termed "incremental costs", which are those over and above telephone charges. All "incremental costs" must be approved by an advisory committee.

The Advisory Committee

In order to determine who receives funding for costs incurred in establishing a 911 system over and above telephone charges, the State Legislature created a nine member advisory committee composed of representatives of industry, government, and the Legislature. It is the committee's job to review all requests for "incremental costs" and recommend that they do or do not be paid. The very limited amount of monies available for such costs, coupled with the fact that there is no definition of just what these costs are, places the advisory committee in a nearly impossible position.

Incremental costs are assumed to be those direct costs that were caused by the necessity of installing 911 service. For example, if 911 caused call volumes to rise beyond the capacity of an existing center, an incremental cost would be the salary of additional dispatchers, complete with dispatching consoles and an addition to the building to house the new equipment.

It is the opinion of the Study Team, based on personal contacts with members of the advisory committee and the State Division of Communications, that the committee in apportioning money for incremental costs, is going to be receptive to 911 system plans that are cost effective and maximize use of internal resources. Section 53109 of the Emergency Telephone Number Law may set the tone for this committee's actions. It reads, in part:

> "The establishment of such systems shall be centralized to the extent feasible. Nothing in the article shall be construed to prohibit or discourage in any way the formation of multi-jurisdictional or regional systems, and any system established pursuant to this article may include the territory of more than one public agency or may include a segment of the territory of a public agency."

The entire thrust of the Contra Costa County Study on Communications Consolidation and 911 is in resonance with the intent of this article. The Study Team has kept the State Division of Communications' staff and members of the advisory committee up to date on the intent of the Study.

# CONTINUED

1 OF 4

Summary

The emergency number 911 is needed now. It is the most important method of calling for help by the public since the telephone and has been available for more than a decade. Despite this, technical difficulties, particularly in a State with many local governmental entities such as California, have been so great that little progress has been made in its implementation.

This is changing and the number of entities, both in California and nationwide, that are establishing 911 service is rapidly increasing. Some of the systems are based on complex equipment; Selective Routing, for example. But more of the systems are recognizing that 911 service is an ideal beginning for building a full function public safety communications system serving more than just a single agency.

Funding for 911 systems is now available and legislation under consideration appears to strengthen the funding base. The time frame for filing final plans remains on or before July 1, 1978, and the progress of the Study Team assures that this time frame will be met, regardless of how the County and its entities elect to provide the service.

# CHAPTER V

# CONSOLIDATED COMMUNICATIONS FOR THE PUBLIC SAFETY SERVICES

# CHAPTER V

## CONSOLIDATED COMMUNICATIONS

### PART A - A NEW CONCEPT

#### Awareness

The Study Team has found, both in the Police and Fire Service, wide variations in the level of understanding of what is meant by the term "consolidated communications" for public safety services. So few of the Contra Costa chiefs have had an opportunity to see a combined center in operation that there was no awareness that such a complex, if correctly designed and supported, provides important advantages in communications capability, economic justification for the use of new technologies, and often in a reduction, or at least a stabilization of, dispatch center operating costs.

It was clear that until each of the Police and Fire Service Chiefs, along with their administrators and managers, visualized the idea of a combined dispatch center with the same perspective and degree of understanding, it was futile to expect support for the idea. The Team has spent much of its time in raising the level of understanding to a plateau sufficient for the service chiefs to see their own operations functioning through a single communications center. Drawings, graphs, pictures and examples were used along with detailed explanations of the concept. Repeatedly stressed was the natural marriage that exists between consolidated dispatching and a 911 system.

Service chiefs most frequently asked the following questions:

* How to control "Level of Service"

* How to control vandalism - loss of the single center?

* How much will it cost? How are the costs apportioned?

* What to do with existing dispatchers?

These questions were openly broached, but what was sensed and not heard was the ultimate question - Is a Police or Fire Chief willing to have the calls from his citizens answered and processed to his patrol or fire fighting forces by an organization that is not on his payroll nor under his direct control?

This question has been presented to each Police and Fire Service Chief of the County, and in each case, the response has been - Yes, a consolidated center will work, and with adequate controls is acceptable. However, it must be realized that for the service chiefs to have said otherwise would have negated the entire study.

The Team has proceeded in its research with the full realization that only a design for alternative dispatch centers that are economically viable and engineered to recognize the rather extreme variations that exist in the present day operations of Contra Costa's public safety agencies will be acceptable.

PART B - FOUR QUESTIONS

Level of Service

The Team understands that there are marked differences in the level of service provided by individual service agencies, particularly police departments. This appears to be directly linked to the financial base available to each agency. In the case of the police services it seems to be an unwritten understanding between members of the department - command officers, field officers and dispatchers - as to how a department will react to any given emergency. The Team could not find any written instructions setting forth just how to proceed with a call; rather, it is just a widespread awareness of what the department has the capability of doing.

It is the opinion of the Study Team that the ultimate decision of level of service often comes from the field officer. It is this officer, at the scene, who is aware of what other calls are pending and somewhat automatically apportions his time for each call. In cases where a call, in the eyes of the dispatcher, may not even warrant a response, the watch commander makes the decision. But this decision depends largely on just what resources are available at any given moment rather than following a set of precise guidelines.

Fire services have a more accurate method of determining level of service - the "run card". Run cards pre-decide how the department will react to any given type of emergency such as rescue, lockout, still alarm, commercial or residential fire. What action is to be taken for each of these instances is set forth along with other information that might be of value - location of fire hydrants, for example. The reaction of a department, the Team found, is governed by what resources, personnel and apparatus are available.

Level of service can be accurately determined with today's technology. Engineering for all variations of combined communications systems uses a computer as an integral part of the system. The program for computer aided dispatching can have, keyed to each city by type of response, specific instructions telling the dispatcher what action to take. This program can be as general or detailed as each city wishes. Level of service is not a problem for the large, multi-agency dispatch center.

## Building Security

This topic has surfaced without fail at each meeting of police chiefs, and with good reason. In view of the vandalism that has affected utilities, the unknown number of social variants in our society and the ease with which explosives seem to be available, building security is a valid concern. This concern must be countered with precautions in the design of the complex based on a worst case situation.

Aside from the need to protect from contamination of life support facilities - air, water, fuel and lighting - it is not the building itself that poses the greatest target...it is the communications facilities. Antennas, microwave dishes, feedlines, and particularly telephone cables, are the vulnerable items. At this time, each of the County's existing dispatch centers has that same vulnerability, and since there is no provision for back-up communications, especially of telephone facilities, the problem is largely one of attractiveness and scale. A single center will attract more attention and, if destroyed, will affect more departments.

There are designs for buildings that are secure. The Civil Defense authorities have guidelines for structures that can withstand large-scale attack and radiation. The military forces have many buildings that incorporate extensive protection measures. To date, however, no one has found a way to protect against the loss of the telephone company facilities...the true nerve center of any dispatch complex.

The Contra Costa Plan would have to rely heavily on redundancy; that is, having alternate facilities immediately available along with a system design that allows each police department to have its own radio control for field units.

## Cost - Who Pays?

The question of cost is of universal interest and concern. The Team has sensed from the early days of the Study that it will be the ultimate determining factor in a decision of how Contra Costa's public safety dispatching will be done in the future. A separate chapter has been devoted to this subject.

## Existing Personnel

Due to the different salaries, benefits, retirement plans, union agreements and seniority of the dispatchers now working at each dispatch center, merging employees into a new agency becomes complex. But it has been done. The Team has found that more often than not, the new agency offers much better chance for advancement due to the greater number of working classifications. It is true that mergers in some cases have caused marginal employees to realize that they cannot perform at the higher standards that will be required at a combined dispatch center.

The large dispatch center, by its very nature, has a much higher responsibility to the support of the agencies it serves than the single, small center. This responsibility must be reflected in the capabilities of its dispatchers. There must be intensive training provided initially and ongoing in techniques of communications well beyond what would ever be required for the small, single agency center.

The Team has observed that certain of Contra Costa's agencies have people capable and desirous of becoming part of the larger center. Equally important - these dispatchers bring with them extensive information and knowledge of their former jurisdiction, which is of value to the entire group.

Historically, when combined dispatch centers are started, union agreements are not much of a problem. This is generally due to the fact that the salary level for dispatchers in a large center is usually higher than that paid by individual police and fire agencies. A more difficult problem is the difference in retirement plans; especially if any of the existing dispatchers are sworn officers or members of the safety member retirement plan. In Contra Costa, the retirement problem already exists and the possibility of Contra Costa's agencies adopting a method of multi-department dispatching will serve to force an issue that must be resolved anyway.

## Use of the Computer

A combined dispatch center lends itself particularly to computer aided dispatching. A dedicated computer system, aside from limited power "minis", requires a large capital outlay, and this cost does not vary appreciably between that required for a small dispatch center and a large, multi-agency complex. This extends beyond hardware costs - CPU, disc drive, tape (if used), printers, and to some extent, terminals to system software (the program).

Use of the Computer (Continued)

The Team is aware of independent undertakings by the larger police agencies - the Sheriff's Department, Concord, Richmond and Walnut Creek Police Departments - to establish their own computer aided dispatching systems. So far, none of this work is lost; rather, it has served to document police dispatching requirements - a basic step in establishing computer aided dispatching.

The same type of activity has been taking place within Contra Costa Consolidated Fire Protection District. Nearly all of the essential fire service activity has been documented and is available for use in a large scale dispatch center for the benefit of all fire services.

Each alternative design for consolidated dispatching systems envisions the use of computer dispatching. In view of the fact that computer hardware has actually dropped in cost, it is impractical to attempt to design a large multi-agency center that does not employ CAD. However, there is another, more important, reason for engineering the consolidated center around the computer - sophisticated 911.

The Pacific Telephone Company will provide ALI (Automatic Location Information) in a data format that is compatible with the combined dispatch center computer system. As soon as a 911 call is answered, the caller's telephone number, location, business name and class of service, pay phone, residence, business, are displayed on a CRT screen. The system computer provides the jurisdiction, police beat, fire station, or whatever else is required for processing the call. Having this information instantly available to the call interrogator greatly reduces the time required to dispatch the field unit or units.

The cost is prohibitive to have this type of system available at a multitude of small police and fire dispatch systems.

## PART C - ECONOMIES OF COMBINED CENTERS

### Rate of Use of Dispatchers

The biggest single cost benefit of a combined dispatch center is in the reduction of dispatchers required. This is due to the "smoothing factor" that occurs with a large volume of calls from multiple agencies. It can be shown that peak activity for one agency, police or fire, does not coincide with a peak of another department. An individual department has no choice but to staff its dispatch section for a peak load - to do otherwise will cause an automatic overload and possible failure of the dispatch system. This, however, results in an average workload that is less than what the staff is capable of accomplishing.

Call volumes of each police and fire service of the County have been received by the Study Team. This required much effort on the part of the agencies, which was generously provided. Call volumes coupled with call duration are the key to the computation of how many dispatchers are required for a combination dispatch center. But call durations as a statistic are not kept by Contra Costa's police and fire services.

The Study Team monitored police and fire tape recordings in an attempt to develop a reliable factor. Concurrently, the LEAA technology transfer group provided an information base gained through a sampling of millions of calls in dispatch centers throughout the nation. Further corroboration was provided by the telephone company Traffic Service Engineering Group, particularly for call interrogators. The Team feels secure that it's mathematics setting forth numbers of dispatchers needed for consolidated dispatching are accurate.

Exhibit 5A shows the efficiencies that can be gained through a large dispatching center. This is designed to show how many dispatchers are on duty with the present system of decentralized dispatching and the number of dispatchers needed for a single, two or three consolidated centers.

EXHIBIT 5A

COMPARISON OF DISPATCHING STAFF REQUIREMENTS

(Supervision Not Included)

| | Number of Dispatchers |
|---|---|
| 1. Police and Fire dispatchers. In present de-centralized County-City-District system Note #1 | 142 |
| 2. Alternative #1 Single Combined dispatch center. Police and Fire. Note #2 Note #3 | 83 |
| 3. Alternative #2 Two Centers Central-East and West Police and Fire Note #2 Note #3 | 100 |
| 4. Alternative #3 Three Centers Central, East and West Police and Fire Note #2 Note #3 | 108 |

Note #1: This figure does not include anticipated rise in call volumes due to 911.

Note #2: This figure includes anticipated 25% increase in call volumes due to 911.

Note #3: Includes provision for answering CHP and EB Regional Parks 911 calls.

## PART D - TYPES OF COMMUNICATIONS CENTERS

### Types of Dispatching Centers

There are two basic types of dispatching systems used for public safety communications - interrogate and relay (called two stage), and combination (called one stage). In a two stage system, the call is first answered by an interrogator who takes the essential information and relays it to the dispatcher, who contacts the field unit. With a single stage system, the same operator talks to the citizen and to the field unit.

Generally, the two stage system is used for large public safety systems, both fire and police. The advantage is that the public is serviced by an operator without being interrupted by calls from a mobile unit. At the same time, the dispatcher is dedicated to field mobiles without being required to listen to incoming calls. The price paid for this system is the time required to transfer the information from the interrogator to the dispatcher. Secondarily, a problem arises when the call "backs up" in the field. For example, if the patrol car cannot find the address of a call, a query is made back to the dispatcher; but the dispatcher did not take the call originally, so it must be further backed up through the system to the interrogator. Time is lost.

With a single stage system, the same operator is used for interrogation and dispatching. It is common with smaller systems - but not always. Chicago Police Department uses combination operators. On the surface, it appears that with just a single operator a difficulty in the field can be resolved in less time. However, the single stage system is always plagued with the problem of being on the phone with a citizen when a call comes from the field. The citizen is generally disturbed when the dispatcher acknowledges a request or changes a status. Equally bad is to have the field unit call, and because the dispatcher is on the phone, no acknowledgement is made - leaving the officer or fireman to wonder if his radio is working.

Two of the three combined dispatch systems presented as alternatives to the existing decentralized arrangement use two stage dispatching. The reasons for this are that two stage lends itself well to computer aided dispatching and that the efficiency of the personnel rises since they are doing fewer tasks. A large single center for the entire County and two centers serving Western Contra Costa and Central and Eastern County would work best with two stage dispatching.

Types of Dispatching Centers (Continued)

In the case of a single center for Eastern County, there is no real advantage to either system. So few operators are required that there is no saving. It appears that the decision will be made on the basis of whether the Sheriff's Department utilizes an Eastern center for controlling patrol forces in the unincorporated Eastern area. If the Sheriff decides to retain all field force status and dispatch from a single location, the Eastern center will most likely be a single stage system.

## PART E - POLICE AND FIRE ALARMS

### Alarms - Two Types

Both police and fire alarms are of two types - direct and retransmitted. Both types are used in Contra Costa County. In the direct type, the sending equipment is at the customer's location; the readout device is at the dispatch center and the interconnecting link is leased from the telephone company.

A characteristic of the direct system is that all indications - a real alarm, circuit trouble and required periodic testing - are all drains of the dispatchers' time. Further, unless control is exercised, the various alarm companies will plaster the dispatch center wall with various sizes, shapes and colors of readout boxes that require the dispatcher to turn away from a work position to recognize. It is possible to control direct alarm circuits so that they are all uniform audio-visual readouts mounted at the work position panel.

Retransmitted alarms have the sending (or sensing) equipment at the customer's location - school, business, residence or factory. The interconnecting link is leased from the telephone company, but the readout equipment is located at a central alarm station. Central alarm personnel initially receive the signal and determine whether it is a test, circuit trouble or a real emergency, in which case the signal is retransmitted to the dispatch center, once again using leased telephone company channels.

At the center, a single readout device is located which serves to monitor many, perhaps hundreds, of customers through the concentrating action of the central station. This device can be a punched tape, a simple telephone, or what is being engineered into the Contra Costa alternative dispatch plans; a direct computer link. With this plan, not only is the alarm received, but the required action for the dispatcher to take is displayed on the computer terminal.

It is necessary for all alarms, police and fire, to be central station types. It is not feasible to connect direct alarms to a computer system. The Study Team has determined that there are five central station alarm companies serving Contra Costa County and that the cost for a retransmitted alarm system is about the same as for direct circuits. The costs to have a central station alarm company monitor the alarms is offset by the savings in telephone costs through the use of multiplexed alarm loops used by many subscribers.

## PART F - MICROWAVE TRANSMISSION

### The Requirement for Microwave

Any consolidation of dispatch centers of the County, whether a single or several centers, will require remote control of geographically located transmitters and receiving equipment. To connect these outlying transmitters with the dispatch center will require a control link.

All of the plans for consolidated dispatch centers make use of computer aided dispatching. The most economical method of having CAD with multiple centers is to use a single computer interconnected with peripheral terminals at other dispatch centers. There must be a way in interconnecting the remote terminals with the computer data modems.

Both of these applications can be met with leased telephone company lines; however, there are severe limitations on the capability, reliability and cost effectiveness of leased long lines. The alternative available to local government is the use of microwave circuits.

### What is Microwave?

Microwave is simply very high frequency radio. As frequencies increase to the SHF (super high frequency) range, they acquire two characteristics useful for police and fire communications systems.

The first is that very small antennas can be used; so small that they can be made into the shape of a dish which aims the signal in a narrow beam that is hard to intercept by unauthorized persons. Since all of the power is focused in this narrow beam, very little power is required for point-to-point transmission.

The second characteristic is called "bandwidth". Bandwidth is analogous to the width of a highway and controls how much traffic, cars or messages that can travel in both directions at the same time. With the usual two-way radio, only a single voice transmission may be made at the same time. At microwave frequencies, it is possible to, depending on the design of the equipment, send dozens - even hundreds - of messages (or data channels) at the same time. And atop the voices, a control signal is sent that turns on and off remote base/mobile radio transmitters.

What is Microwave (Continued)

The Sheriff's Department operates a microwave system. This is commonly called a "backbone" system because it has a capacity to handle several hundred channels at the same time. Police, fire, and emergency medical services are the chief users, but others - Road and Flood Control operations - also use it to control their radio equipment and increase radio coverage. This system is capable of being expanded to accommodate additional "links" or "drops", which will interconnect extremes of the County and expand radio coverage of all police and fire systems operated by the consolidated communications center.

Exhibit 5B shows the location of existing Sheriff's Department microwave system terminals and the plan for expanding the system to include the entire County.

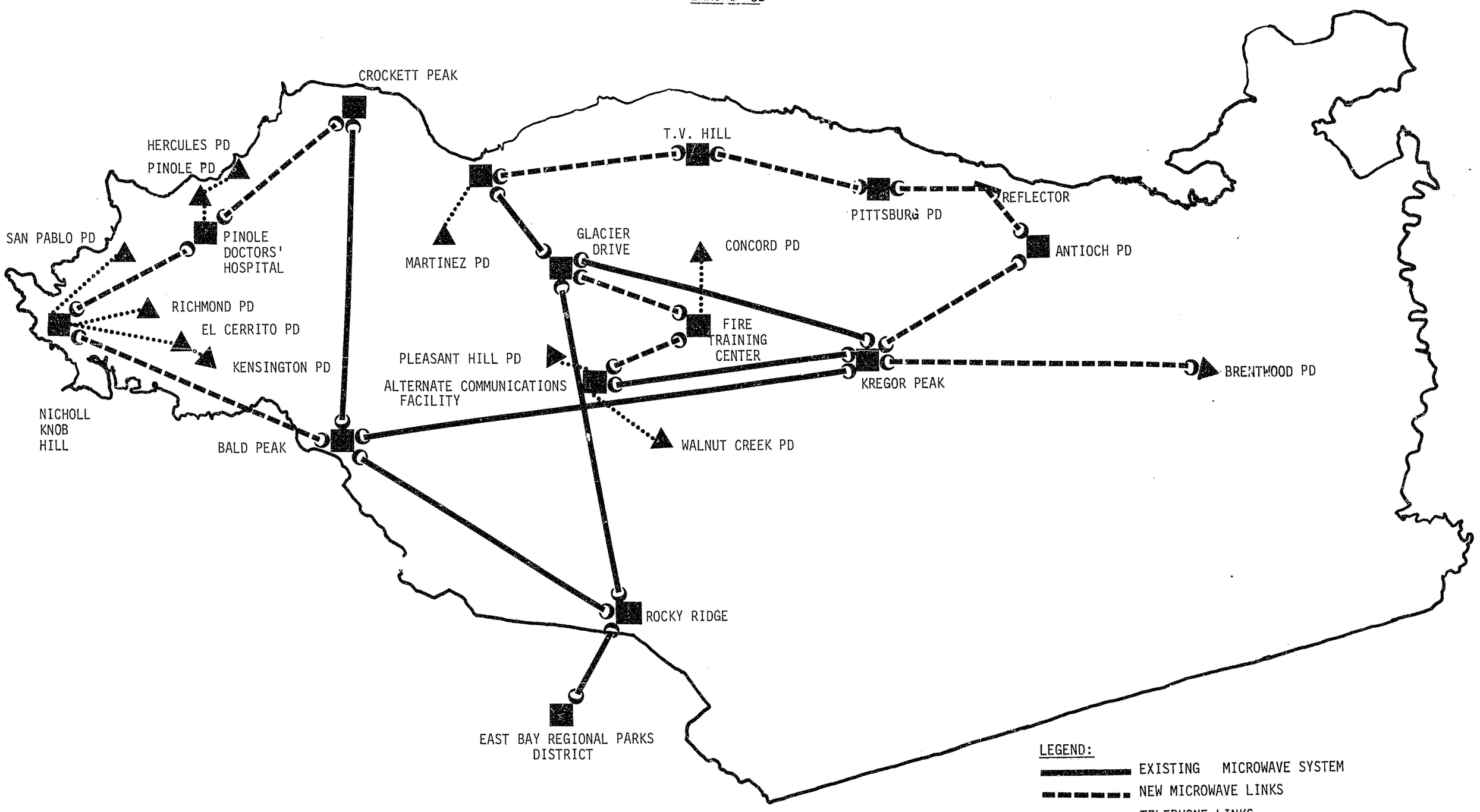
Summary

The concept of a single, two or three dispatch centers serving all public safety agencies within the County or a geographical area of the County lends itself very well to Contra Costa County. The ease with which 911 service can be incorporated into a multi-agency complex and the economies that are possible indicate that consolidation should be regarded as an excellent alternative to the existing number of small dispatch centers.

Some agencies are sensitive to this concept. System security, loss of local control, cost apportionment, merging of personnel with attendant union, retirement and seniority problems and fear that combined dispatching is a step toward total departmental take-over, are all factors that must be addressed and resolved before a plan can be accepted.

Consolidated public safety dispatching systems do work. As the fiscal difficulties of local government in the nation become more acute, more administrators are coming to realize that a multiplicity of individual dispatch centers for police, fire, and emergency medical services may not be the most cost effective way of providing public safety communications.

EXHIBIT 5B




LEGEND:

EXISTING MICROWAVE SYSTEM

NEW MICROWAVE LINKS

TELEPHONE LINKS

NOTE: ALL FIRE DISTRICTS WOULD ALSO BE CONNECTED TO THE SYSTEM. MAP SIZE DOES NOT PERMIT DETAILED PRESENTATION OF FIRE DISTRICT CONNECTIONS

# CHAPTER VI

## A 911 TELEPHONE SYSTEM USING SELECTIVE ROUTING

# CHAPTER VI

## A 911 TELEPHONE SYSTEM USING SELECTIVE ROUTING

### PART A - GENERAL OVERVIEW

#### Description

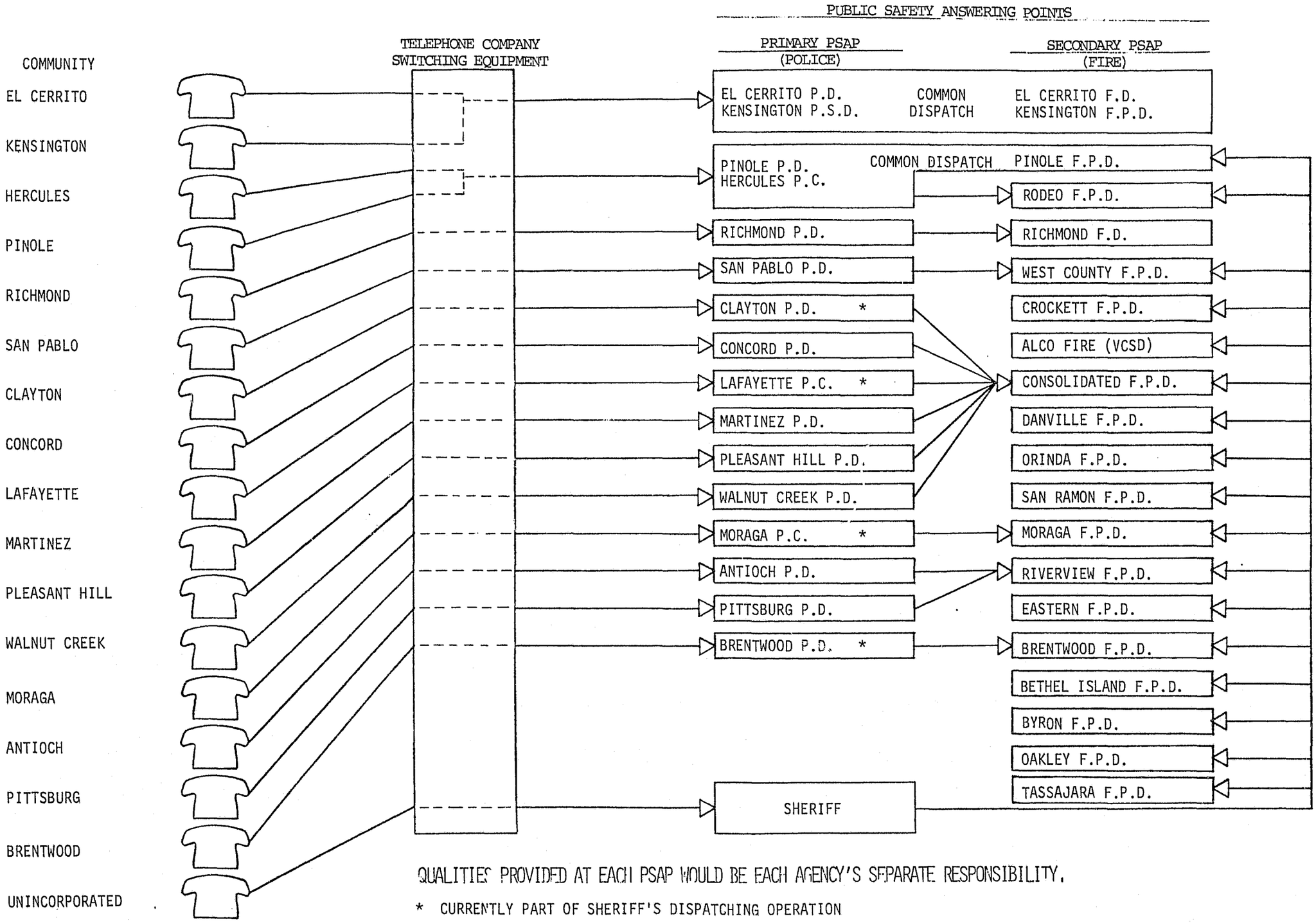
Selective Routing is a type of 911 emergency telephone system that relies on the telephone company's central office switching computer to recognize where each 911 call is coming from and to automatically route it to the appropriate jurisdiction. Selective Routing is characterized by comparatively high installation and on-going costs, the need for continuous update of the computer program to adjust for citizens moving, and no offset savings through a reduction in number of dispatchers...dispatch centers remain essentially as they now exist.

#### Why Developed

Selective Routing was developed to solve the boundary problem -- the non-alignment of telephone company exchanges with service jurisdictions. This problem is so severe in the more developed areas that it threatens an impasse in providing 911 emergency telephone service. It was developed by the telephone company in response to a demand for a 911 system that allows each agency to receive their own calls, irrespective of which telephone exchange the caller is in.

As of this date, there are no Selective Routing systems serving multiple jurisdictions in operation. The City of Chicago has a variation of Selective Routing which routes calls from the entire city to selected police precinct operators, which indicates that the concept is workable, but the first operating system will be in Alameda County. Alameda's system, funded by LEAA, will route 911 calls to each of thirteen city police departments and the Sheriff's Department. It will be the first real test of Selective Routing.

EXHIBIT 6A
CONTRA COSTA COUNTY
EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY
SELECTIVE ROUTING CONCEPTUAL CONFIGURATION
OCTOBER 24, 1977




QUALITIES PROVIDED AT EACH PSAP WOULD BE EACH AGENCY'S SEPARATE RESPONSIBILITY.

* CURRENTLY PART OF SHERIFF'S DISPATCHING OPERATION

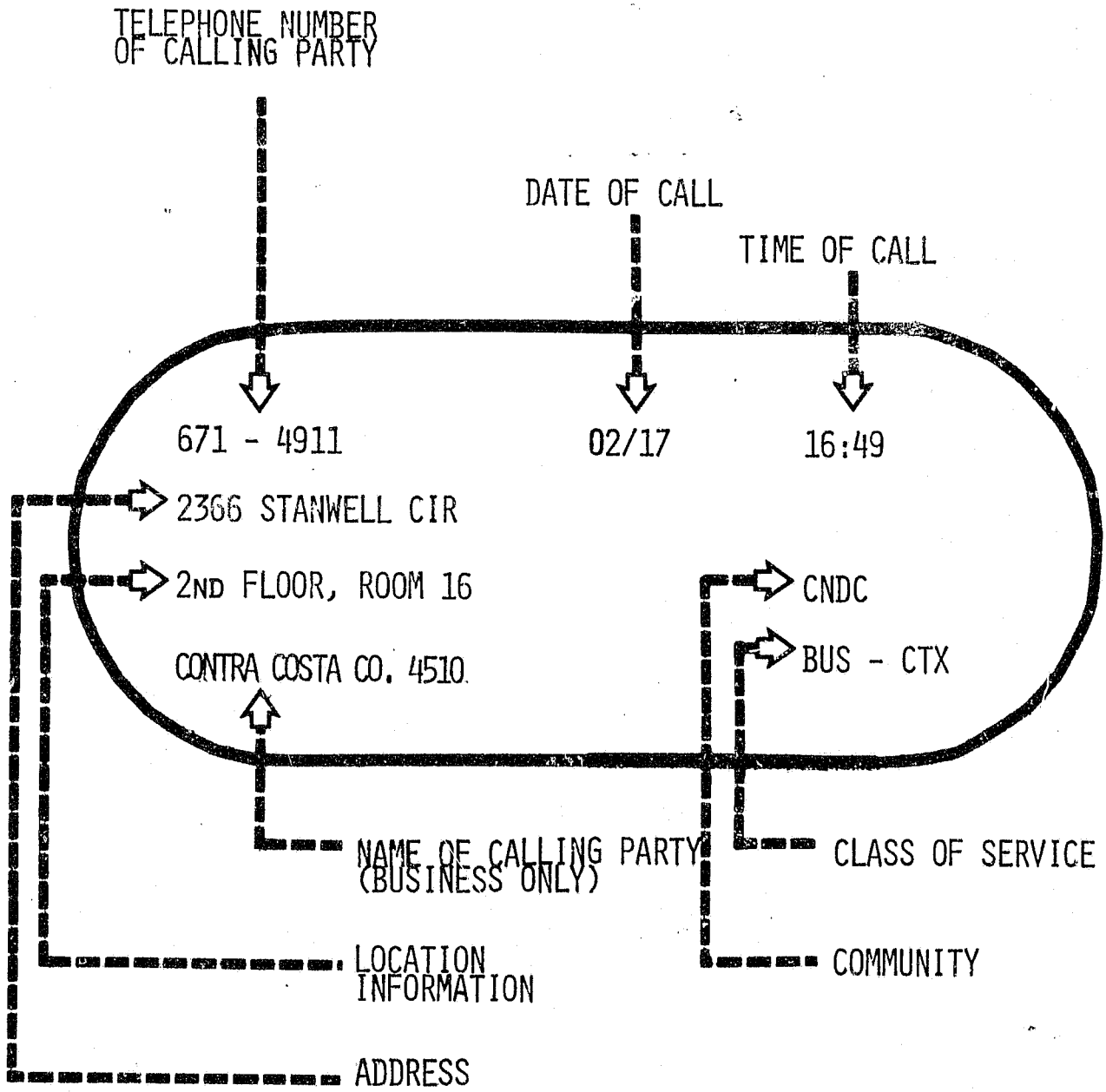
Staffing

A Selective Routing 911 system uses as a basis the existing police and fire dispatch centers. Predictably, there will always be more 911 calls for police than for fire services; therefore, the first call is generally answered by a police dispatch center, screened, serviced if it is a police call, and transferred if it is for fire or medical emergency service.

There will be an increase in the number of calls received. This is due initially to a curious public dialing 911 just to see if it works, and secondarily due to the ease with which the public can reach a source of aid. This increase has been noted and documented in each 911 system established and indicates that existing dispatch centers should be capable of handling 20 percent greater call volume. If a dispatch center is near the breakover point in needing additional personnel, Selective Routing 911 will provide the additional need.

EXHIBIT 6B

# TYPICAL ALI DISPLAY



PART B - TECHNICAL

Level of Complexity

Elementary Selective Routing simply sends each 911 call to the correct response agency. The complaint board operator or dispatcher must still screen the caller for all pertinent information including the caller's telephone number and location. The same telephone company equipment that selects the call route can provide and maintain other more "sophisticated" features; specifically, ANI (Automatic Number Identification), and ALI (Automatic Location Information).

With ANI, the caller's number is displayed to the dispatcher the instant the call is answered. This will show on a small display attached to or "embedded" in the telephone answering equipment. This equipment looks very much like a call director and is made by the CEAC Company for use by Pacific Telephone Company. ANI is of importance for system discipline; for example, crank calls can be traced to the caller's telephone. But more importantly, for calls such as a cardiac attack where the victim reached the phone, dialed 911, but could do no more. The dispatcher, using a reverse directory, may be able to find the location of the caller and send assistance. The problem with just having ANI is that the reverse directory does not have unlisted numbers, and 28 percent of Contra Costa County's residential telephones are unlisted.

With full sophistication, the dispatcher will have not only the number of the calling party appear, but also ALI. Exhibit 6B shows what information will appear as soon as the call is answered. This includes the number of the calling party; again, date and time of call, address of caller, postal zone, calss of service (such as pay phone, business or residence), and if the number is assigned to a business, the name of the business will be shown. This information appears on a CRT (cathode ray tube) terminal provided by the telephone company. Engineering for the Contra Costa system utilizes "data speed 40" equipment manufactured by the Teletype Corporation. For Volunteer Fire Districts which have more than one answering point only one display was costed to be located at the Fire Station due to the high cost of the ALI terminal.

Dispatcher screening is required even with sophisticated 911 features. Neither ANI nor ALI indicate what the nature of the emergency is nor where it occurred. There will be frequent cases where a citizen went to a neighbor's house or a pay phone to make the call for help. The most frequent

Level of Complexity (Cont'd)

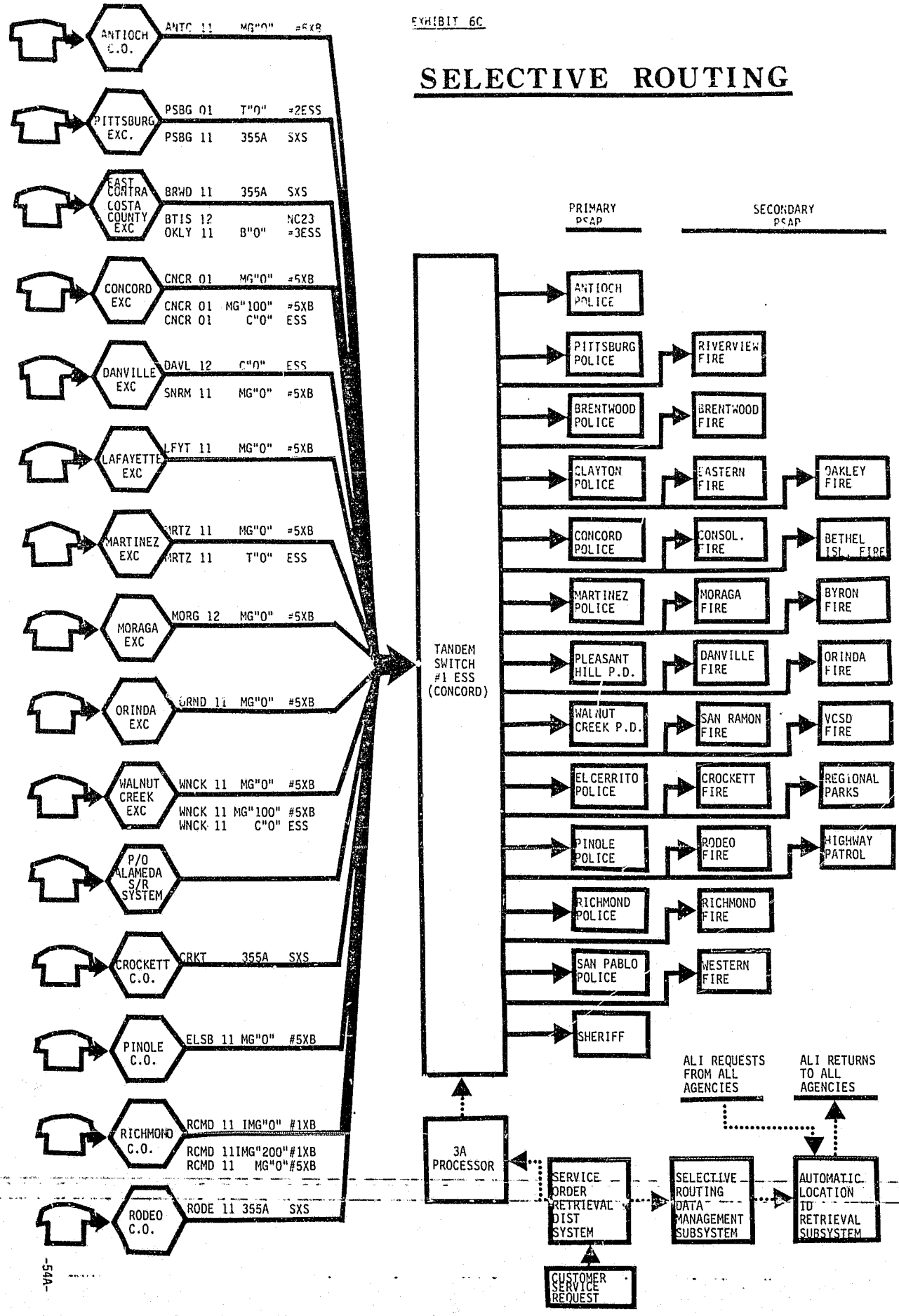
situation will probably be a motorist observing a traffic accident and travelling some distance before finding a telephone to report the incident. In this case, the emergency might not even be in the same county. With any 911 system including Selective Routing, the dispatcher takes the information and relays it to the appropriate authority. Selective Routing does not lessen the need for trained dispatchers.

The ESS

The heart of a Selective Routing 911 emergency telephone system is the telephone industry's ESS (Electronic Switching System). An ESS is a new type of central office telephone switch that uses no moving parts, is equipped with its own computer, and replaces the time-honored central office relays, solenoids and other electro-mechanical devices. There is an ESS in Contra Costa County. It takes up an entire floor of the Concord central office and is available to provide Selective Routing 911 service to Contra Costa's public safety agencies. The high cost of the equipment needed to support a Selective Routing ESS makes one ESS the most economical way of providing this telephone service.

EXHIBIT 6C

# SELECTIVE ROUTING



PART C - FILES REQUIRED

MATS-ARG File

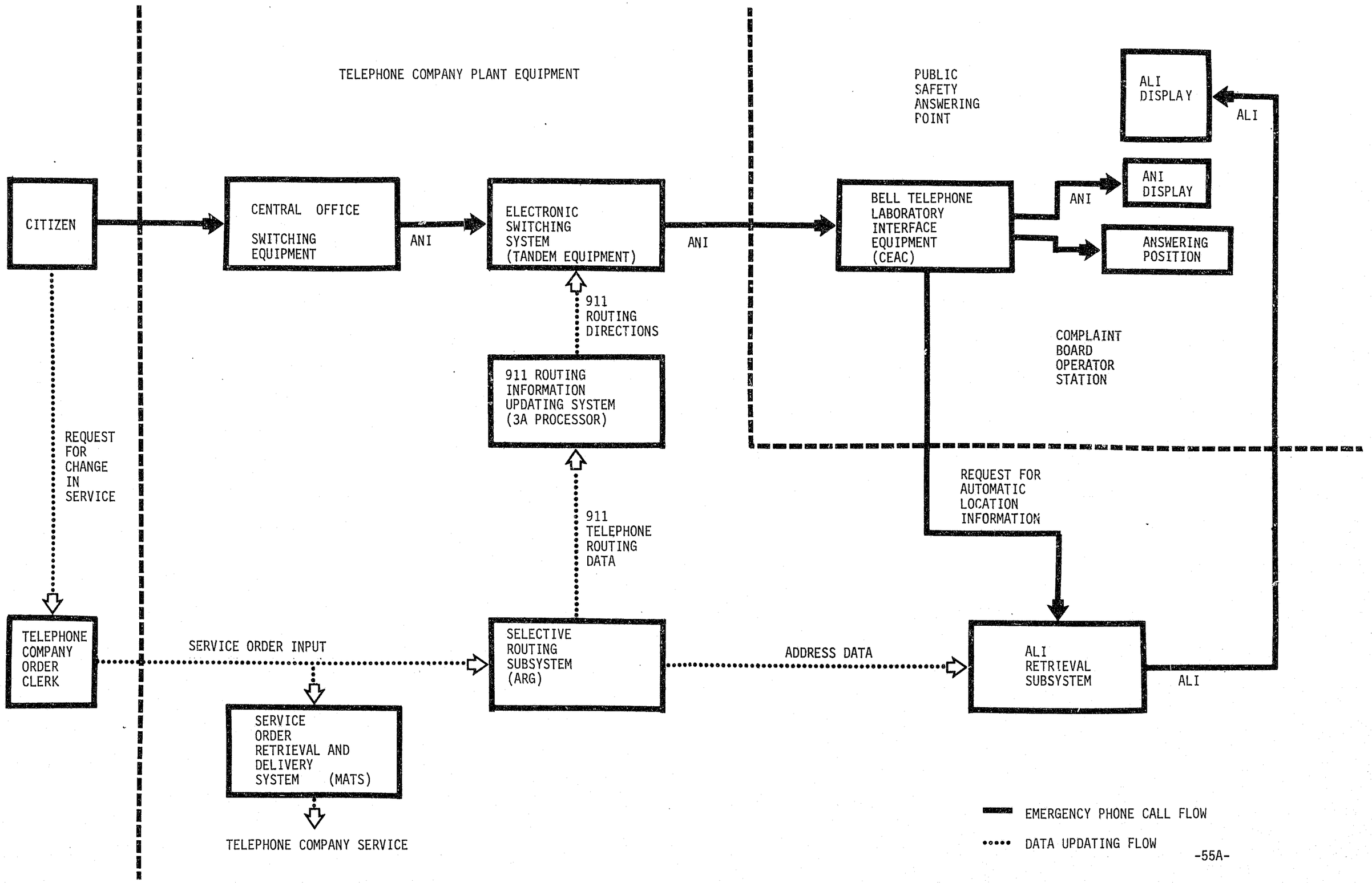
When an ESS is used to provide a 911 system, it will receive a call, recognize the caller's number and location, and according to a set of instructions (computer programs), route the call to the correct answering point. The telephone company does not have these instructions -- they must be provided by the agencies being provided 911 service. The only file maintained by the telephone company is called MATS (Master Address Table System) and it is used to verify street numbers for billing, new connections and changes in service. MATS does not indicate jurisdiction.

Selective Routing 911 requires a new file, often called ARG (Address Routing Guide), which can instruct the computer where to send a call from any telephone in the County. The file must co-relate every telephone in the County with its unique police department and it must be continuously updated. Each time a citizen moves, there will be a change in telephone number, address or jurisdiction.

The basis for this new file, the ARG, is usually the Assessor's parcel maps, Clerk-Recorder's Election Division drawings, and planning maps of each individual city. The ARG is tedious and expensive to develop, but it is essential for Selective Routing. The cost of establishing and maintaining the ARG file and the need for the model 3A computer processor to update the ESS switch are major expenses of Selective Routing. These components, the ARG and the 3A processor, are required no matter what the size of the system; therefore, the cost of Selective Routing is about the same for a single or small group of cities as it is for the entire County. All cost quotations received from the telephone company are based on a system serving all of Contra Costa County.

Exhibit 6D shows how Selective Routing calls are processed through the ESS switching system.

EXHIBIT 6D
SELECTIVE ROUTING TELEPHONE SYSTEM



## PART D - SELECTIVE ROUTING FOR CONTRA COSTA COUNTY

### Applicability

Contra Costa County, with its multiple police and fire service agencies and the omnipresent boundary problem, lends itself well to a Selective Routing 911 system. From a technical and engineering point of view, Selective Routing will be easy to implement; however, there will be operational difficulties due to the large fire districts of the County and the increased call volumes that will occur.

Principal impacts will be on the following agencies:

* Sheriff's Department will receive all calls for fire service in the unincorporated area of the County. These calls will require screening and transfer to one or more of fifteen fire districts.

* All Police Departments will receive calls for fire service in their city limits. These must be screened and transferred to the appropriate fire district.

* The Entire Fire Service will have all their calls screened by police dispatchers before their receipt by the fire dispatcher.

* All Agencies now doing dispatching can expect to receive an increase in call volume ranging from 14 to 20 percent. This will overload certain police dispatch centers, who will have to add personnel and dispatch positions.

Selective Routing normally enjoys a base of support among fire and particularly police service chiefs, as it is the only system that allows each agency to retain direct control over its field units. The Study Team is aware of support for the plan in Contra Costa County based on this reason and stimulated to some degree by neighboring Alameda County's adoption of Selective Routing.

The Study Team does agree that if the system can be funded and if the sophisticated features of ANI and ALI are included, that Selective Routing is a viable method of establishing 911 service to Contra Costa's citizens.

PART E - ORGANIZATION NEEDED

Duties

A program director with two assistants will be required during the initial planning stages of Selective Routing 911:

The principal duties of this group will be:

* Coordinate the construction of the ARG (Address Routing Guide), file with city and County planning agencies, the Assessor and Clerk-Recorder's Offices and police and fire service chiefs.

* Maintain liaison with each agency and the Pacific Telephone Company as to type and location of call answering equipment.

* Establish default answering points.

The most important of these tasks is the creation of an accurate ARG file for the telephone company to use in programming its ESS switcher. This will require close contact; in most cases, actually working in the offices of the city and County agencies in order to exactly determine where every address is located in terms of responsible service jurisdiction. In many cases, by on-site inspections of questionable addresses, service chiefs or their delegates will be required to determine proper jurisdictional responsibilities.

The Pacific Telephone Company service representatives are best able to serve when they work closely with a person or group that can interface with the end user. The array of apparatus available for answering 911 telephone calls is not extensive and there will be cases where the question of where to install specific equipment will require close coordination. The 911 director will be in the best position to make recommendations and point up what other agencies are doing.

A default PSAP (Public Safety Answering Point) is necessary in a Selective Routing system to receive calls that "back up" through the system. There will be cases when a citizen calls 911 from a newly connected telephone which has not been entered into the computer program. This call has no direction and must be routed to a default answering station. Normally, this is done on a prefix basis; for example, a call originating in the Richmond Area Beacon telephone exchange came from a citizen in San Pablo. However, the ESS was not yet programmed to route the call to San Pablo.

Duties (Cont'd)

Instead of having the citizen receive a recording, the call will be sent to Richmond Police, who will handle the call. The default PSAP will have to screen the call for nature of emergency, location, and if the jurisdiction is not theirs, relay the information to the correct agency for action.

After the Selective Routing system is up and operating, the tasks will have diminished to the point where a single coordinator can maintain the file. On an on-going basis, the telephone company will take care of moves and changes of telephones. What will change, however, are city boundaries due to annexations, incorporations and boundary corrections.

The Mandate

California Legislature has mandated the establishment of 911 service. According to SB90 and AB2008, a mandated requirement must be paid for. Although money is now being collected to pay for 911 systems, there is serious question as to just what is going to be paid for. The State planning manual, government codes, revenue codes and the opinions of the State Division of Communications do little to provide a base for funding upon which a local government can make 911 planning decisions.

In 1972, AB515, the "Warren Bill", called for 911 service in California by 1982. This was followed by AB416, also a "Warren Bill", setting up the machinery for paying for 911 service. In July, 1977, a surcharge of 1/2 percent was put on all intrastate telephone service which is expected to generate 13 million dollars and will rise to 18 million in October, 1977 when the surcharge rises to 3/4 percent. There is no agreement as to whether this fund will support the cost of 911 service.

The Guidelines

Contra Costa County is well ahead of most other complex counties in 911 system planning. It would appear that those counties who have their plans firm and who qualify under the heading of simple - not sophisticated - 911 systems, will receive full funding. Selective Routing without ANI and ALI are regarded as simple systems.

It appears that Selective Routing for Contra Costa will be paid from State surcharge revenues. The features ANI and ALI, although desirable and even essential to a smoothly operating system, are classed as "incremental costs" and must be approved by an advisory board. If there is to be a shortage of funding, it will be the incremental funds that will be withheld.

Summary

Station Selective Routing is a 911 telephone system that relies on the telephone company equipment to distribute the call from a citizen to the appropriate jurisdiction - usually a police department. If the call is for fire, emergency medical, or any other type of service, the call is transferred to the correct service agency. Most Selective Routing systems have the police department answer the call first since most calls are for police service.

Selective Routing is expensive in terms of telephone company charges. However, it is approved for payment from 911 surcharge revenues. Therefore, there is question as to whether or not it is any more expensive in terms of user cost. The system does require the user to develop an accurate address routing guide for the telephone company's use. This file development is expensive and is not covered by the State surcharge revenues.

Selective Routing is well suited to Contra Costa County. It does not provide any saving in personnel costs since dispatch centers are retained without change; however, neither does it require substantial change in the way a department does its dispatching.

Station Selective Routing

Advantages:

1) Maximum control over selection of dispatching personnel

2) Greatest degree of independence from other departments

3) Minimum initial capital outlay

Disadvantages:

1) No economies in reduction of personnel

2) Least degree of interservice of coordination

3) Least degree of interdepartment coordination

Station Selective Routing (Cont'd)

Disadvantages:

4) Requires each agency to provide for computer aided dispatching individually at great expense

5) Totally dependent on telephone company equipment to route calls

6) Highest ongoing costs of all plans

7) Every fire service call must be transferred

8) Need to develop and maintain ARG (Address Routing Guide) file

# CHAPTER VII

# ONE, TWO AND THREE CONSOLIDATED DISPATCH CENTERS FOR PUBLIC SAFETY SERVICES

# CHAPTER VII

# ONE, TWO AND THREE CONSOLIDATED DISPATCH CENTERS FOR PUBLIC SAFETY SERVICES

## PART A - ONE DISPATCH CENTER

### Design

Chapter V sets forth a design for a single communications complex serving all public safety agencies of Contra Costa County. The design is based entirely on the communications requirements of each public safety agency of the County as given to the Study Team. The center will, in effect, retire existing small de-centralized dispatch centers now serving police and fire services and place these functions into a single complex equipped with the latest in communications technologies.

The design is for a "two stage" center utilizing separate complaint board operators and dispatchers who will receive, verify and categorize calls, deploy departmental police units and activate fire engine companies, apparatus and personnel. California Highway Patrol and East Bay Regional Parks District Rangers, among others, will receive emergency calls on a call receipt and transfer basis.

Maximum use is made of computers; police and fire for reducing dependence on personnel in the call receipt-dispatch process and telephone companies for providing the advanced 911 features; automatic number and caller location information. Computers will also be used to create management information and required files for the police and fire services.

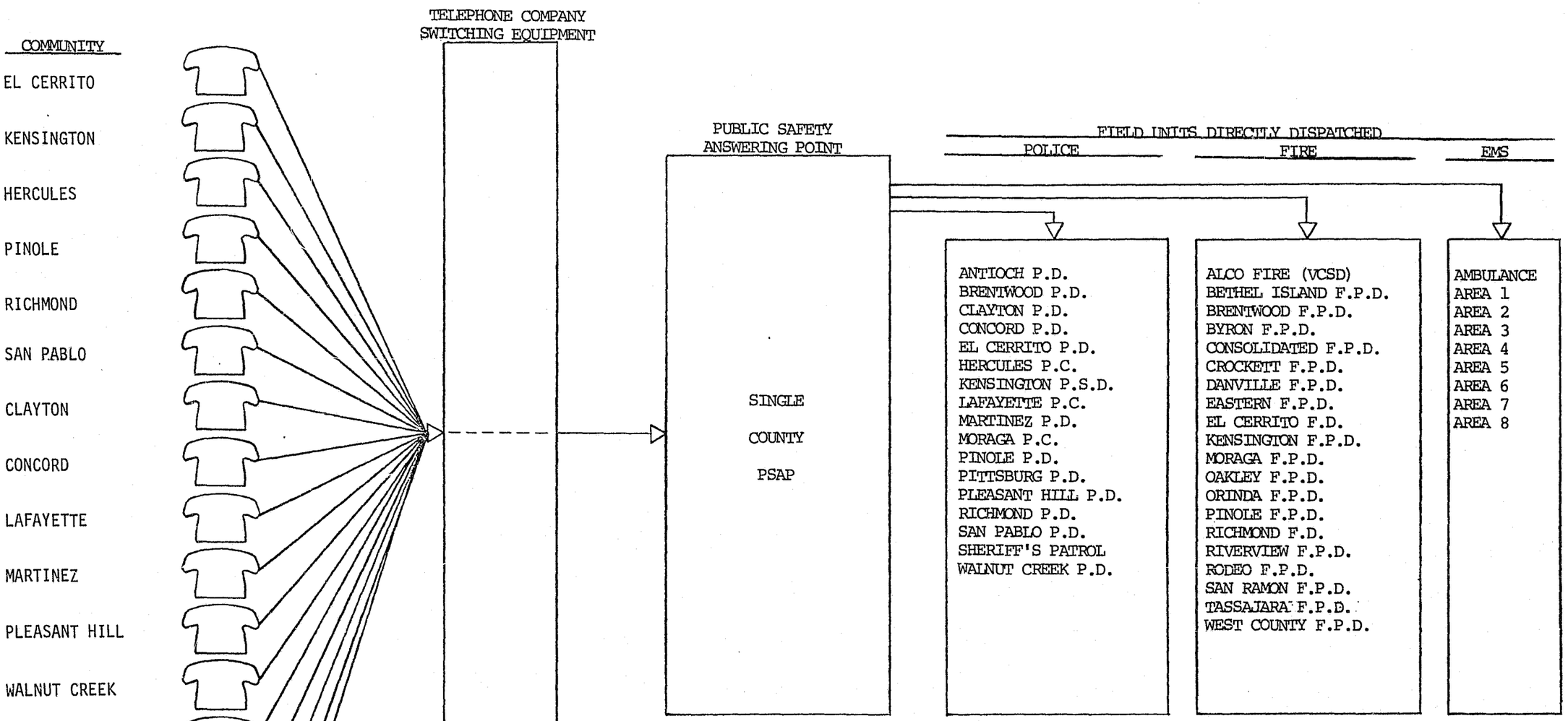
### Capabilities - Call Answering

* Receive 911 calls from the entire County

* Receive calls on 7-digit emergency departmental numbers

EXHIBIT 7A

# CONTRA COSTA COUNTY
# EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY
# PRELIMINARY SINGLE CENTER CONCEPTUAL CONFIGURATION
## OCTOBER 24, 1977




QUALITIES PROVIDED AT PSAP:

1) ANSWER, INTERROGATE AND DISPATCH ALL CALLS FOR SERVICE RECEIVED BY
   - A) 911 LINES,
   - B) SEVEN DIGIT EMERGENCY LINES,
   - C) "0" (OPERATOR) TRANSFERS,
   - D) ALARM CIRCUITS, AND
   - E) ANY OTHER CALL TRANSFERRED TO PSAP.
2) ANI (AUTOMATIC NUMBER IDENTIFICATION)
3) ALI (AUTOMATIC LOCATION IDENTIFICATION)
4) CAD (COMPUTER ASSISTED DISPATCHING)
5) OES COMMAND CENTER
6) PUBLIC WORKS COORDINATION
7) TRANSFER LINES TO
   - A) CALIFORNIA HIGHWAY PATROL
   - B) EAST BAY REGIONAL PARKS
   - C) ALL OTHER AGENCIES

Capabilities - Call Answering (Cont'd)

* Receive automatic alarms; heat rise, water flow, intrusion, robbery from business, industry, schools and others.

* Receive "O" telephone operators' emergency calls

* Receive calls from field units, other services and citizens

Principal Functions - Police

* Maintain, through use of computer, exact status of each field unit

* Upon receipt of verified call, use departmental police frequency to dispatch police unit(s)

* Receive calls from field units and take action as officer directs

* Maintain ALPHA file containing: name, address, phone number, physical description, prior CII number, whether witness or suspect, whether or not conviction, type of incident and jurisdiction for each department of the County

* Dispatching computer will be interfaced with the JAAC distributed processing system so that warrants will be updated directly by the courts

* Become the Contra Costa County PIN (Police Information Network) interface for all departments

* Print for watch commander use activity reports for each department on a shift, day and month basis

* Create file for transmittal to BCS (Bureau of Criminal Statistics) concerning activity of each department

Principal Functions - Fire

* Through use of computer, maintain exact status of all departmental and district personnel

* Maintain in computer file status of all apparatus both "on line" and reserve

Principal Functions - Fire (Cont'd)

* Maintain in computer current "run card" file showing which station, engine company, apparatus and personnel are to respond to an alarm. This same file will contain all mutual aid information, target hazards and locations of fire hydrants on a continuously updated basis.

* Upon receipt of a verified alarm, alert fire station personnel of response needed providing all essential information. This alerting will take place both by wire and by radio in accordance with ISO (Insurance Service Organization) dictates.

* Receive calls from field units; inspection, administrative and suppression, and take action as officer dictates.

* Automatically create CFRS (California Fire Reporting System) on magnetic tape for each fire department and district. As required, transmit this file to Sacramento State Fire Marshal's Office.

Principal Functions - Emergency Medical Services

* Maintain in computer file status and availability of all medical response units; private and public ambulances, paramedic teams and key medical personnel.

* Maintain response areas of the County with indication of prime, alternate and mutual aid emergency medical service providers.

* Upon receipt of a verified call for emergency medical assistance, dispatch appropriate ambulance or other medical aid. Alert police and fire service within that area.

* Be the termination point for emergency medical "medcom" radio telemetry channels. Interface mobile telemetry with designated trauma reception centers of the County.

EXHIBIT 7B

EMERGENCY COMMUNICATIONS COMPLEX

PROPOSED OPERATION SYSTEM

VOICE PATH

AUTOMATIC CALL DISTRIBUTER SYSTEM

COMPLAINT BOARD OPERATORS

POSITION 1

POSITION 2

POSITION 3

POSITION 4

POSITION 5

POSITION 6

POSITION 7

POSITION 8

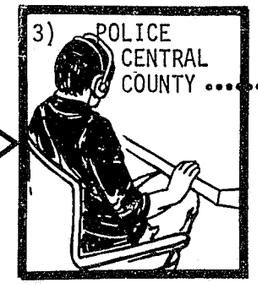

POSITION 10

POSITION 11

COMPUTER AIDED DISPATCHING SYSTEM

1) POLICE WEST COUNTY

2) POLICE WEST COUNTY




4) POLICE CENTRAL COUNTY

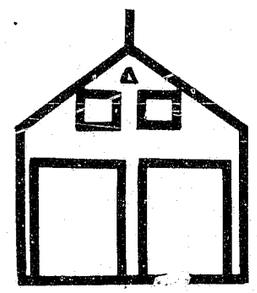
5) POLICE EAST COUNTY

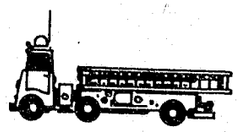
6) POLICE ALL COUNTY

7) EMS & FIRE BACKUP

8) FIRE ALL COUNTY

9) FIRE ALL COUNTY





Engineering Parameters

Equipment for the single public safety dispatch center has been designed for peak hour workloads and the staff requirements - complaint board operators and dispatchers - have been based on the peaks of each working shift. These parameters assure the following capability:

* An average busy hour call answering delay of three seconds. Ninety percent of all busy hour calls will be answered within ten seconds, and the remainder in less than thirty seconds.

* All incoming 911 telephone trunks will have a P005 grade of service. This equates to 1 busy signal in 200 tries.

* Maximum delay through the computer aided dispatch system will not exceed ten seconds.

* Maximum delay in receiving ALI (Automatic Location Information) from the telephone company computer will not exceed 0.75 second (three-quarters of a second).

* Maximum radio channel delay - three seconds during busy hour.

These design parameters are well within the capabilities of modern dispatch center engineering. The goals are based on peak (not average) call volumes, and each call will be handled in the same controlled manner, irrespective of the knowledge and memory of the complaint board operators and dispatchers. This will result in a shortened and "evened" time frame for the call receipt-to-dispatch process, particularly for the police service.

The Complaint Board Operator

With any 911 equipped dispatch center, there is no indication of the type of emergency until the call is answered. All calls, whether for fire, police or medical, arrive on a single number - 911. Therefore, the center uses a common group of complaint board operators who determine the type of call and its severity. Upon answering a 911 call, these operators will immediately receive on a CRT (cathode ray tube) screen the ALI information from the telephone company. (See Exhibit 6B) This will include the following:

* Caller's telephone number

* Address from where the call is being made

The Complaint Board Operator (Cont'd)

* Business name(names of persons will not be shown)

* Class of service: Pay phone, business, residence

To this information the complaint board operator, using the computer keyboard, will enter additional information gained through querying the caller. At a minimum, this will include:

* Nature of incident

* Location of incident

Using the computer dispatching system, the complaint board operator transfers the completed call for service request to police, fire or both, radio dispatching groups. The Computer System will also notify the complaint board operator if this incident or similar incident has already been in the same area.

Police Dispatch

The center will have three groups of police dispatchers, each dedicated primarily to a geographical area of the County. These will be: West County (El Cerrito, San Pablo, Richmond, Kensington, Pinole and Hercules and the Sheriff's Patrol for the Rodeo, El Sobrante, North Richmond unincorporated areas), Central County (Walnut Creek, Concord, Pleasant Hill, Martinez and Clayton and the Sheriff's Patrol for unincorporated Central areas), and East County (Antioch, Pittsburg, Brentwood and Bethel Island).

Each dispatcher work position will have the ability to function in any zone so that a peak of activity simply means that a dispatcher will move to where additional help is needed. Police call volumes will determine how many dispatchers will be needed for each area.

Police Dispatch - CRT Display

The completed call for service request from the complaint board operator will show on the screen at the work position of the most available radio dispatcher for one of the geozones. This display will indicate the following:

* Caller's telephone number and address

* Nature and severity of the incident

Police Dispatch - CRT Display (Cont'd)

* Location of the incident

* Prior calls to this address and any hazards known to exist

* Level of service (pre-decided by each police department)

On a second CRT display screen, a list of available resources will be shown. This will include patrol cars, detective units, supervisors and reserves. From this list the police dispatcher makes the determination of who will respond and transmits the message by voice. When an acknowledgment is received from the mobile unit, the dispatcher updates the computer memory showing the selected unit having received the detail.

Determining Level of Service

Currently, local public safety agencies rely on dispatch personnel to administer the level of service established by city councils, boards of commissioners, service chiefs and other local officials. During a dispatcher's training, the dispatcher is given specific detailed instructions on how to process any particular call that may be received. The dispatcher provides service following these instructions and does not determine the level of service to be provided.

In an era of increased demands for services coupled with decreasing local agency revenues and large dispatcher turnover rates, it has become difficult to maintain and train dispatchers on the correct procedures for each call. There are just too many different types of service calls for one person to remember exactly what to do in each case.

With the aid of the computer, local agencies will be assured that each call will be properly dispatched in accordance with that agency's selected level of service. Instead of relying upon people to remember each response, the computer will notify the dispatcher and complaint board operator of the responsible local agency's exact instructions for handling that precise type of service request.

Two pieces of information are needed before any dispatcher can process a request for service; the incident location and the incident type. A matrix would be maintained in the computer so that as soon as these two pieces of information

EXHIBIT 7C

| Type of Incident | | Type of Response By Responsible Agency | |
|---|---|---|---|
| Code | | Richmond | Brentwood |
| 211-S | Robbery; Silent Alarm | Respond 2 cars; closest car code 3, back-up car code 2, notify watch commander | Respond all cars available; request Sheriff back-up if less than 2 cars available; respond duty officer |
| 905-S | Stray Cat/Dog | Notify Animal Control, Respond unit only if life or property in danger or if unit is available and citizen is upset; low priority | Respond unit when available; notify Animal Control |
| 586 | Illegal Parking | Notify Traffic Control unit; Respond only if Traffic Control unit not available and suspect vehicle represents a hazard; low priority | Respond unit when available; low priority |

Determining Levels of Service (Cont'd)

are input, the computer would produce a CRT display for the Emergency Communications Complex personnel containing the local agency's preprogrammed instructions for how to service the call. Exhibit 7C shows an example of this matrix for two different police departments.

The complexity of fire dispatching procedures has already motivated most fire districts to adopt a manual service response matrix in the form of street and run cards. The Emergency Communications Complex would computerize fire district street and run cards and continue to dispatch fire apparatus in accordance to each district's response desires.

These level of service matrices will also provide performance objectives and reports, which will increase each agency's ability to maximize service to the citizen by the dispatching staff. Local control over the service provided will be quantified and documented by computerized reports and statistics sent to each agency. This documented evidence of performance will allow agencies to monitor performance and effect immediate changes in dispatching procedures as difficulties arise.

Computer Aided Dispatching

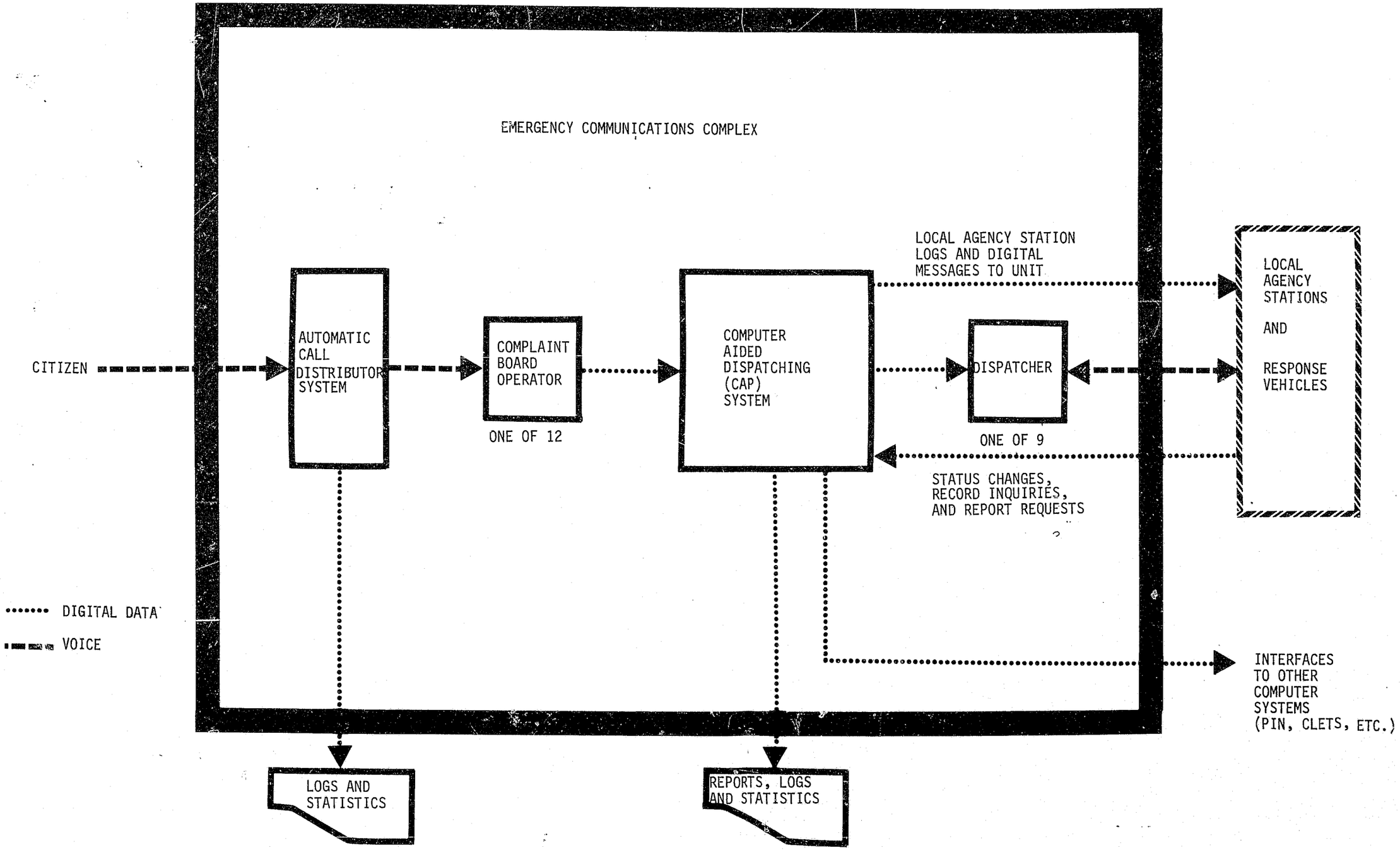
A modern day dispatching operation cannot function economically without the assistance of the computer. Dispatchers need instantaneous access to enormous volumes of constantly changing information to provide quick relay of information to the correct field unit. Also, administrators need reports and statistics while the information is current enough to allow the administrator to take effectual action to optimize the utilization of his field forces.

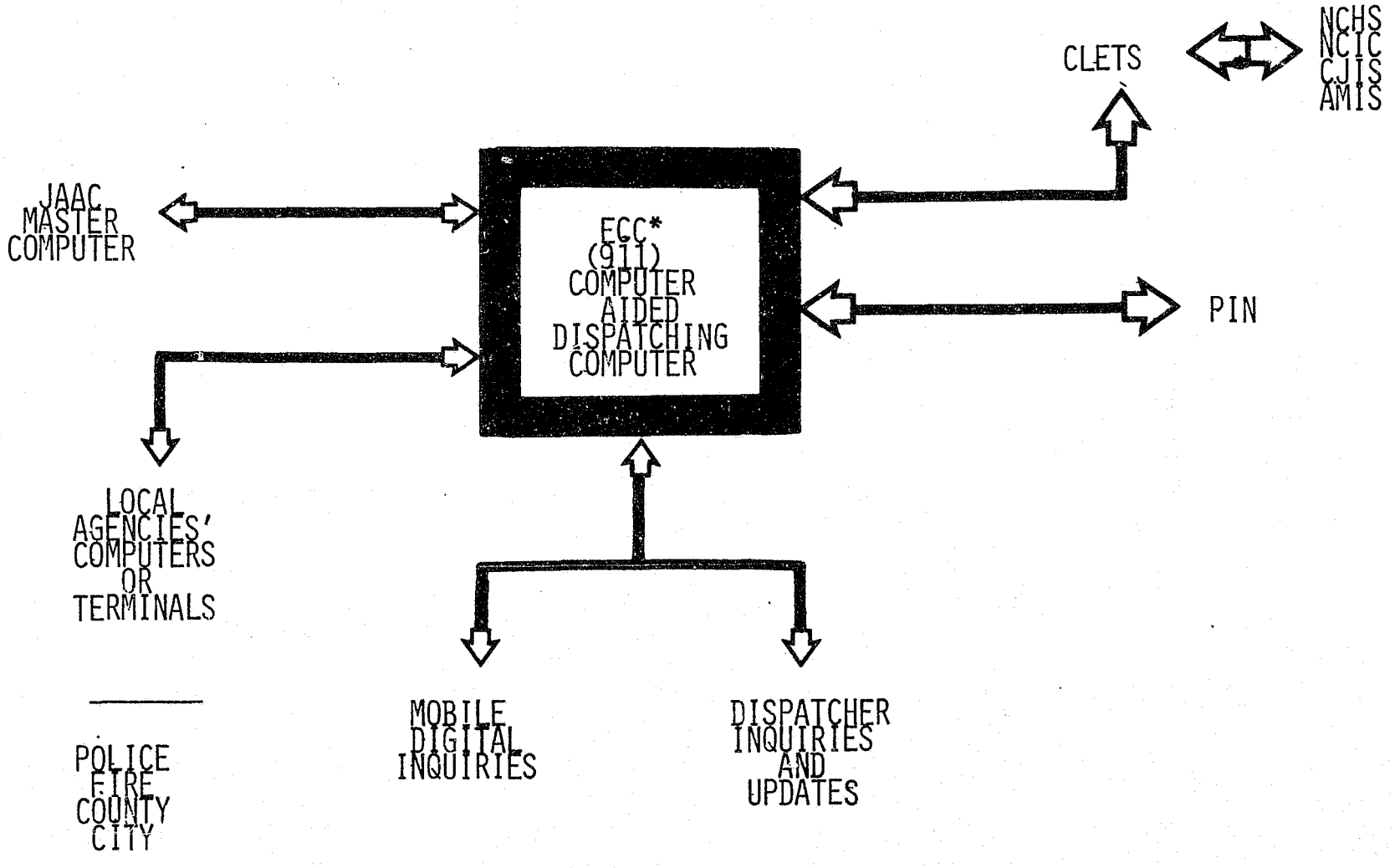
Dispatch operations can be operated without CAD, but not as efficiently. The cost of manpower to maintain and process logs and records and to prepare reports and statistics on a timely basis is exorbitant. Rather than pay the high personnel costs required to adequately document the dispatch function, most departments have chosen to reduce the amount of documentation available. This has lead to a delay of two to three months in the preparation of some reports and greatly increases the possibility of dispatcher or administrator error.

The computer is already in limited use by all police departments in the County. The California Law Enforcement Telecommunications System (CLETS) and Police Information Network (PIN) are both computer based processing systems which allow law enforcement officers to use remote computers to

EXHIBIT 7D

SIMPLIFIED COMPUTERIZED DATA FLOW DIAGRAM






* EMERGENCY COMMUNICATIONS COMPLEX

EXHIBIT 7E

# PROPOSED COMPUTER INTERFACE PLAN

Computer Aided Dispatching (Cont'd)

determine if suspect warrants or stolen article reports are on file in another jurisdiction. However, these services do nothing to help handle the far greater workload involved with processing local dispatching information requirements.

The Sheriff, Concord Police, Martinez Police, Pleasant Hill Police, Richmond Police, Walnut Creek Police, Consolidated Fire and Riverview Fire are among the departments who have recognized the need for CAD. All of these departments are currently planning CAD systems for their current dispatching centers. The development of one centralized CAD system for one, two or three centers will allow all agencies to share in the benefits of CAD without having to individually pay high costs for hardware and software.

Non-Voice Transmission

A logical extension of CAD is to send messages to and from the computer directly to the field mobile units "digitally" without using voice. This method is faster and relatively free from interception. It also allows for messages to be sent to a unit while the officer is out of the vehicle. Although mobile digital terminals are beneficial, they are not considered to be a necessity by the Study Team.

There are some problems with mobile digital terminals. It is hard for an officer in pursuit to concentrate on good driving skills and utilize a terminal simultaneously. Use of mobile digital terminals require the installation of two radios in each vehicle (one for voice only and one for voice and data).

The Study Team has engineered the dispatch centers and frequency plans to allow for the inclusion of mobile digital terminals. However, it is the opinion of the Team that the actual link to the vehicles will be phased in by local option as departments determine their own needs for a digital data link to each officer.

Fire Service - Radio Dispatch

The Study Team finds that the volume of calls received by all of Contra Costa's fire services are within the capability of less than three fire radio dispatchers. It is, therefore, more efficient in terms of dispatcher usage to have a single group of fire dispatchers treating fire calls for the entire County. In addition, the Team finds that the relationship between the fire and emergency medical service is quite complementary - much more so than the relationship between police and emergency medical. The same complement of fire service dispatchers can handle all emergency medical requests for assistance, provided that the County does not enter into handling remote telemetry by means of the "medcom channels". To date, there is no indication that the County emergency medical services will be utilizing the ten UHF "medcom" radio channels for field unit telemetry.

Fire Service Dispatcher - CRT Display

As in the case of the police dispatcher work position, the fire dispatcher receives a completed request for service from the complaint board operators. This appears at the work position of an available dispatcher and appears as follows:

* Location of the incident

* Nature of the incident

* Jurisdiction of the incident

* Engine company, apparatus, personnel complement

* Known hazards, blocked streets, prior calls

The fire dispatcher keys open remote receivers located at each fire station and broadcasts the alarm. Fire personnel provide an acknowledgment and begin the response. As soon as the fire apparatus is rolling, a further acknowledgment is made to the dispatcher, who then inputs any late information concerning the nature of the response.

At the same time as the voice announcement, the dispatcher sends the same information to the fire station, digitally, where it is printed out on a high speed printer. This information is received at the fire station so fast that it can be torn off by the fire personnel and read as they make the response. This same machine will be used to print a resume of the call including time of call, time of dispatch, time of acknowledgment, time of arrival at scene, and time of return to station.

Calls for Service Originating in the Field

In both the police and fire services there will be incidents discovered by field units that require service. These will come to the police or fire dispatchers, who will enter the information into the system in the same way as if the call had come to the dispatcher via the complaint board operators.

In the case of the police dispatch division, the call from the field is most likely to be a request for a record check of a person or vehicle. Based on what information is required, the dispatcher will enter a command into the computer dispatch system which can do the following:

* Query the ALPHA file for Contra Costa County

* Query the Alameda PIN (Police Information Network) file

* Through the PIN system, search State and Federal files

A record of the query will be stored both in voice and digital form on magnetic tape. This record will be available to the department for determining validity of the file inquiry or for any other official research.

Fire service requests from the field units will predictably fall into two classes: emergency, such as the discovery of a fire; or routine, concerning an inspection schedule. In each case, the call is entered into the system by the fire dispatcher using the computer keyboard, a record is made, and the required information is procured for the field unit.

Basis for Determining Staffing Levels

The personnel complement and number of work positions for a combined dispatching center is based entirely on workload. Workload, however, in dispatching with its random call arrival rate, must be defined carefully.

For complaint board operators, workload consists of number of calls received over a given time period multiplied by the duration of each call. The larger the center and the more calls that are received, the greater the accuracy of determining workload and number of call answerers required.

Basis for Determining Staffing Levels (Cont'd)

Call volumes, both police and fire, were provided by the public service agencies of the County. They have been massaged by the Study Team to remove what appear to be mistakes, and reformed on spread sheets showing each agency's activity over long periods of time. In the case of the fire services, attention has been paid to the predictable rise in activity over certain holidays, school vacations, and recognizing effects of variations in weather patterns. For police, special holidays, school vacations, and the periodicity of high volume days and shifts were added as adjustment factors.

Call durations were predicated on the largest delays occurring in the early stages of call reception and consist of the following:

* Conversation time between citizen and complaint board operator - 60 seconds

* Time required to enter information into the computer system - 15 seconds

For a total of 75 seconds, or 0.75 CCS (1 CCS equals 100 call seconds). This is the call duration factor used. It is based on extensive studies of large dispatch operations, further verified by Pacific Telephone Company traffic engineers.

Housing Requirements

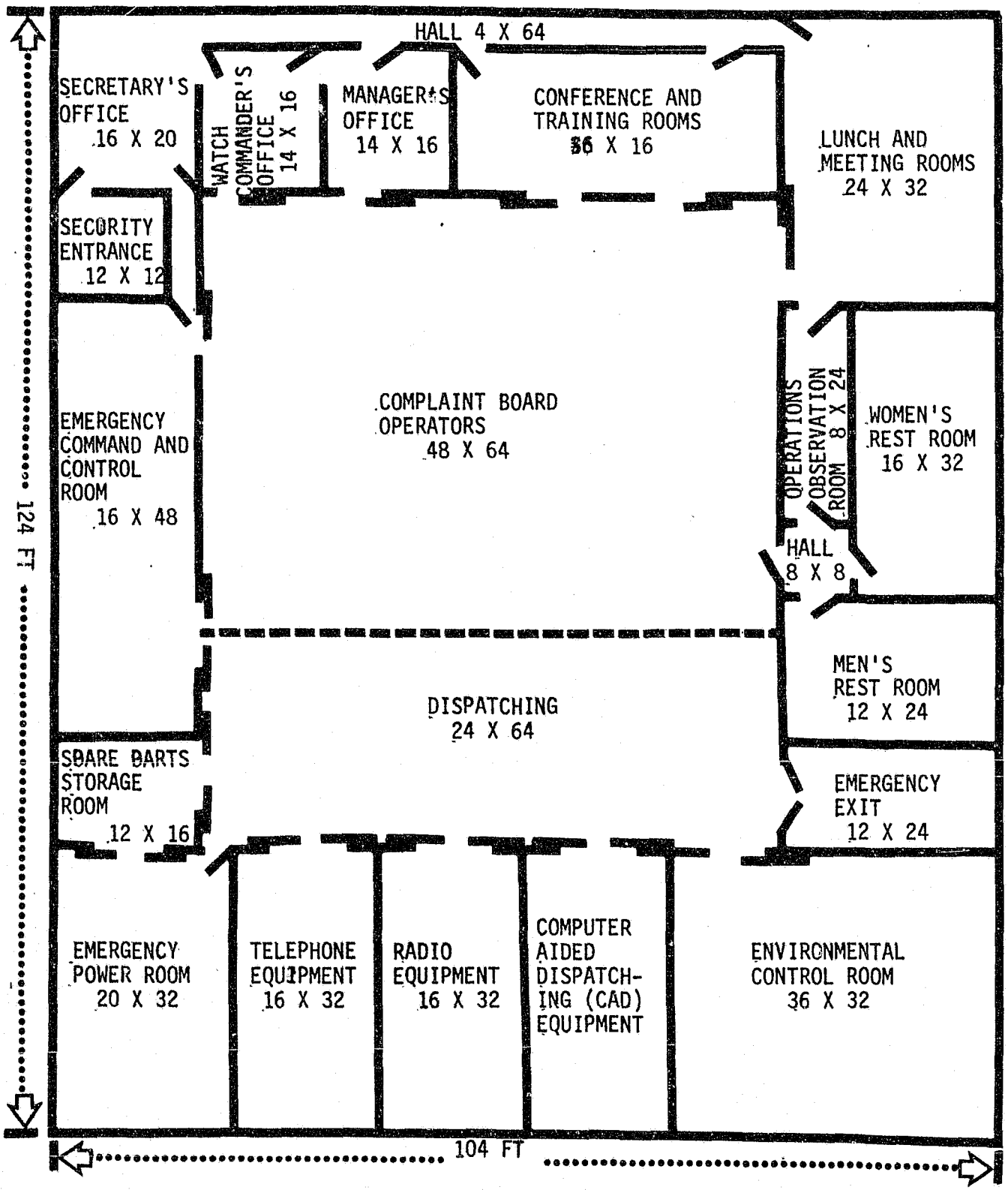
The single communications center for the entire County must be housed in a building capable of withstanding vandalism, civil strife, and all natural dangers such as earthquake, flood or lightning. It must be equipped with life support facilities such as food, filtered air, and must have its own drinking water supply and emergency electrical power supply.

The structure used as a cost model complies with all Office of Civil Defense standards for natural dangers plus a one-hundred-to-one protection ratio against radioactivity radiation. It has sufficient space to incorporate the entire communications function, including all equipment and computers.

The building will be located at a site in Central Contra Costa County that is favorable in terms of: seismic stability, freedom from flood danger, accessible by major highways and as close as possible to the telephone company's 911 call processing facility. The best site researched to date is the Contra Costa County property near Highway 4 and Glacier Drive in Martinez.

Drawing 7F shows the layout of the communications dispatch center and sets forth space required.

EXHIBIT 7F
CONTRA COSTA COUNTY
EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY
COMBINED EMERGENCY COMMUNICATIONS COMPLEX
PRELIMINARY SINGLE PSAP CONCEPTUAL DESIGN
DECEMBER 22, 1977




SCALE: 1/16" = 1'
TOTAL AREA = 12,896 SQUARE FEET

## Need For Microwave Circuits

Although the radio dispatchers for police and fire services will all be located at the consolidated dispatching center, the actual radio equipment used to communicate with mobile units, police and fire, will be located throughout the County. This is good engineering in terms of intelligent use of the frequency spectrum, providing extensive radio coverage and allowing access to remote base stations and repeaters by individual departments for special communications that do not require the center's involvement. To control these remote stations, either long wire lines leased from the telephone company or microwave links are needed. The center will use a mix of both and will build on the existing microwave system now operated by the Sheriff's Department.

This system, designed primarily as a mountain-top radio control network, can easily be added to provide necessary radio links to more "low level" locations and at the same time become the primary link to transmit digital information to other locations from the center's main dispatching computer.

## Telephone Company Facilities

The most important facility to be provided by the telephone company is the assembly of 911 trunks and terminating equipment. It is through these circuits and equipment that most of the incoming calls for aid will be received. The 911 system has been designed in two parts: the basic incoming call circuits, and the sophisticated features; ANI and ALI. This has been done chiefly to allow separation of costs so that a precise claim can be made to the State of California for 911 expenses.

The Pacific Telephone Company engineers, recognizing that the Contra Costa County consolidated dispatching facility is the first large system planned for Central California, have been ultra-conservative in their design of the 911 system. There are sufficient trunks to allow for extreme peaks in calling without the citizen receiving a busy signal. Trunk groups are routed from each telephone exchange of the County using alternate cable facilities so that no single cable path carries all 911 traffic from an area.

Within the dispatch center, all telephone equipment will be "battery float" so that even a momentary disruption of electrical power will not affect the 911 circuit. Entry into the building will be through alternate cable conduits buried in concrete so that a maximum level of protection is provided.

Telephone Company Facilities (Cont'd)

In addition to the 911 system, the telephone company will provide a separate assembly of 7-digit emergency telephone lines, alarm circuits for police and fire, and specialized digital channels for data transmission. All of these facilities will be carried in separate cables so that there is less chance of losing critical communications to the center.

PART B - TWO DISPATCH CENTERS

The Model

The basic design and planning for a single consolidated police, fire and emergency medical service communications complex is the model for alternative plans using two and three separate dispatch centers geographically located. The plan for two centers will be to have a dispatch facility for Western Contra Costa County which would serve police agencies of El Cerrito, Kensington, Richmond, San Pablo, Pinole, Hercules and the Sheriff's Patrol. Fire agencies served by the West center would be Carquinez-Crockett, Rodeo, Pinole, West County, Kensington and El Cerrito.

The second complex, located nearer the Martinez area, would serve law enforcement forces of Walnut Creek, Concord, Clayton, Martinez, Pleasant Hill, Antioch, Pittsburg and Brentwood, as well as the Sheriff's Patrol. Fire agencies operating from the second dispatch center would be Moraga, Orinda, San Ramon, Danville, Tassajara, Riverview, Contra Costa Consolidated, Bethel Island, Oakley-Knightsen, Byron, Brentwood, Eastern (Marsh Creek) and that part of Valley Community that is within Contra Costa County.

Operation

Each of the two dispatch centers would operate in the same way as the single facility; functionally they would be part of a single system. Each would have the same computer assistance for the complaint board operators and dispatchers; however, the engineering of the computer system would be changed so that neither center relies completely on inter-connecting microwave or wire link links.

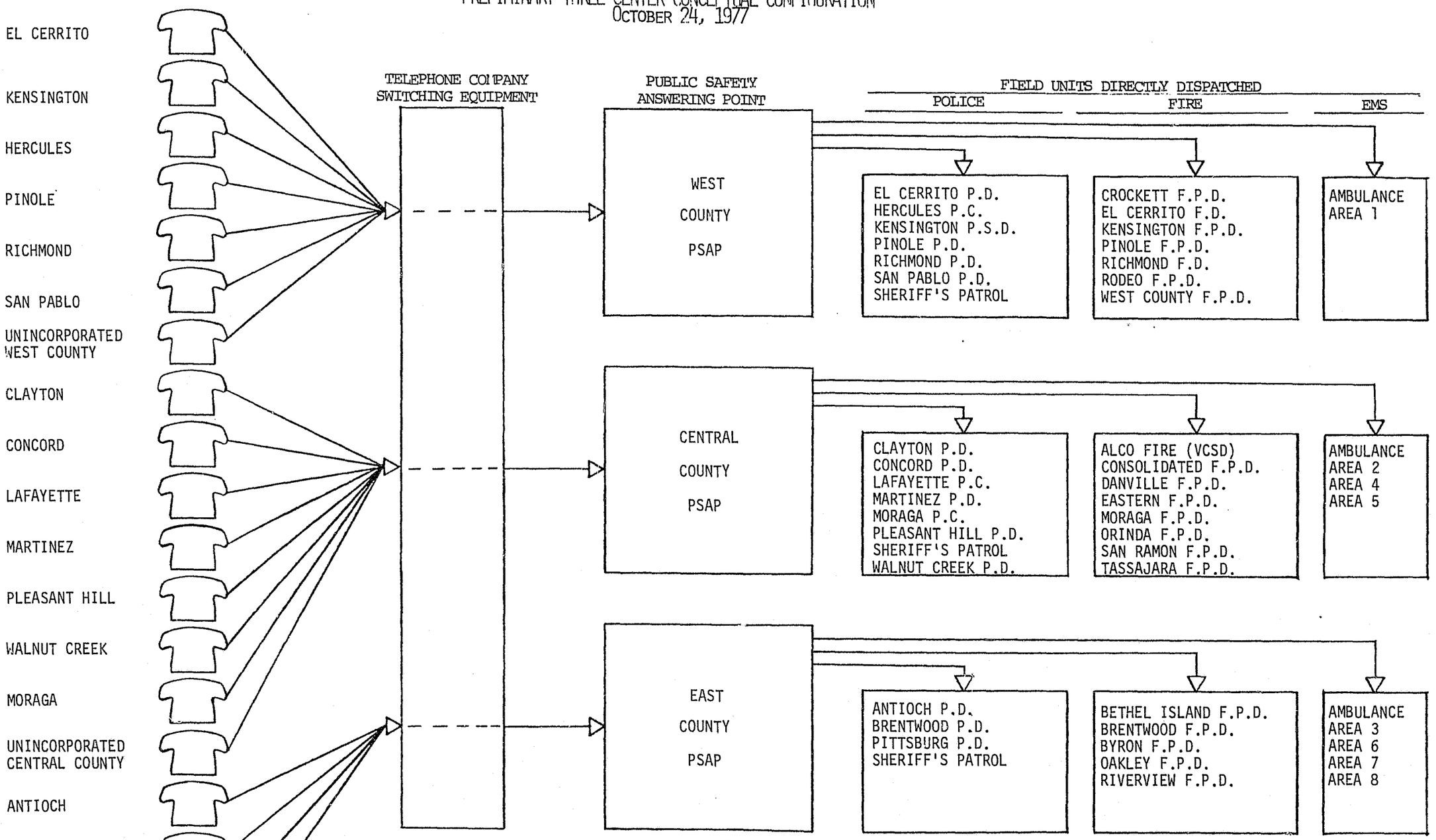
Normally, each center will keep status of its own field units and only dispatch for its own sphere of responsibility. With two or more centers, the 911 boundary problem surfaces and there will be need for the dispatchers of the two centers to keep some track of each other's calls, since there will be a co-mingling of telephone exchanges relative to operational areas of each dispatch center.

Backup

Radio dispatchers of each center, West and Central-East, will be able to talk to any police or fire mobile, no matter where it is operating. This provides a degree of backup in the event that there is a problem with either center's radio

EXHIBIT 7G

CONTRA COSTA COUNTY
EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY
PRELIMINARY THREE CENTER CONCEPTUAL CONFIGURATION
OCTOBER 24, 1977




COMMON QUALITIES PROVIDED AT EACH PSAP:

1) ANSWER, INTERROGATE AND DISPATCH ALL CALLS FOR SERVICE RECEIVED BY
   A) 911 LINES,
   B) SEVEN DIGIT EMERGENCY LINES,
   C) "0" (OPERATOR) TRANSFERS,
   D) ALARM CIRCUITS, AND
   E) ANY OTHER CALL TRANSFERRED TO PSAP.
2) ANI (AUTOMATIC NUMBER IDENTIFICATION)
3) ALI (AUTOMATIC LOCATION IDENTIFICATION)
4) CAD (COMPUTER ASSISTED DISPATCHING)
5) OES COMMAND CENTER
6) PUBLIC WORKS COORDINATION
7) MICROWAVE COORDINATION LINKS BETWEEN PSAP's
8) TRANSFER LINES TO
   A) CALIFORNIA HIGHWAY PATROL
   B) EAST BAY REGIONAL PARKS
   C) ALL OTHER AGENCIES

Backup (Cont'd)

system. This will be of particular advantage during equipment service or changeout. However, it does not suffice for total redundancy, because the telephone facilities are not duplicated.

Pacific Telephone Company engineers have indicated that they could provide totally redundant 911 facilities, 7-digit emergency circuits, alarms, and other required facilities at two or three centers. The cost, however, is prohibitive. Of importance is the fact that the State 911 surcharge funds will not cover the cost of duplicating 911 facilities at each dispatch center. Therefore, it must be stated that each center, from the standpoint of incoming emergency telephone lines, is not capable of being supported by the other center.

Changes Required for Two Dispatch Centers

The principal changes required for two dispatch centers are:

* Need for two buildings

* More staff needed due to a change in the rate of use of complaint board operators and dispatchers

* For the same freedom from busy signals, more 911 trunks will be required

* Table of organization for staff will require more supervisors

PART C - THREE DISPATCH CENTERS

Technically Possible

There are no technical difficulties in establishing a plan for three dispatch centers for the County that do not exist with two centers. There will be a mismatch or boundary problem that will require the Central and East centers to maintain very close coordination, the telephone company cannot inexpensively provide redundant 911 trunks and facilities; but, given these problems, there may be sufficient reason to adopt a three center plan.

The plan for three dispatch centers would, as in the case of the two center plan, be based operationally on the single complex. Each of the centers would have the same resources in terms of ANI, ALI and computer aided dispatching. The Western center would have the same responsibilities as in the two center plan, and the change would be to have police agencies of Antioch, Pittsburg, Brentwood and the Sheriff's Department along with the fire districts of Brentwood, Byron, Eastern, Oakley-Knightsen, Bethel Island and Riverview operating from the Eastern dispatching complex.

As the volume of requests for service are reduced, as they will be with three dispatch centers, the economies of consolidation become diluted. According to the call volume statistics provided to the Study Team, and Eastern dispatch center serving a population of less than 90,000 citizens will receive too few calls to justify a two stage dispatching system. Therefore, the Eastern center would use combination dispatchers receiving the 911 calls, dispatching police units and alerting fire stations and engine companies. Combination operators are used throughout the County at this time, and the one stage system lends itself well to smaller communications centers.

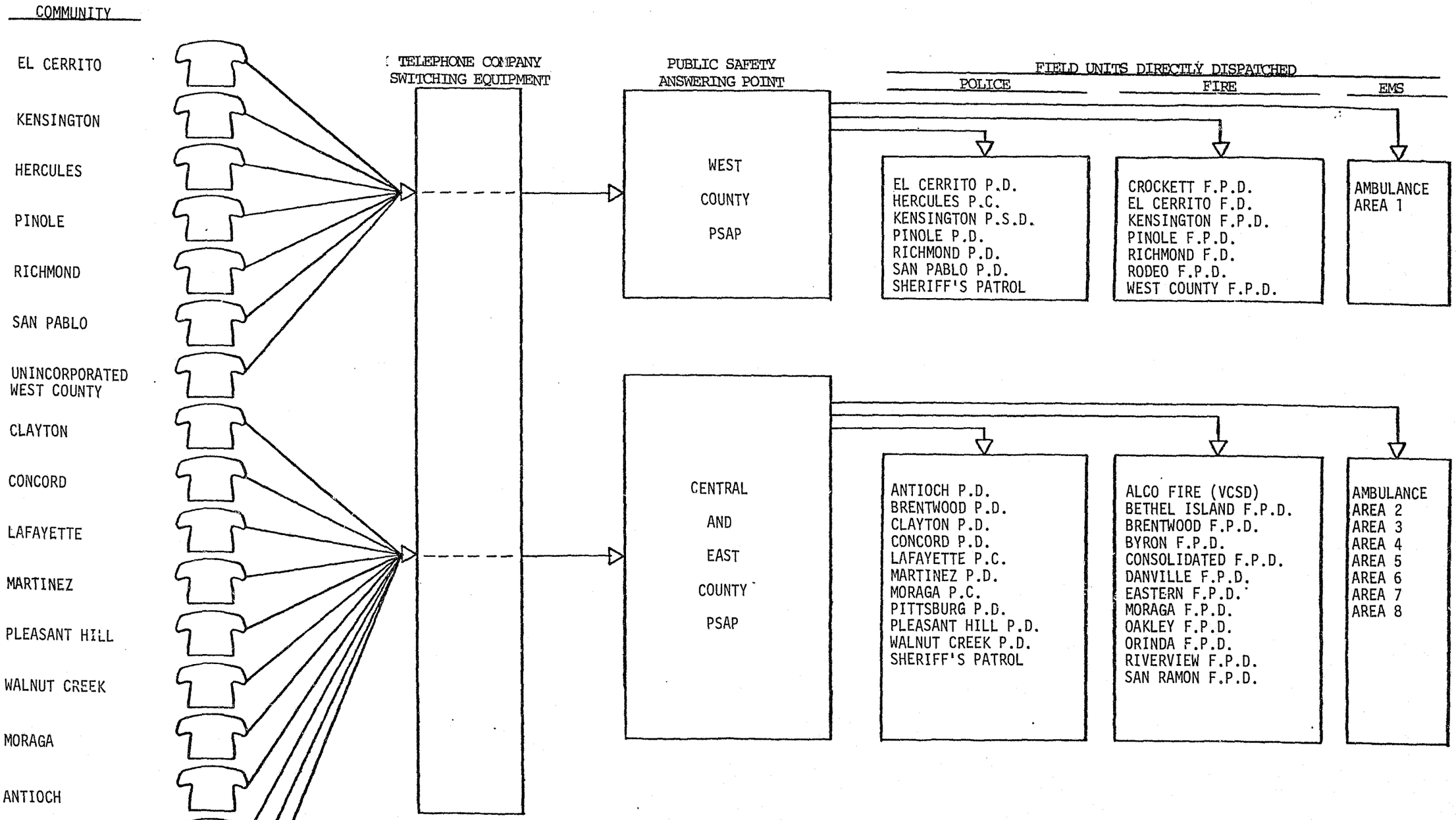
Changes Required for Three Dispatch Centers

The principal changes required for three dispatch centers will be:

* Need for three buildings
* More staff needed for the total system due to a change in the rate of use of complaint board operators and dispatchers
* More 911 trunks will be required for the total system
* Table of organization for communications staff will require more supervisors
* Eastern dispatch center will be single stage design using combination operators

EXHIBIT 7H

CONTRA COSTA COUNTY
EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY
PRELIMINARY TWO CENTER CONCEPTUAL CONFIGURATION
OCTOBER 24, 1977




COMMON QUALITIES PROVIDED AT EACH PSAP:

1) ANSWER, INTERROGATE AND DISPATCH ALL CALLS FOR SERVICE RECEIVED BY
   A) 911 LINES,
   B) SEVEN DIGIT EMERGENCY LINES,
   C) "0" (OPERATOR) TRANSFERS,
   D) ALARM CIRCUITS, AND
   E) ANY OTHER CALL TRANSFERRED TO PSAP.
2) ANI (AUTOMATIC NUMBER IDENTIFICATION)
3) ALI (AUTOMATIC LOCATION IDENTIFICATION)
4) CAD (COMPUTER ASSISTED DISPATCHING)
5) OES COMMAND CENTER
6) PUBLIC WORKS COORDINATION
7) MICROWAVE COORDINATION LINKS BETWEEN PSAPs
8) TRANSFER LINES TO
   A) CALIFORNIA HIGHWAY PATROL
   B) EAST BAY REGIONAL PARKS
   C) ALL OTHER AGENCIES

## COMPARISONS AND RECOMMENDATIONS

### Number of Public Safety Answering Points (PSAPs)

Alternative A - Single Dispatch Center

Advantages:

1) Requires fewest number of personnel for operation

2) Least expense for maintenance of building and equipment

3) Best "rate of use" of dispatch personnel

4) Lowest expense for supervision

5) Simplified computer design and application

6) Highest degree of interservice coordination

7) Highest degree of interagency coordination

8) Least County-wide capital and operating expenditure

Disadvantages:

1) Greatest potential for damage to the center resulting in a loss of communications

2) Greatest travel time for public safety administrators to coordinate operations during a disaster situation

3) Tendency to "even out" level of service, requiring smaller agencies to accept the policies of larger agencies

COMPARISONS AND RECOMMENDATIONS (Cont'd)

Number of Public Safety Answering Points (PSAPs)

Alternative B - Two Dispatch Centers

Advantages:

1) Can back each other up

2) Greater regional identification

3) Reduces reliance on long wire and microwave communications links

4) Reduced travel time for disaster communications teams

Disadvantages:

1) Greater cost

2) More personnel required

3) Need for construction and maintenance of two expensive buildings

Alternative C - Three Dispatch Centers

Advantages:

1) Greatest degree of regional identification

2) Ability to back each other up

3) Utilizes shorter communications links

Disadvantages:

1) Highest cost of all consolidated plans

2) Lowest "rate of use" of dispatchers

3) Lowest degree of interservice and interagency coordination

COMPARISONS AND RECOMMENDATIONS (Cont'd)

Number of Public Safety Answering Points (PSAPs)

Alternative C - Three Dispatch Centers

Disadvantages: (Cont'd)

4) Requires construction and maintenance of three high cost buildings

5) Most difficult of consolidation plans to utilize computer aided dispatching

6) Most complex and expensive supervision structure

Alternative D - Station Selective Routing
(See Chapter VI, Page )

Advantages:

1) Maximum control over selection of dispatching personnel

2) Greatest degree of independence from other departments

3) Minimum initial capital outlay

Disadvantages:

1) No economies in reduction of personnel

2) Least degree of interservice of coordination

3) Least degree of interdepartment coordination

4) Requires each agency to provide for computer aided dispatching individually at great expense

5) Totally dependent on telephone company equipment to route calls

6) Highest ongoing costs of all plans

7) Every fire service call must be transferred

8) Need to develop and maintain ARG (Automatic Routing Guide) file

COMPARISONS AND RECOMMENDATIONS (Cont'd)

Number of Public Safety Answering Points (PSAPs)

Recommendation: The Study Team finds that due to the cost effectiveness and capability for interservice and inter-department communication, that a single dispatch center is the best choice.

# CHAPTER VIII

## OPERATING ORGANIZATION FOR CONSOLIDATED PUBLIC SAFETY DISPATCHING CENTERS

# CHAPTER VIII

## OPERATING ORGANIZATION

### PART A - NEED FOR ORGANIZATION

An organization is needed that can provide the administration, management and overall direction required for the operation of a consolidated public safety communications complex. It must be a unit of, or interwoven with, local government, but not a part of any one service such as law enforcement or fire. If there are multiple dispatch centers, all should be operated by a single organization that will set policy and plan system engineering.

Without regard to the type of organization empowered to operate public safety communications systems of the County, its cities and districts, necessary duties will include the following:

Administration - Prepare capital, services and supplies, and salary budget. Develop and implement IGS (intergovernmental services) cost plan. Interact with other governing bodies: FCC, State Division of Communications, Cities, Districts, and the County Administrator and Board.

Management - Direct day-to-day operation of centers, hire, train, schedule work shifts, promote, process grievances, and discharge unsatisfactory communication system workers.

Engineering - Design, test, evaluate new technologies needed to upgrade communications system. Do frequency planning work in concert with FCC, make changes as necessary in microwave and computer equipment.

Maintenance - On a scheduled and emergency basis, keep communications system components in good operating condition. Do routine and corrective work on consoles, microwave stations, base and mobile radio and digital radio equipment. Service as needed computer tape drives, disc rotators and support devices.

## PART B - EXISTING ORGANIZATIONS

Without substantial restructuring, there is no existing organization within the County capable of handling the design, construction, implementation and operation of a communications complex of the size and magnitude that will be required for the County's public safety agencies. Tasks related to the operation of existing dispatch centers such as control of operators and repair of equipment are now being handled by each individual department or district. Dispatchers are usually adjuncts to police or fire service personnel complements and equipment repair is done by contract with private shops or the Sheriff's Department maintenance facility.

From police and fire service chiefs, the Study Team has received tacit support for two types of organizations, either of which could provide the administrative and managerial structure to operate a large communications system. These are a County Department of Communications and a Joint Powers Authority. Although there are other plans that have been used, these two offer participants a large measure of local control - an essential factor for the success of a consolidated multi-agency dispatch center.

## PART C - ORGANIZATIONAL VARIATIONS

### County Department of Communications

A Department of Communications of the County would be a suitable organizational vehicle to operate a combined communications center. It can be formed easily by Board of Supervisors action and will have the latitude to operate the dispatch center, levy apportioned costs and receive direction from users of the system. Of paramount importance is the fact that the communications director will have access to the highest level of County government for the resolution of problems relating to the operation of the center. A Communications Department could easily be structured so that policies relating to dispatching are subject to advice and assistance from a users' council composed of police and fire service chiefs and other users.

A Communications Department is the model for the Monterey County plan. A Director of Communications, reporting directly to the Board of Supervisors, also receives guidance from a users' council made up of fire, police and emergency medical chiefs from geographical sections of the County. For a county the size and makeup of Monterey, the system has proven itself, operates economically, and limits the number of user representatives to a manageable number. The plan is workable for Contra Costa County.

The Project Team never encountered any stated objection to a County Communications Department being the operating organization. There seemed to be a belief that the County was not willing to establish a Communications Department and that the Joint Powers Authority was the only plan open. It is apparent that the fire and police service chiefs only insist that there be an assured means of input to the center's operation and of redress in the event the system does not adequately support their service force communications needs.

Exhibit 8A shows a workable table of organization structured around a County Department of Communications.

### Communications Division of a General Services Agency

A variation of a County Department of Communications is the Division of Communications of a General Services Agency, which also includes other County service departments such as purchasing, motor vehicles, building maintenance and central services. GSA divisions are usually those support functions that do not contact the public directly. When the communications function is included, this is a workable structure

EXHIBIT 8A

Emergency Communications Consolidation ( 911 ) Study

Proposed County Communications Department Table of Organization

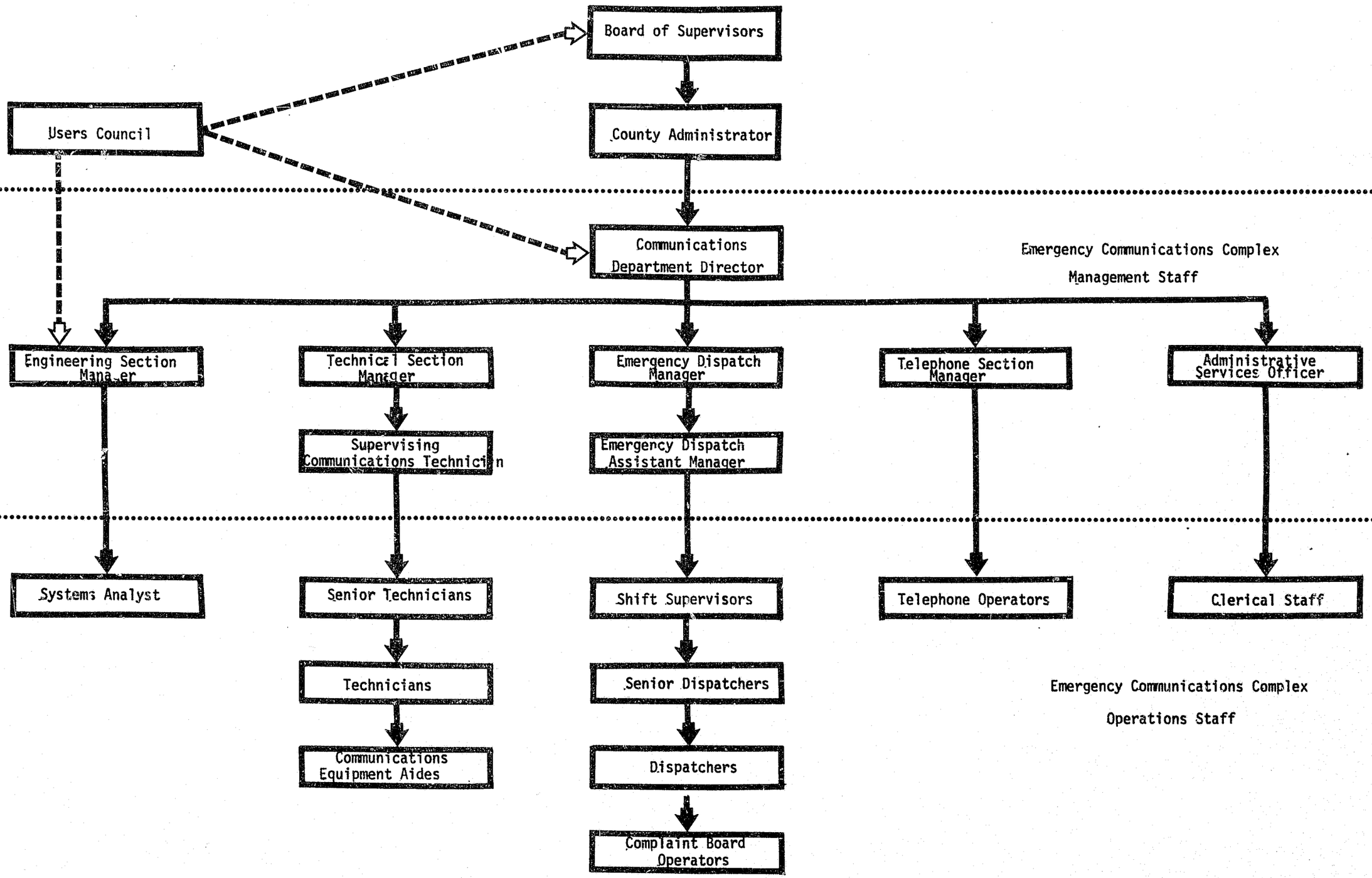
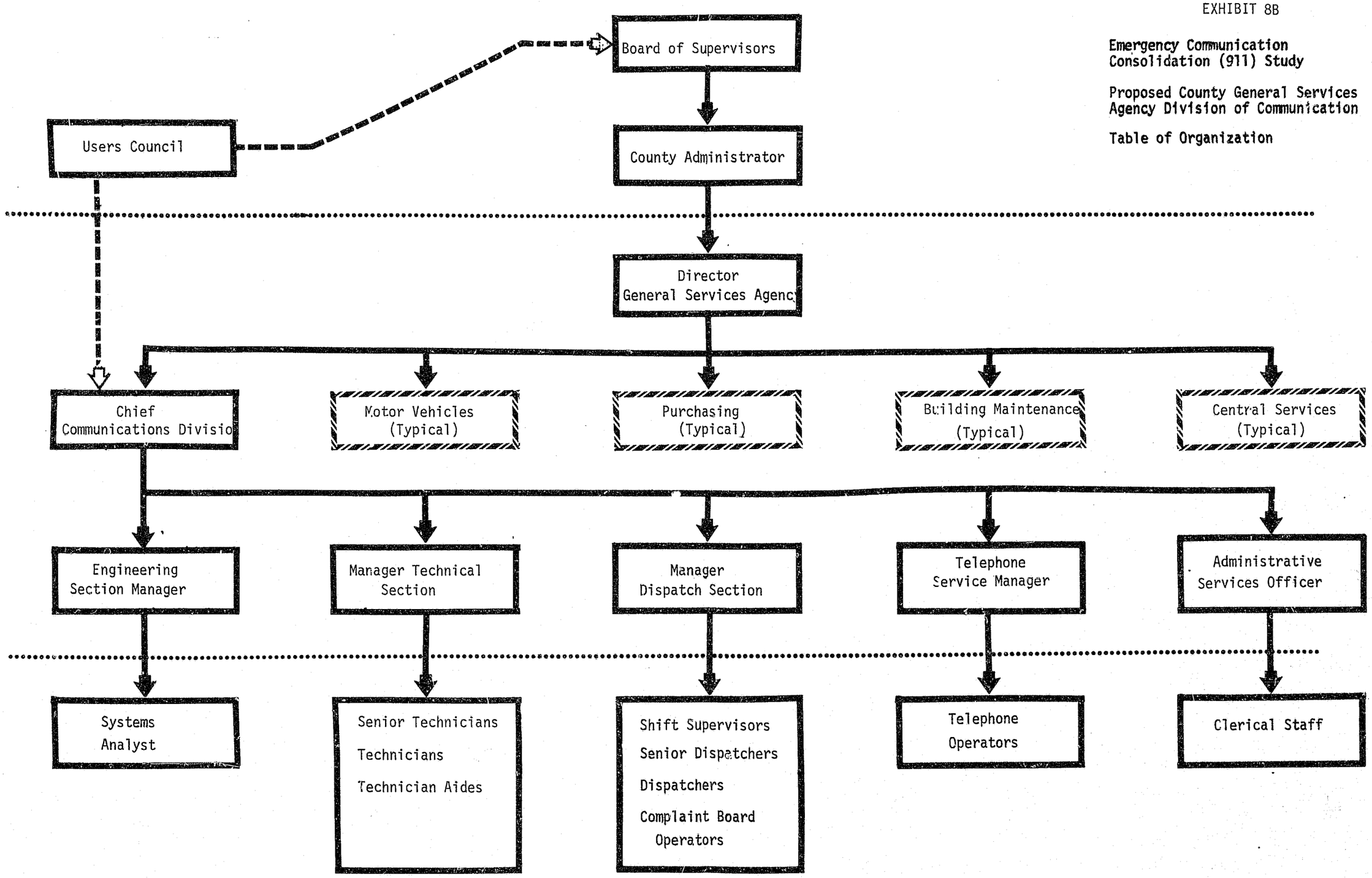


EXHIBIT 8B

**Emergency Communication Consolidation (911) Study**

**Proposed County General Services Agency Division of Communication**

**Table of Organization**



for a city or county that does not render contractual service to other units of local government. It poses a problem, however, for the Communications Director with responsibilities to contracting non-county departments and districts.

A Communications Director must serve service chiefs of each participating entity, many of whom are not part of county government. In addition, there is need for constant activity with the Federal Communications Commission, a regulatory body with intricate and binding rules controlling all radio transmissions. To deal effectively with these agencies, a measure of autonomy is required along with direct access to the highest level of County government - the Board and the Administrator.

With a Department of Communications, this exists; however, with a Division of Communications of a General Services Agency, the Communications Director reports to the agency head. This creates an insulating layer of administration between the Communications Director serving county and non-county entities and the decision-making level of county government. The problem is compounded when the Director also reports to and receives direction and advice from a users' council.

There are economies to a General Services Agency; specifically, the use of common support functions such as payroll, personnel processing, secretarial pool and record maintenance. A General Services Agency is the structure now being used by Santa Clara County for the operation of a multi-user dispatch center complex.

Exhibit 8B shows the table of organization of a typical General Services Agency.

Joint Powers Authority

A Joint Powers Authority is somewhat more difficult to create, but it provides the greatest level of end user participation in setting policy and direction. Simply stated, a Joint Powers Authority is an agreement entered into by all users of the public safety communications system which sets forth purpose, methods of cost apportionment and establishes a table of organization. It has been used extensively by local governments to fund and operate projects used by multiple agencies. The Study Team finds that the Joint Powers Authority is the basis for the more successful eastern United States consolidated dispatch centers. Among these are the Muskegon, Michigan; Hamilton County, Ohio; and Nassau County, New York multi-agency communications systems.

Joint Powers Authority (Cont'd)

Unlike a special service district which must be created by and have its tax rate set by a vote of the electorate, a Joint Powers Authority has no taxing power. Its support stems from a levy on each participant receiving service according to an agreed upon formula. The monetary foundation for the agreement is still the individual taxing power of each participant.

One of the difficulties with the Joint Powers Authority is that there can be too much input to the system director. Unless the Authority limits the number of users that have a voice, a Contra Costa County agreement will have more than 40 police and fire service chiefs providing instructions, ideas, and submitting complaints. It will be impossible to please that many bosses. And it will be difficult to limit the number of users that will be representatives. Each user, large and small, will want a measure of control over the system.

Exhibit 8C shows a method of setting up a Joint Powers Authority table of organization utilizing an appointed Board of Commissioners and a users' council. This combines the best features of Joint Powers with a limitation on direct representation.

Communications Service District

Somewhat similar in structure to the Joint Powers Authority and with the advantages of a large measure of user input, is the concept of a Communications District serving all of Contra Costa County devoted to public safety communications problems. Creation of such a district requires a vote of the electorate, both to establish the district and to set the tax rate.

Although the idea of a district is a workable plan, there is serious question that it could actually be created. It does establish an additional layer of government - a new taxing power - and this is counter to prevalent taxpayer desires.

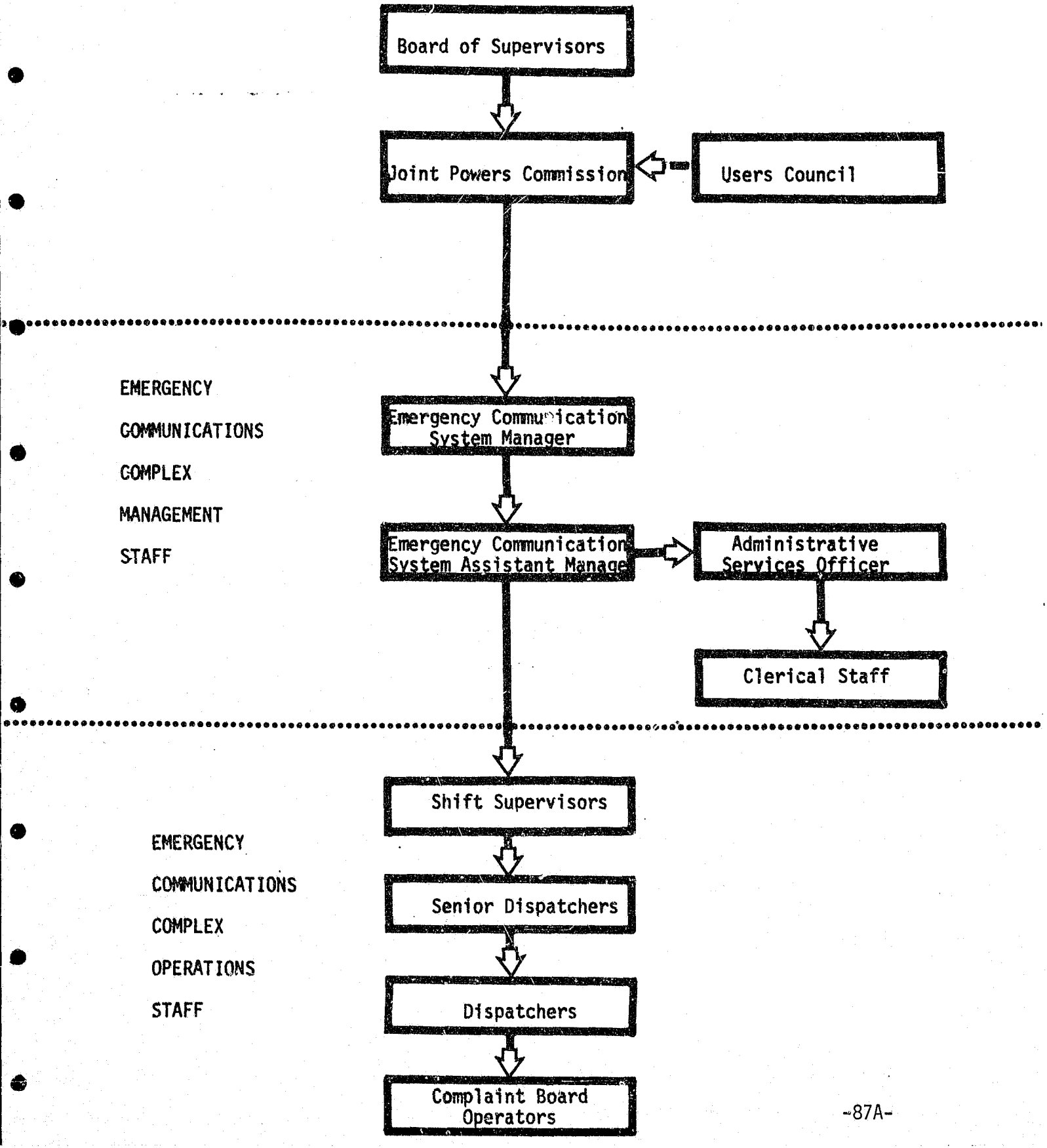
Operation by the Sheriff's Department

The Sheriff's Department operates the largest dispatch center in the County and presently dispatches Clayton and Brentwood Police mobiles in addition to Sheriff's units. The Sheriff's center also controls all emergency ambulance runs and can coordinate fire service activity. It would be possible to relocate and expand this existing facility to serve as the all-County, Central County or Central and East

EXHIBIT 8C

Emergency Communications Consolidation ( 911 ) Study

Proposed Joint Power Table of Organization



Operation by the Sheriff's Department

County dispatch center. The operating organization would be the Sheriff's Communications Division. This is a departure from the goals of the Consolidation Study in that all communications would be under the control of one of the end users.

When this concept was mentioned during project research, two points of disagreement emerged; the first was from police departments who felt that since the dispatchers were on the Sheriff's payroll, there would be some inate prioritization in terms of which agency received the best service. True or not, this was a genuine concern among all police departments.

The attitude of the fire service chiefs was much more succinct. Fire service chiefs, even the larger departments and districts, have expressed willingness to have their dispatching done by a non-aligned organization, but not by any law enforcement agency.

Operation by Existing Police Department

The same difficulties that would beset a Sheriff's Department being the operational agency for a mult-department dispatch center would apply to an existing police department being the operational organization - a fear of prioritization and reluctance of the fire service chiefs to accept the concept. There would, in the case of the fire service, be an additional drawback - the attitude of the fire insurance rating bureau. The bureau for the Contra Costa County area is the ISO, Insurance Service Organization, located in San Francisco. This bureau has typically downgraded tactical fire communications when they are provided by a police department. The result can be a lesser insurance grading for the participating fire department or district.

There are few cities that are structured to bill participants for services rendered. This is not a common role for city communication divisions. And the difficulty in assimilating dispatchers from other jurisdictions with the attendant salary, retirement and fringe benefit problems are not within the simple capability of any of Contra Costa's cities.

## PART D - ELECTRONIC INSTALLATION AND MAINTENANCE

The successful operation of a combined communications complex will depend very much on having immediately available a group of well-trained and equipped technicians to service and adjust the many components of the communications system. The system cannot be successful unless its base and mobile radios, microwave terminals, computer tapes, disc drives, CPUs, consoles and wire line facilities are kept in perfect operating order. There are two sources for this technical support -- the Sheriff's Department maintenance shop and the private service agencies.

### The County Shop

The Sheriff's Maintenance Shop is devoted primarily to servicing the County's electronic equipment. Secondarily, this shop provides communications system maintenance to other local governments on a contract basis. This arrangement is typical of many counties and has been an effective means of having the County Communications Director and staff bring technical developments to the attention of the service chiefs. At this time, the Sheriff's Shop provides contract service to all but six police and two fire agencies. It is a large, complete facility and could easily be expanded to handle all maintenance and installation for the consolidated communications complex. There are, however, private service providers who are contracting with the remaining police and fire services.

### Private Shops

The Study Team has examined two of the private service providers - Delta Industrial Communications and Engineering, and Atcomm, Incorporated. Both have been found to be well qualified in terms of technician training and service equipment and could be supplanting service providers for the maintenance of the consolidated communications center. Both companies have expressed an interest in retaining electronic service work in the public sector and both understand that they would, along with the County shop, have specific engineering guidelines and system operating standards that would be set up by the engineering staff of the consolidated communications complex.

There is reason for balancing required communications system work between the County's and private service shops -- labor strikes. Local government now has collective bargaining and the public service shops can no longer certify that they will not be strike-bound. It is a paradox that in the last three Bay Area county labor strikes, it was the private technicians, assisted by management engineers, that kept essential communications systems operating. Whether maintenance is provided by public or private technical work forces is not of paramount importance. The two groups could operate in conjunction with each other as long as engineering parameters are met and the integrity of the communications system is maintained.

## COMPARISONS AND RECOMMENDATIONS

### OPERATING ORGANIZATION

Alternative A - County Department of Communications

Advantages:

1) Simple to establish

2) Can be vehicle for other communications assignments; maintenance, telephones

3) Direct access to other County Services

4) Administrative machinery for shared cost collection already available

5) End user control through both the Board of Supervisors and Users' Advisory Council direction

6) Dedicated to communications

7) Easiest worker transition

Disadvantages:

1) Creation of additional department broadens Board of Supervisors' span of control

2) User sensitivity to increased County control

3) Pay and classification disparities

Alternative B - Operation by a County Department of General Services

Advantages:

1) Can be vehicle for other communications assignments; maintenance, telephones

2) Direct access to other County services

3) Administrative machinery for shared cost collection already available

4) End user control through both the Board of Supervisors and Users' Advisory Council direction

5) Easy worker transition

COMPARISONS AND RECOMMENDATIONS (Cont'd)

OPERATING ORGANIZATION

Alternative B - Operation by a County Department of General Services

Disadvantages:

1) Depends upon Board of Supervisors creating a Department of General Services

2) Communications would have to compete for resources with other functions within the Department of General Services

3) Additional layer of management inserted between users and communications operation

4) Pay and classification disparities

Alternative C - Joint Powers Authority

Advantages:

1) Maximum system user guidance

2) Widely used elsewhere

3) No election required

Disadvantages:

1) Difficulty in resolving conflicts between many different users

2) Ability to support is dependent upon existing taxing powers of each participant

3) Not totally recognized by Federal Communications Commission

4) No direct access to support services

5) Requires agreement between a large number of agencies

6) Pay and classification disparities

OPERATING ORGANIZATION

Alternative D - Communications Service District

Advantages:

1) Would have direct taxing power
2) Would have broad based representation
3) Separate and defined costs on tax bills

Disadvantages:

1) Requires an election to establish
2) Creates another layer of government
3) Requires State of California approval
4) Requires staffing of a larger number of support services
5) Pay and classification disparities

Alternative E - Operation By Sheriff's Department

Advantages:

1) Organization already exists
2) Presently handles police and emergency medical communications for a large portion of the County

Disadvantages:

1) Reluctance of other agencies to accept operating policies set by Sheriff's Department
2) Will require extensive modification of existing Sheriff's Department dispatch facility
3) Question of user input to elected official
4) Load upon Sheriff's Department operation caused by processing other agencies' calls
5) Reluctance of fire insurance rating bureau to accept the dispatching of fire services by police agencies
6) Pay and classification disparities

# CONTINUED

2 OF 4

COMPARISONS AND RECOMMENDATIONS (Cont'd)

OPERATING ORGANIZATION

Alternative F - Operation by Existing Police Department

Advantages:

1) Organization already exists

2) Already capable of handling law enforcement communications

Disadvantages:

1) Reluctance of other agencies to accept operating policies of a police department

2) No existing center can handle communications load without modification

3) No extensive support facilities

4) Fire insurance rating bureau is reluctant to rate highly fire departments who are dispatched by police agencies

Recommendation: Due to its ease to establish, ability to draw on extensive support services and high level of control by participating end users, the Study Team feels that a County Department of Communications is the best type of organizational structure to operate any of the alternatives for consolidated communications systems.

# CHAPTER IX

## COST OF DISPATCHING SYSTEM ALTERNATIVES

# CHAPTER IX

## COST OF DISPATCHING SYSTEM ALTERNATIVES

### PART A - OVERVIEW

The current dispatching facilities in Contra Costa County need vast improvements to provide the optimum capabilities necessary to serve citizens. The four alternative dispatching systems of one central center, two regional centers, three regional centers and Selective Routing provide some, if not all, of the necessary improvements. This chapter is devoted to costing out each of these systems to show the fiscal affects of adopting each alternative.

Each system has been engineered in sufficient detail enabling the Study Team to quantify costs. These plans, as detailed in this report, have been supported by a majority of the service chiefs and include all of the improvements discussed in this report. Instead of producing a multitude of different costs representing the inclusion or omission of certain improvements, the cost sheets in this chapter show only one total cost for each alternative which includes all improvements. Where possible, the cost for each improvement is shown as a separate line item in developing the costs. While all of the improvements have merit, it is possible to subtract certain line items to compare systems with fewer features.

The Study Team is well aware of underestimating system costing. No one desires to select a design, expecting one estimated cost, only to have that cost escalate during construction. To avoid this possibility, the Study Team took extra precautions to make the costs presented in this chapter as realistic as possible.

Whenever possible, the Study Team had these costs checked and cross-checked by industry engineers and professional staff. Particular attention was used to insure that the cost for each alternative was determined by using the same set of costing rules for every alternative. The costs, therefore, are comparative and can be used to reach a system selection.

In the event that two or more manufacturers offered equipment or services that would adequately provide a particular system improvement at different costs, the highest cost was used for estimation in this report. Population growth, inflation and price fluctuation factors were also applied to each cost element to make the costs representative of the actual costs to be expected if implementation begins July 1, 1978, and takes three years to complete (building construction start date of July 1, 1979 for one, two or three centers).

The Study Team is confident that these costs are accurate and truly represent the cost for each alternative. These relevant costs provide an adequate cost comparison to make a firm selection between the alternative systems.

Cost Segments

Dispatching costs fall within four distinct cost areas as follows:

Personnel costs including benefits;
Telephone costs;
Equipment costs including computer support; and
Housing costs including construction and maintenance.

These four cost areas are necessary, regardless of the dispatching alternative slected. Where costs differ is in the quantity of items required within each area. For example, dispatching personnel are needed to operate any dispatching operation, but as the need for additional people to operate a system increases, the costs also increase. As system complexity decreases, so do system costs.

To develop costs for these complex alternative systems, each of these four areas was analyzed in detail. For each of presentation, we present each of these areas separately in this chapter and summarize all areas together at the end of the chapter.

Since the Selective Routing system alternative is dependent upon all public safety agencies maintaining their current dispatch operations, a separate section on current costs is included. Since Selective Routing merely supplements local operations with 911 improvements, the cost for Selective Routing can be determined by the summation of current operating costs, 911 telephone Selective Routing costs, and the cost of improvements necessary for existing systems to make the existing operations relatively comparable to the improvements found in a consolidated center.

PART B - CURRENT COSTS

Currently, there are 27 different dispatch operations serving the 37 public safety agencies or contract services in Contra Costa County. These dispatch operations require funds for personnel, telephone, equipment and housing costs to be expended.

To establish a comparison reference point for evaluating cost changes in implementing one of the proposed alternative dispatching systems and to determine the cost of multiple dispatch agencies for the Selective Routing alternative, the costs of operating these current dispatch operations was evaluated.

These costs were developed by each agency following consistent guidelines provided by the Study Team. Whenever possible, the supervisor immediately responsible for the dispatching function and the dispatching budget made the initial cost evaluations. These cost evaluations were then reviewed by the agency for accuracy and the Study Team for consistency and reasonableness.

Personnel Costs

Personnel costs were determined by splitting out the time used by personnel to perform the dispatching functions and the other functions they were required to do. This is not difficult in large operations like those of the Sheriff, Concord Police, Richmond Police, Consolidated Fire and Richmond Fire, where the dispatchers are dedicated to performing only dispatching duties. However, medium and small agencies depend upon their dispatchers to perform a part, if not all, of the agency's clerical duties.

Many current costs of dispatching operations are buried in other operational costs. The personnel who operate the dispatching functions also perform many other tasks such as typing, filing, and business telephone operations. Special care was utilized to assure that the costs shown are unique to the dispatching function.

To split out the dispatcher personnel costs, each agency first determined who actually staffed the dispatching equipment on a 24-hour a day basis, 7 days a week, and their associated salary and benefits costs. Then the dispatch supervisors and, in most cases, the dispatching staff, determined what additional duties were performed and estimated how much time was needed to perform the additional duties.

Personnel Costs (Cont'd)

Cost for performing the additional duties was subtracted from the total cost of the dispatching personnel to arrive at a net dispatching personnel cost. This cost represents the amount of cost savings which could be realized by each agency if the dispatch function was removed from each agency, providing each agency did not require continual, round-the-clock operations for other reasons.

Lack of resources made precise time and motion studies at each agency impossible. However, these time separation estimates were carefully developed by each agency and have been reviewed by the Study Team. In the Study Team's opinion, these cost estimations are reasonable and do not contain any significant errors.

Telephone Costs

Dispatching telephone costs consist of the emergency phone lines appearing at the agency, special alarm circuits, lease lines to other agencies, extension lines for dispatcher business calls, the telephone instruments used solely for dispatching, and special devices such as recorder couplers which place the recording "beep" on the line.

These dispatching telephone costs are submerged in the agency's total telephone bill. To accurately determine the telephone costs for each agency, the Study Team acquired the Key System Worksheet and/or the single records for each agency. Each agency then identified the specific telephone lines and equipment used uniquely forthe dispatching function. Working closely with the telephone company representative, the Study Team then extended out the cost for dispatching telephone service, using the tariff or contract prices the telephone company uses to bill that agency.

Equipment Costs

Dispatching equipment costs include only that equipment which is unique to the operation of each agency's own center. Since base stations, mobile radios, portable radios and pagers are necessary no matter where the actual dispatch operations are located, these costs were excluded in dispatching costs. The only equipment costed were dispatching consoles and tape recording equipment.

Equipment Costs (Cont'd)

These costs include annual contract maintenance costs for repairing this equipment and estimated depreciation charges. Contract maintenance costs were applied by the Study Team based upon the current rates used by private and the County shop. Depreciation was calculated by using the agency's stated original acquisition cost for the equipment or the Study Team's estimation on historical price lists and applied this cost over a ten-year life for the equipment.

Housing Costs

Most existing dispatch operations take valuable space in facilities devoted to other department functions. Whether this operation doubles as the receptionist's desk or is a separate dedicated room, there is a hidden cost for using this space. This operational cost can be evaluated as a rental cost for building space to the dispatching function.

To determine the cost for this space, the Study Team first measured the actual space devoted to dispatching at each agency. Then estimates for a class A building lease rates at the location of each agency were developed by the Lease Property Division of the County Public Works Department utilizing the costs for existing leases in the area of each specific agency's dispatch operation. These estimated costs averaged approximately sixty cents (60¢) per square foot per month. These estimated costs were then multiplied by the area used for dispatching to arrive at the cost for housing the dispatching operation.

Volunteer Fire Departments

The dispatch operation for volunteer fire departments is not consistent with that of larger jurisdictions. Normally, several citizens volunteer their time to be available at one of five or six emergency telephones to answer the phone. These volunteers do not charge for the service and act merely as a coordinated volunteer answering service.

There is an implicit cost for this service, however, because the dispatching function is a required operation and is not a luxury. If the citizens were to refuse to volunteer their services, the district would have to pay employees to answer the phone and activate a response.

Volunteer Fire Departments (Cont'd)

The least expensive way of paying for telephone answerers who would sound an alarm siren and relay the citizen's complaint is to use the services of a telephone answering service. This is not acceptable to most agencies due to the lack of fire dispatching training of the operators, the relay time required, the accessibility of these answering services, and the unacceptability to the insurance organizations who set fire insurance rates. However, the budgets of volunteer fire departments make an answering service the closest cost comparison to their current operating systems.

Due to these facts, the Study Team estimated the cost of volunteer fire departments to be equal to the cost of a typical answering service ($1,344 a year) and the department's current telephone costs. In actuality, the hidden costs of operations is higher than this, but in the Study Team's opinion, these cost estimations reflect comparable operation costs within reasonable limits.

Current Cost Summation

As denoted by the following charts, public safety agencies in Contra Costa County currently pay $2,438,806 a year for this dispatching operations. These costs represent relevant, conservative, comparative recurring costs of operations.

These costs were prepared and reviewed by the local agencies, experts in certain technical fields, and the Study Team. These operations costs can now be used as a reference point for evaluating alternative system selection and as a basis for Selective Routing costs.

Selective Routing Costs

Current costs represent operations at the current level of dispatching sophistication which range from fairly modern to archaic. In general, a majority of dispatch centers in Contra Costa County are operating as they did thirty years ago and are in desperate need of improvement.

Since the alternatives dealing with some form of consolidation have been costed with all the benefits of a modern dispatch facility, it would be difficult to compare these modern consolidated centers to a Selective Routing system that directs calls to existing outmoded dispatching facilities.

EXHIBIT 9A

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

CURRENT ANNUAL DISPATCHING COSTS

| | Police | Fire | Total |
|---|---|---|---|
| Personnel | $1,537,934 | $696,161 | $2,234,095 |
| Telephone | 22,668 | 23,847 | 46,515 |
| Equipment | 105,378 | 12,822 | 118,200 |
| Housing | 28,576 | 11,420 | 39,996 |
| Total Current Costs | $1,694,556 | $744,250 | $2,438,806 |

For details by Agency, see Exhibit 9B and 9C

CONTRA COSTA COUNTY -Exhibit 9B
EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY
CURRENT POLICE DISPATCHING COSTS
As of September 1, 1977

EXHIBIT 9B

| | Personnel | Telephone | Equipment | Housing | Total |
|---|---|---|---|---|---|
| Antioch | $ 135,026 | $ 1,329 | $ 6,621 | $ 2,097 | $ 145,073 |
| Brentwood | 2,743 | 2,570 | 1,011 | 220 | 6,544 |
| Clayton * (S.O.) | --- | --- | -- | -- | -- |
| Concord | 233,041 | 1,470 | 9,100 | 3,591 | 247,202 |
| El Cerrito | 74,626 | 923 | 6,543 | 566 | 82,658 |
| Hercules (See Pinole) | --- | -- | --- | -- | --- |
| Kensington (See El Cerrito) | --- | -- | --- | -- | --- |
| Lafayette * (S.O.) | --- | -- | --- | -- | --- |
| Martinez | 87,450 | 420 | 4,010 | 737 | 92,617 |
| Moraga * (S.O.) | --- | -- | --- | -- | --- |
| Pinole | 47,521 | 396 | 4,848 | 480 | 53,245 |
| Pittsburg | 63,553 | 799 | 5,101 | 1,636 | 71,089 |
| Pleasant Hill | 71,112 | 840 | 5,074 | 708 | 77,734 |
| Richmond | 239,077 | 2,226 | 9,158 | 4,349 | 254,810 |
| San Pablo | 75,183 | 498 | 3,345 | 510 | 79,536 |
| Walnut Creek | 94,007 | 672 | 6,103 | 795 | 101,577 |
| City Totals | $1,123,339 | $12,143 | $ 60,914 | $15,689 | $1,212,085 |
| Sheriff | 414,595 | 10,525 | 44,464 | 12,887 | 482,471 |
| COUNTY TOTALS | $1,537,934 | $22,668 | $105,378 | $28,576 | $1,694,556 |

* Part of Sheriff's Dispatching Operation

EXHIBIT 9C

CONTRA COSTA COUNTY
Emergency Communications Consolidation (911) Study
Current Annual Fire Dispatching Cost Summary
as of 1/1/78

| AGENCY | PERSONNEL | TELEPHONE | EQUIPMENT | HOUSING | TOTAL |
|---|---|---|---|---|---|
| Bethel Island FPD | $ 1,344 | $ 255 | $ | $ | $ 1,599 |
| Brentwood FPD | 1,344 | 1,274 | | | 2,618 |
| Byron FPD | 1,344 | 1,335 | | | 2,679 |
| Contra Costa County FPD | 274,698 | 3,603 | 9,493 | 4,320 | 292,114 |
| Crockett-Carquinez FPD | 1,344 | 286 | | | 1,630 |
| Danville FPD | 67,823 | 1,211 | 71 | 461 | 69,566 |
| Eastern FPD | 1,344 | 553 | | | 1,897 |
| El Cerrito FD | * | * | * | * | * |
| Kensington FPD | * | * | * | * | * |
| Moraga FPD | 21,618 | 3,328 | 272 | 346 | 25,564 |
| Oakley FPD | 1,344 | 453 | | | 1,797 |
| Orinda FPD | 21,618 | 3,328 | 272 | 346 | 25,564 |
| Pinole FPD | * | 353 | * | * | 353 |
| Richmond FD | 94,140 | 1,680 | 2,050 | 3,557 | 101,427 |
| Riverview FPD | 100,962 | 4,106 | 508 | 1,209 | 106,785 |
| Rodeo FPD | 1,344 | 335 | 156 | 259 | 2,094 |
| San Ramon FPD | 1,344 | 378 | | 461 | 2,183 |
| Tassajara FPD | 1,344 | | | | 1,344 |
| Valley Comm. Services Dist. | 1,344 | | | | 1,344 |
| West County FPD | 101,862 | 1,369 | | 461 | 103,692 |
| County Total | $696,161 | $ 23,847 | $ 12,822 | $11,420 | $744,250 |

* Costs are included in Police Department Costs for those Fire Agencies which have combined Dispatching with Police Agencies.

Selective Routing Costs (Cont'd)

Currently, seven agencies are actively considering conversion to computer aided dispatching and fourteen agencies are planning major dispatching systems improvements to their existing facilities. It is quite evident that if Selective Routing is the alternative 911 telephone system selected, additional costs for improvements and additional personnel will be needed by many existing dispatch facilities to provide the 6-second peak hour call answering time possible in a consolidated center.

To make Selective Routing costs comparative, the Study Team has estimated the costs to upgrade current operations to be comparative to a consolidation operation. These costs were developed on a County-wide basis and are not identified by agency. Since the level of service requirements vary from agency to agency, it will be each agency's responsibility to determine how much they wish to improve their operations. The majority of the agencies recognize that they need improvements now and that these improvements are going to cost significant amounts of money.

The costs estimated by the Study Team are as realistic as possible in this area. It is the opinion of the Study Team that at least this level of increased expenditures, as shown in Exhibit 9D, will be met within five years of the adoption of a Selective Routing telephone system, and a majority of that expenditure will occur within the first three years. Local agencies are already preparing to propose capital improvements budgets for their communications systems which aggregate a total in excess of 3.5-million dollars for Fiscal Year 1978-1979. Most of these improvements are for computer aided dispatching systems and for dispatch equipment.

EXHIBIT 9D

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

CONVERSION COST ESTIMATES TO UPGRADE CURRENT DISPATCHING OPERATIONS

SELECTIVE ROUTING ALTERNATIVE ONLY

| | Implementation Costs | Annual Costs |
|---|---|---|
| Personnel Costs | None | $1,278,000 (1) |
| Telephone Costs | * | * |
| Housing Costs | $ 750,000 (2) | None |
| Equipment Costs | 6,800,000 (3) | None |
| Total | $7,550,000 | $1,278,000 |

* Covered by installation of Selective Routing 911 system

(1) Based upon a Countywide average increase of 50% in dispatching employees to handle 20% increase in 911 call volume within the peak hour mean call answering time of 6 seconds used in engineering the consolidated center alternatives

(2) These costs were developed based upon estimated average building modification costs for the area used by current dispatching staff Countywide (5,555 square feet). This cost recognizes the expenditures necessary to provide security, fire protection and emergency operation of existing centers

(3) Includes conversion of the 17 dispatch operations costing in excess of $50,000 a year to computer aided dispatching within 5 years and installation of new radio, microwave and console equipment currently needed to support current operations

EXHIBIT 9E

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

SELECTIVE ROUTING ADMINISTRATION COSTS

| Position | Salaries | Benefits | Total Costs |
|---|---|---|---|
| System Coordinator | $25,000 | $ 6,250 | $31,250 |
| Data Base Assistant | 18,000 | 4,500 | 22,500 |
| Clerical Support | 10,000 | 2,500 | 12,500 |
| Total Administration Costs | $53,000 | $13,250 | $66,250 |

These costs would be incurred to provide the staff required to maintain the Automatic Routing Guide (ARG) file. This file will require constant checking and revision because it is the only way that the telephone company has of directing the citizen's call to the proper agency. It is assumed that this staff would be structured within an existing County department.

PART C - PERSONNEL COSTS

Work Loads

The work load of a dispatching center is the key factor in determining the costs associated with that center. The amount of work required to be performed is the basis for the number of personnel required to accomplish the tasks, the size of the building to house the staff, and the type and amount of equipment needed to operate the center efficiently.

Survey

To determine work loads at one, two or three consolidated centers, information was gathered from each agency on the volume of work the dispatchers now process through each of the separate dispatch centers in the County. Following strict guidelines and using forms provided by the Study Team, each agency collected a seven to ten day block sample of the number of times a dispatcher was required to perform certain dispatching operations. These dispatch operations included the following tasks:

Telephone Operations:
- Emergency calls for service
- Other calls for service
- Business calls
- Other telephone calls

Radio Operations:
- Dispatches
- Status changes
- Record inquiries
- Other radio traffic

Responses:
- Total actual incidents occurred

Each agency counted and recorded these operations for each hour of the day during the block test period. Where possible, these counts were verified to mechanical radio and telephone usage counters and general trends of past records and reports.

Taking this detailed survey was very difficult for most agencies. The current staffing levels of most agencies are designed to handle average call volumes. When heavy volume periods occur, it is difficult for the dispatchers to handle dispatching functions correctly without having to worry about

Survey (Cont'd)

survey taking. The Study Team found minimal resistance to the survey and the results are very accurate. The staff of all the participating agencies did an excellent job of providing this detailed information.

Peak Load Determination

Dispatch centers activity is generated by public requests for service to generate activity. The flow of these citizen complaints is often cyclic in nature. For hours, and sometimes even days, the dispatch center will have very few complaints to handle, but at other times the center will have to handle a great many complaints. Regardless of how busy the center is, the citizen expects his complaint to be handled immediately.

Most existing dispatching operationg in Contra Costa County have chosen to staff their centers to handle average call volumes with minimum delay. This is largely due to the expense of hiring more personnel who would remain idle until needed during a peak period. During peak periods these current centers have to either allow other phones to ring while handling a complaint, or they have to handle complaints in less than the normal interrogation time. This can lead to longer response times and/or dispatch errors. Staffing for average call volumes is risky when citizens have to receive services to protect life and property.

The staffing for consolidated dispatching centers was calculated at the peak load for the peak hour of the peak day of the year. This met with the approval of a majority of the service chiefs and is consistent with the concept of designing a better dispatching system than current operations. Since the peak loads of one jurisdiction don't normally correspond with the peak loads of other jurisdictions, the number of dispatchers required to handle peak load periods is greatly reduced over small center operations.

Due to the increased fire danger of hot, dry days, and the problems created by juveniles out on vacation, the peak activity for most agencies occurs during the summer months. To convert the block samples collected in December to represent the peak period summer load, a ratio was applied to each of the hourly counts taken in the survey. The ratio used was the ratio of peak period incident activity to the block sample period incident activity by each individual agency.

Summary sheets were then prepared for each agency showing one representative day of activity by placing each hour's count as equal to the highest recorded count during the block sample test. These summary sheets are available for review at the Study Team office and represent the activity each agency may cause during the peak period of the year, regardless of peak weekly trends.

Peak Load Determination (Continued)

The summary sheets for each agency were then combined together to represent the activity to be handled by each of the proposed consolidated communications centers. These figures were increased by 25% to represent the use in call volumes due to the new 911 telephone number and to allow for growth up to the installation date. These activity work loads were then used to determine how many people are needed to staff each center.

Staffing Requirements

Calculating the staff requirements of the centers depends upon the amount of activity a dispatcher has to do, the probability that two or more activities must be performed simultaneously, and the time it takes to accomplish the activity.

Dispatching operations can be divided into two distinct stages--interrogating citizens and communicating with field units. Depending upon the size of the operation, these functions can be combined or separated. Separate two-stage processing increases operation efficiency by allowing people to concentrate on one specialized function. In small operations, manpower is not available, so a combined single-stage operation must be used. All of the consolidated centers are large enough to require two-stage operation except the Eastern regional center, which is presently at an activity rate which makes both single-stage or two-stage operation equally efficient. The amount of people required to perform each stage was calculated individually.

Complaint Board Operators

To calculate the number of complaint board operators, the staff who answer the phones and record citizen complaints, formulas were used to determine the probability of more than one call being processed simultaneously. One operator is needed to handle each simultaneous call.

A total operator processing time of 75 seconds appears to be normal in large dispatching operations. This gives the operator 60 seconds to converse with the citizen and 15 seconds to record the information. Also assumed was that during the peak center activity, a majority of citizens should have their calls answered within 6 seconds -- two telephone rings.

Complaint Board Operators (Continued)

Using these time elements and the work load rates previously developed, simple calculation was all that was necessary to determine staffing levels. These calculations use standard probability formulas developed tohandle queueing theory problems.

Queueing theory is a model which was developed to predict the behavior of a system that attempts to provide service for randomly arising demands. In 1909, A. K. Erlang observed that telephone clals are characterized by a Poisson distribution, which means that phone calls are received as random, isolated events. By determining the pattern of telephone call activity, Erlang was then able to develop mathematical formulas to predict the probability of receiving multiple calls during the same time frame.

The Erlang C formula is used widely in the industry today to predict the number of telephone lines and operators needed to service the citizen. The formula is:

$$P(WGTt) = e^{-sut(1-p)}$$

where

P(WGTt) = the probability that, given a call wait, it waits more than t seconds

t = maximum call waiting time

s = the number of call answers

u = the number of calls processed per hour

m = the number of calls received per hour

e = the natural base (approximately 2.71828...), and

p = m/su.

The Study Team applied the peak hour call volumes, the 75-second call holding time, and the mean 6-second answering criteria to this formula to determine the number of complaint board operators needed at each center. These calculations were then verified correct by the telephone company engineering staff.

## Dispatchers

Dispatchers represent the second stage of the operation and have a totally different work load. The dispatcher must determine the correct response for a situation, communicate this to the field units, provide information, look up services, and be constantly avaiable to act as a life-line to the field forces.

Quantifying dispatcher requirements into a reliable and trusted formula has not yet been done. However, time and motion studies funded by LEAA were performed both at Huntington Beach and San Diego, California. Closed circuit television cameras were used to record the activities of a dispatcher as they were performed.

Taking into account a dispatcher busy time of 67% and a maximum 10-second waiting time, it was observed that for a two-stage answering system with computer aided dispatching and mobile digital status systems, a dispatcher could process up to 21 incidents per hour.

By applying the 21 incidents per hour loading factor to the peak hourly activity rates determined by the block survey, the number of dispatchers per center were determined.

## Cost of Personnel

The salaries and wages of a new center have to be determined by official salary-setting procedures at the time of implementation. Since the operation organization and methods of funding have not yet been agreed upon, it is impossible for the Study Team to know what salary and benefit structures will be used in staffing consolidated centers.

The assumption is made here that the salaries paid at the consolidated centers would be among the highest paid dispatchers in the County and that their benefits would also be among the highest benefit package for non-safety member retirement plan employees. The Sheriff's Department pays dispatching staff an amount and a benefit package, equal to twenty-five percent (25%) of the salary, which is among the highest total compensation packages in the County for non-safety member employees. The Study Team used the top step of the Sheriff's Department salary scales to calculate the total cost of dispatching personnel at each center.

EXHIBIT 9F

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

ANNUAL PERSONNEL COST SUMMARY

| | Operational | Administration | Total |
|---|---|---|---|
| Single Center | $1,671,000 | $123,750 | $1,794,750 |
| Two Center | $2,098,500 | $123,750 | $2,222,250 |
| Three Center | $2,287,500 | $123,750 | $2,411,250 |
| Selective Routing | N/A | $ 66,250 | $ 66,250 |

EXHIBIT 9G

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION ( 911 ) PROJECT

OPERATIONAL PERSONNEL COSTS

| | Annual Costs | Single County PSAP | | Central/East County PSAP | | West County PSAP | | Central County PSAP | | East County PSAP | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | * | | * | | * | | * | | * | |
| Watch Commanders | $24,000 | 5 | $ 120,000 | 5 | $ 120,000 | 5 | $120,000 | 5 | $120,000 | 5 | $120,000 |
| Senior Dispatchers | $19,000 | 38 | 741,000 | 22 | 429,000 | 17 | 331,500 | 15 | 292,500 | 17 | 331,500 |
| Dispatchers | $18,000 | 45 | 810,000 | 33 | 594,000 | 28 | 504,000 | 26 | 468,000 | -- | --- |
| Total Costs Per Center | | 88 | $1,671,000 | 60 | $1,143,000 | 50 | $955,500 | 46 | $880,500 | 22 | $451,500 |
| Single PSAP Plan | | 88 | $1,671,000 | | | | | | | | |
| Two PSAP Plan | | | | 110 | $2,098,500 | | | | | | |
| Three PSAP Plan | | | | | | | | 118 | $2,287,500 | | |

* Number of personnel required

EXHIBIT 9H

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

CONSOLIDATED CENTERS ADMINISTRATIVE PERSONNEL COST

| Position | Salaries | Benefits | Total Costs |
|---|---|---|---|
| Manager | $25,000 | $ 6,250 | $ 31,250 |
| Assistant Manager | 20,000 | 5,000 | 25,000 |
| Administrative Services Officer | 18,000 | 4,500 | 22,500 |
| Operations Assistant | 16,000 | 4,000 | 20,000 |
| Clerical Staff: | | | |
| Clerk Typist | 10,000 | 2,500 | 12,500 |
| Account Clerk | 10,000 | 2,500 | 12,500 |
| Total Administration Costs | $99,000 | $24,750 | $123,750 |

EXHIBIT 9I

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

IMPLEMENTATION PERSONNEL COSTS

| | One Center | Two Center | Three Center | Selective Routing |
|---|---|---|---|---|
| Manager / Coordinator | $ 62,500 | $ 62,500 | $ 62,500 | $ 62,500 |
| Assistants | 45,000 | 56,250 | 67,500 | 45,000 |
| Clerical | 25,000 | 25,000 | 25,000 | 25,000 |
| Total Costs | $132,500 | $143,750 | $155,000 | $132,500 |

Estimation based upon a 24 month Implementation period utilizing current project employees with part-time position asssistance.

This staff will be required to develop specifications, coordinate the desires of participating agencies, monitor the progress of contractors and perform acceptance testing on the system selected. It is assumed that the staff would operate under the operating organization selected to run the system.

PART D - TELEPHONE COSTS

911 Telephone system costs for all four alternatives were provided by Pacific Telephone and Telegraph Company. The Study Team received extremely good cooperation and excellent service from the telephone company staff, who worked very hard to produce contract costs on complicated systems within a short period of time.

The alternative 911 telephone system designs were development by the project team. These plans, along with the number of answering positions at each PSAP, were given to the telephone representative. Telephone engineering staff then calculated out the number of 911 trunks required from each central office and to each PSAP. The engineers also selected the type and size of switching equipment which would be required to route 911 calls.

The telephone company cost estimator then determined exact contract costs for the system. These contract costs were only good until March 20, 1978, but still provide a reliable estimation of telephone costs. These costs also include amortization for the use of large computers and switching equipment which extend up to a thirty-year life.

Automatic Number Identification (ANI) is included as a basic cost of each system. Automatic Location Information (ALI) was included as a separate line item (see Exhibit 9K) and in the total costs. Each system includes the same features and are the most sophisticated systems available with today's technology.

The telephone company contract cost also includes termination costs. This is the cost a customer has to pay if the service is discontinued within a set time period. This time period varies from ten (10) to twenty-two (22) years for these 911 systems.

EXHIBIT 9J

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

TELEPHONE COSTS RECAP

| | Implementation Costs | Annual Recurring Charges |
|---|---|---|
| Single Center | $ 594,665 | $ 527,953 |
| Two Center | $ 599,605 | $ 546,551 |
| Three Center | $ 608,640 | $ 566,922 |
| Selective Routing | $1,132,145 | $1,340,515 |

Costs include Automatic Number Identification (ANI), Automatic Location Identification (ALI) and embedded display stations.

EXHIBIT 9K
CONTRA COSTA COUNTY
EMERGENCY CONSOLIDATED COMMUNICATIONS (911) PROJECT
TELEPHONE COMPANY COST COMPARISON FOR 911
AS OF DECEMBER 1, 1977

| Cost Factor | Selective Routing Plan C9 | One PSAP Plan C6A | Two PSAPs Plan C4A | Three PSAPs Plan C5A |
|---|---|---|---|---|
| End Office to Tandem Trunk Groups | $151,776.00 | $142,790.40 | $142,790.40 | $142,790.40 |
| E 911 Tandem | | 40,800.00 | 40,800.00 | 40,800.00 |
| 3A Processor/Tandem | 296,700.00 | | | |
| Data Management System (DMS) | 126,480.00 | | | |
| Data Line from DMS to 3A Processor | 1,728.00 | | | |
| Common County Charges | $576,684.00 | $183,590.40 | $183,590.40 | $183,590.40 |
| Stand Alone Displays | 319,449.60 | 53,338.80 | 67,592.40 | 80,733.60 |
| Basic Annual Charges | $896,133.60 | $236,929.20 | $251,182.80 | $264,324.00 |
| Automatic Location Information (ALI) Retrieval System | 427,857.00 | 287,964.00 | 292,614.00 | 299,232.00 |
| Annual Charges with ALI | $1,323,990.60 | $524,893.20 | $543,796.80 | $563,556.00 |
| Increased Costs for Embedded Display Stations | 16,524.00 | 3,060.00 | 2,754.00 | 3,366.00 |
| Annual Charges for 911 * | $1,340,514.60 | $527,953.20 | $546,550.80 | $566,922.00 |
| Installation Charges for 911 * | 1,132,145.00 | 594,665.00 | 599,605.00 | 608,640.00 |
| First Year Telephone Charges for 911 * | $2,472,659.60 | $1,122,618.20 | $1,146,155.80 | $1,175,562.00 |
| Total Basic Termination Charges for 911 System * | $883,730.00 | $345,880.00 | $350,500.00 | $359,680.00 |

* With Embedded Display Stations and ALI

PART E - EQUIPMENT COST

Cost of equipment at the consolidated centers was estimated by the project staff using current price lists for the equipment. All costs were reviewed and adjusted to reflect expected cost trends and inflation rates for purchase in two years. Whenever possible, the Study Team had industry sources cross check the cost estimations for reasonableness.

## Dispatch Consoles

Dispatch positions were costed by position type. Complaint board operators need far less equipment (no radios) than dispatchers. Each console within a type was costed with identical features including everything necessary by the operating personnel. For example, every dispatch position has every radio frequency and access to all phone lines.

## Microwave System

Improvements to the microwave system were engineered to extend the microwave system to all parts of the County. This new "backbone" system will be used to connect dispatch centers (if more than one), base station radio transceivers and local agencies. A basic expandable item was costed to provide these vital links at the lowest operational cost.

## Computer Aided Dispatching System

The computer aided dispatching system was designed and costed to provide all of the features detailed in this report. The system would handle the processing of complaints and assignment of suggested responses. The system would also produce all records and reports needed by local administrators or for court purposes. The system would also provide for mobile digital status terminals in each emergency vehicle. Capabilities for mobile digital record inquiry terminals would be provided, but the purchase and use of these terminals would be by local option.

Hardware and software costs were included. It was assumed that the CAD system would be built from an existing CAD system such as the proposed CAD system currently being purchased by Contra Costa County Fire Protection District.

Police Frequency Conversion Costs

Two frequency plans are proposed to improve police radio spectrum utilization and interdepartmental coordination. Plan One utilizes the TV 17 radio channels and would mean that departments would have to change out all their existing radio equipment for new equipment. Plan Two uses existing radio frequencies supplemented with two new UHF channels requiring a fire waiver. Plan One costs over one million dollars ($1,000,000) more to implement than Plan Two.

The consolidated centers would serve police, fire, medical and other services. The Study Team found only the police to be in frequency utilization trouble. Plan Two was included in the costs for consolidated centers as a minimum necessity for combined operation. Plan One, if implemented, would be funded separately.

EXHIBIT 9L

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

TOTAL EQUIPMENT COST

| | Single Center | Two Center | Three Center |
|---|---|---|---|
| Dispatch Console Equipment | $ 354,350 | $ 540,725 | $ 683,600 |
| Computer Aided Dispatching Costs | 1,530,000 | 1,774,000 | 1,958,000 |
| PSAP Equipment Costs | 1,884,350 | 2,314,725 | 2,641,600 |
| New Microwave Equipment Cost | 347,190 | 347,190 | 347,190 |
| Cost to Convert to New Frequency Plan (Plan #2) | 212,960 | 212,960 | 212,960 |
| Total Equipment Costs | $2,444,500 | $2,874,875 | $3,201,750 |

EXHIBIT 9M

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATION CONSOLIDATION (911) PROJECT

DISPATCH CONSOLE EQUIPMENT COST ESTIMATES

| | COST PER UNIT | CENTRAL CENTER | WESTERN CENTER | EASTERN CENTER |
|---|---|---|---|---|
| DISPATCH CONSOLES | $20,500 | $246,000 | $123,000 | $102,500 |
| SUPERVISOR CONSOLES | 20,775 | 41,550 | 20,775 | 20,775 |
| ADMINISTRATION CONSOLES | 15,000 | 30,000 | 15,000 | 15,000 |
| TOTAL CONSOLES COST | | $317,550 | $158,775 | $138,275 |
| COMPLAINT BOARD OPERATORS | $ 2,300 | $ 36,800 | $ 27,600 | $ 4,600 |
| TOTAL POSITION COSTS | | $354,350 | $186,375 | $142,875 |
| SINGLE CENTER COST | | $354,350 | | |
| TWO CENTER COST | | | $540,725 | |
| THREE CENTER COST | | | | $683,600 |

Estimates include taxes

EXHIBIT 9N

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

COMPUTER AIDED DISPATCHING COSTS

| | Central Center | Western Center | Eastern Center |
|---|---|---|---|
| Processors (CPUs) | $ 300,000 | $ 50,000 | $ 50,000 |
| Disk Storage | 100,000 | 45,000 | 45,000 |
| Magnetic Tape Drives | 40,000 | | |
| High Speed Printers | 70,000 | | |
| Uninterruptable Power Supply * | 60,000 | | |
| Interconnect Hardware | 20,000 | 5,000 | 5,000 |
| Digital Status System | 330,000 | 14,000 | 14,000 |
| Basic Hardware Costs | $ 920,000 | $ 114,000 | $ 114,000 |
| Operator Terminal Equipment | 150,000 | 90,000 | 60,000 |
| Hardware Costs | $1,070,000 | $ 204,000 | $ 174,000 |
| Software Development Costs | 420,000 | 30,000 | |
| Administrative & Data Base Entry | 40,000 | 10,000 | 10,000 |
| Total CAD Costs | $1,530,000 | $ 244,000 | $ 184,000 |
| Single Center CAD Cost | $1,530,000 | | |
| Two Center CAD Costs | | $1,774,000 | |
| Three Center CAD Costs | | | $1,958,000 |

Estimates include taxes

* Computer backup power only to insure loss of data during power switching operations

EXHIBIT 9"O"

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) PROJECT

NEW MICROWAVE EQUIPMENT COSTS

| | | |
|---|---|---|
| 1. | BALD - NICHOLL KNOB | $ 46,950 |
| 2. | NICHOLL KNOB - DOCTOR'S HOSPITAL | 31,350 |
| 3. | DOCTOR'S HOSPITAL - CROCKETT | 24,100 |
| 4. | TV HILL - PITTSBURG | 32,400 |
| 5. | PITTSBURG - REFLECTOR - ANTIOCH | 41,400 |
| 6. | BRENTWOOD - KREGOR | 35,400 |
| 7. | MARTINEZ - TV HILL | 23,200 |
| | NEW PATH COSTS | $234,800 |
| | TACFONE TELEPHONE | 60,000 |
| | MUX CHANNEL ENDS | 31,200 |
| | | $326,000 |
| | STATE SALES TAX | 21,190 |
| | TOTAL NEW MICROWAVE EQUIPMENT COSTS | $347,190 |

EXHIBIT 9P

RADIO EQUIPMENT REQUIRED TO CONVERT ALL POLICE SERVICES TO UHF

Police Frequency Plan Two

| AGENCY | MOBILES | COST | BASE | COST | PORTABLES | COST | TOTAL COST |
|---|---|---|---|---|---|---|---|
| ANTIOCH | 18 | $ 27,000 | 2 | $ 5,900 | 14 | $18,760 | $ 51,660 |
| BRENTWOOD | 3 | 4,500 | 1 | 5,900 | 6 | 8,040 | 18,440 |
| MARTINEZ | 17 | 25,500 | 2 | 5,900 | 9 | 12,060 | 43,460 |
| PLEASANT HILL | 22 | 33,000 | 1 | 5,900 | 11 | 14,740 | 50,690 |
| PINOLE | 9 | 13,500 | 2 | 5,900 | 3 | 4,020 | 23,420 |
| SAN PABLO | 14 | 21,000 | 1 | 2,950 | 1 | 1,340 | 25,290 |
| | 83 | $124,500 | 9 | $32,450 | 44 | $58,960 | $212,960 |

BASE: 8 channel mobiles: $1,500, 2 channel base: $2,950, 8 channel portables: $1,340

Estimates include taxes

EXHIBIT 9Q

Contra Costa County
Emergency Communications Consolidation (911) Study
Annual Equipment Maintenance Costs

| | Single Center | Two Centers | Three Centers |
|---|---|---|---|
| Dispatch Consoles | $ 10,488 | $ 16,284 | $ 20,148 |
| Computer Aided Dispatch | 101,120 | 128,440 | 145,360 |
| PSAP Equipment | 111,608 | 144,724 | 165,508 |
| New Microwave | 37,632 | 37,632 | 37,632 |
| Annual Equipment Maintenance Costs | $149,240 | $182,356 | $203,140 |

Costs for maintaining new mobile radio equipment would be the responsibility of each agency and should be comparable with current mobile radio equipment maintenance costs.

## PART F - CONSTRUCTION COSTS

Building size and configuration were estimated by the Study Team based upon the number of personnel operating the center, the equipment needed within the center, and facilities needed to maintain security and emergency operations. Preliminary site locations were also selected by the Study Team based upon availability of power, telephone and radio systems, avoidance of fault lines and flood areas, quick access by the agencies being served, and indications of service chiefs' preferences.

The buildings were then costed by the Architectual Division of County Public Works. The cost includes heating, air conditioning, lighting, rest room facilities, kitchen facilities and all security equipment. These costs were estimated considering a building construction start date of July 1, 1979.

Based on building size, the Study Team and the Architectual Division estimated the site size need by the building. Then estimated land acquisition costs were developed and provided by the Real Property Division of the County Public Works Department. Due to the uncertainty of land dealings, these are budget magnitude costs only and may not reflect actual purchase costs.

New construction may not be required in areas where adequate facilities currently exist for a regional dispatching center. No facilities in Central or East Contra Costa County have both the size and the security required for a regional dispatching center. The dispatch center located on the third floor of the Richmond Police and Fire Departments could be used as a West County PSAP. If this space were leased from the City of Richmond for 65 cents a square foot each month, the annual rental costs would be $49,920 for a 6,400 square foot center. The use of this facility depends upon the acceptance of the users and the procurement of a lease. For the purposes of this report, costs have been shown as if a new facility was constructed for a Western PSAP.

EXHIBIT 9R

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

CONSTRUCTION COST SUMMARY

| | Single Center | Two Center | Three Center |
|---|---|---|---|
| Emergency Operations Center: | | | |
| Construction Costs | $2,227,935 | $2,912,278 | $3,670,393 |
| Site Acquisition Costs | 52,500 | 95,000 | 112,500 |
| Total Costs | $2,280,435 | $3,007,278 | $3,782,893 |
| Concrete Operations Center: | | | |
| Construction Costs | $1,702,230 | $2,268,454 | $2,854,189 |
| Site Acquisition Costs | 52,500 | 95,000 | 112,500 |
| Total Costs | $1,754,730 | $2,363,454 | $2,966,689 |

EXHIBIT 9S

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) PROJECT

CONSTRUCTION TYPE COST DIFFERENTIAL

| Construction type | Single Center | Two Center | Three Center |
|---|---|---|---|
| Emergency Operations Center | $ 2,227,935 | $ 2,912,278 | $ 3,670,393 |
| Concrete Operations Center | (1,702,230) | (2,268,454) | (2,854,189) |
| Cost Difference | $ 525,705 | $ 643,824 | $ 816,204 |

EXHIBIT 9T

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) PROJECT

PROJECTED PSAP CONSTRUCTION COSTS - EMERGENCY OPERATIONS CENTERS

| | SINGLE CENTER (13,000 sq.ft.) | CENTRAL CENTER (10,300 sq.ft.) | WESTERN CENTER (6,400 sq.ft.) | EASTERN CENTER (4,000 sq.ft.) |
|---|---|---|---|---|
| ARCHITECTURAL/ENGINEERING SERVICES | $ 184,000 | $ 154,750 | $ 102,200 | $ 76,500 |
| CONSTRUCTION | 2,000,250 | 1,591,275 | 1,006,950 | 666,750 |
| CONSTRUCTION PROJECT CONTINGENCY | 43,685 | 34,920 | 22,183 | 14,865 |
| CONSTRUCTION COSTS* | $2,227,935 | $1,780,945 | $1,131,333 | $758,115 |

| | | | |
|---|---|---|---|
| SINGLE CENTER CONSTRUCTION COSTS | $2,227,935 | | |
| TWO CENTER CONSTRUCTION COSTS | | $2,912,278 | |
| THREE CENTER CONSTRUCTION COSTS | | | $3,670,393 |

* Not including land acquisition or additional equipment costs.

EXHIBIT 9U

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) PROJECT

PROJECTED PSAP CONSTRUCTION COSTS - CONCRETE OPERATING CENTERS

| | SINGLE CENTER (13,000 sq.ft.) | CENTRAL CENTER (10,300 sq.ft.) | WESTERN CENTER (6,400 sq.ft.) | EASTERN CENTER (4,000 sq.ft.) |
|---|---|---|---|---|
| ARCHITECTURAL/ENGINEERING SERVICES | $ 135,500 | $ 130,000 | $ 84,800 | $ 65,000 |
| CONSTRUCTION | 1,533,000 | 1,235,325 | 773,850 | 509,250 |
| CONSTRUCTION PROJECT CONTINGENCY | 33,730 | 27,306 | 17,173 | 11,485 |
| CONSTRUCTION COSTS* | $1,702,230 | $1,392,631 | $875,823 | $585,735 |

| | | |
|---|---|---|
| SINGLE CENTER CONSTRUCTION COSTS | $1,702,230 | |
| TWO CENTER CONSTRUCTION COSTS | | $2,268,454 |
| THREE CENTER CONSTRUCTION COSTS | | $2,854,189 |

* Not including land acquisition or additional equipment costs.

EXHIBIT 9V

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

LAND ACQUISITION COST ESTIMATES

February 1, 1978

| | Central | Western | Eastern |
|---|---|---|---|
| Proposed Site Location | Glacier Rd. & Muir Rd., Martinez | Hilltop Dr. & Highway 80, Richmond | Standard Oil Ave. & Highway 4, Antioch |
| Approximate Building Size | 13,000 sq. ft. | 6,400 sq.ft. | 4,000 sq. ft. |
| Estimated Site Size | 1¼ Acres | 3/4 Acre | ½ Acre |
| Estimated Land Costs | $50,000 | $40,000 | $15,000 |
| Acquisition Process Costs | 2,500 | 2,500 | 2,500 |
| Total Site Costs | $52,500 | $42,500 | $17,500 |
| Single Center Cost | $52,500 | | |
| Two Center Cost | | $95,000 | |
| Three Center Cost | | $112,500 | |

Costs based on acquisition by July 1, 1979

EXHIBIT 9W

CONTRA COSTA COUNTY

EMERGENCY COMMUNICATIONS CONSOLIDATION (911) STUDY

ANNUAL HOUSING MAINTENANCE COSTS

| | Single Centers (13,000 sq. ft.) | Two Centers (16,700 sq. ft.) | Three Centers (20,700 sq. ft.) |
|---|---|---|---|
| Annual Maintenance Costs: Estimated at $3.25 per square foot by County Public Works | $42,250 | $54,275 | $67,275 |

PART G - SUMMARY

The plans for all four alternatives have been engineered and costed with care and accuracy. The Study Team has been careful to assure that all costs are comparative and realistic. The resulting total costs for each alternative can be used as a quantified tool by decision makers in deciding the future of public safety dispatching in Contra Costa County.

For these costs to remain valid, a decision must be made soon. Implementation delays will cause some agencies to expend funds providing desperately needed improvements for their systems which may not be compatible with these alternatives. Delays may cause vendors and local agency staffs to have to re-engineer the systems if continuity is broken. In addition, inflation and cost fluctuations could cause an increase of 12% a year for every year implentation is delayed.

It is the project team's conclusion, based on the total costs for each alternative, that the most cost effective alternative is the Single Center plan.

EXHIBIT 9X
Contra Costa County

Emergency Communications Consolidation (911) Study

Four Alternatives Costs Summary

| | Implementation Costs | | | | Annual Recurring Costs | | | |
|---|---|---|---|---|---|---|---|---|
| | Single Center | Two Center | Three Center | Selective Routing | Single Center | Two Center | Three Center | Selective Routing |
| Total Personnel Costs | $ 132,500 | $ 143,750 | $ 155,000 | $ 132,500 | $1,794,750 | $2,222,250 | $2,411,250 | $2,300,345 |
| Telephone Costs | 549,665 | 599,605 | 608,640 | 1,132,145 | 527,935 | 546,551 | 566,922 | 1,340,515 |
| Housing Costs (Emergency Operations Center) | 2,280,435 | 3,007,278 | 3,782,893 | None | 42,250 | 54,275 | 67,275 | 39,996 |
| Equipment Costs | 2,231,540 | 2,874,875 | 3,201,750 | None | 149,240 | 182,356 | 203,140 | 118,200 |
| Total Costs | $5,194,140 | $6,625,508 | $7,748,283 | $1,264,645* | $2,514,175 | $3,005,432 | $3,248,587 | $3,799,056* |
| Estimated Cost to convert Current operations into comparative level of service configurations: (Refer to Exhibit 9D) | | | | 7,550,000 | | | | 1,278,000 |
| Total Comparative Costs | $5,194,140 | $6,625,508 | $7,748,283 | $8,814,645 | $2,514,175 | $3,005,432 | $3,248,587 | $5,077,056 |

* Current operations are costed here at present service level which is significantly lower than the other alternatives.

# CHAPTER X

## METHODS OF FUNDING

# CHAPTER X

## METHODS OF FUNDING

### PART A - COSTS, ALTERNATIVE DISPATCH CENTERS

#### Initial Outlay

Three of the four designs developed by the Study Team for 911 equipped communications centers are based on the consolidation of existing decentralized centers into a single, two or three complexes geographically located. For any of the consolidated designs, a capital outlay of considerable magnitude will be required for housing, microwave and electronic devices, dispatch consoles, computer hardware and programs and telephone equipment. Even if spread over several budget cycles, this outlay will represent a significant part of each supporting agency's budget.

The fourth design, Selective Routing, is primarily a 911 telephone system and only changes existing operations by requiring fire calls to be transferred. Neither does it require an immediate outlay for computer equipment to aid dispatchers. (For cost comparison, the Study Team has provided costs of computer assistance to dispatchers in a Selective Routing system.) Therefore, the only capital outlay required will be for the development of the data management system required by the telephone company and for that part of the 911 Selective Routing system that is not subvented by the State.

#### On-Going Costs

All plans for 911 equipped dispatch centers, whether consolidated or decentralized using Selective Routing, will create on-going costs. As in the case of the existing police and fire systems, these will be principally for personnel salaries and, to a lesser extent, for building and electronic equipment maintenance and non-emergency telephone service. In the event that Selective Routing is adopted, there will be a continuing expense for updating the address routing guide needed by the telephone company.

Funding the establishment of a 911 equipped dispatch complex and providing for on-going operating expenses should be seen as separate problems. Because of their one-time nature and magnitude, initial costs might qualify for outside financial assistance; however, it is unlikely that there will be any aid aside from the State payment of 911 telephone system charges that will offset continuing operational costs.

PART B - FUNDING SOURCES - INITIAL

Outside Funding

There are sources of funding, some certain, others tentative, that are available for offsetting part of the cost of improving public safety communications and all of the cost of providing basic 911 service. Included in these sources are LEAA (Law Enforcement Assistance Administration), HEW (Health, Education and Welfare), and DCPA (Defense Civil Preparedness Agency) grants. The most assured among these sources is State revenue being collected through the 911 telephone surcharge specifically to defray 911 system costs.

State 911

The State 911 surcharge funds are available in two forms: direct payment by the State of telephone company installation and recurring charges for 911 circuits and equipment and, upon approval by the Advisory Board, payment of costs over and above telephone company charges that are generated because of providing 911 service. Costs requiring approval for payment are termed "incremental" and may consist of additional personnel, a larger building or anything that can be proven to be needed in order to provide 911 service.

State funding of 911 costs is guaranteed as part of the mandate set forth in 1972 Legislation AB515 and the 1974 funding law created by AB416. For Contra Costa County and its entities, the State 911 cost subvention is considerable (see table below); particularly if sophisticated features such as ANI and ALI, eligible for payment as "incremental funds", are approved for payment by the Advisory Board (see Page ).

Out of the estimated 15-million dollars being collected annually, the following costs are expected to be offset by 911 surcharge revenues:

Initial

| Single Center | Two Centers | Three Centers | Selective Routing |
|---|---|---|---|
| $549,665 | $599,605 | $608,640 | $1,132,145 |

Recurring

| Single Center | Two Centers | Three Centers | Selective Routing |
|---|---|---|---|
| $527,935 | $546,551 | $566,922 | $1,340,515 |

State 911 (Cont'd)

This schedule includes expected payments for the sophisticated features ANI and ALI regarded by the Study Team as critically important to any of the alternative dispatch systems. Incremental costs have not been shown because at this time, it is very doubtful that any funds will be available after the State pays telephone costs.

Civil Defense

The Federal DCPA, formerly called the Office of Civil Defense, will provide a fifty percent subvention on certain communications equipments if they are part of an emergency operating center. This means that if the County's police, fire and emergency medical services select a consolidated dispatch system housed in a protected building meeting radiation protection standards, fixed radio and microwave equipment, along with dispatch consoles, they become eligible for cost reimbursement.

Contra Costa County's Office of Emergency Services Director indicates that all required communications planning reports are on file with federal authorities, paving the way for the filing of a grant application. Prior grants have been based on the use of a single dispatch center which is capable of providing total disaster communications.

Based on past precedent, the following costs might be eligible for fifty percent reimbursement by DCPA:

| | |
|---|---|
| Control Consoles | $ 177,170 |
| Microwave Equipment | 173,545 |
| Common Building Costs (foundation-air cond.) | 90,000 |
| Architect's Design Fee | 150,000 |
| | $ 590,715 |

HEW

The Department of Health, Education and Welfare (HEW) has in the past funded emergency medical communications systems based on the need for improved hospital to ambulance, emergency medical dispatch centers to ambulances, and advanced medical teams operating over large areas. HEW prefers to recognize a region based on geographical lines, highways, medical resources and health hazards rather than on political boundaries. The Counties of Alameda and Contra Costa are recognized as a HSA (Health Service Area), which is the new term of a region.

HEW (Cont'd)

For Fiscal 1978-79, the Alameda-Contra Costa HSA has a grant application in process which includes a substantial amount ($262,616 out of a total grant application of $896,808) of funding for emergency medical communications equipment. The basis for the communications grant request is to improve the Alameda County system and expand the coverage of the Contra Costa network. The net effect will be to provide two-county hospital-ambulance communications capability. Included in the Contra Costa sub-grant is microwave equipment to serve Western Contra Costa County.

This microwave link will expand emergency medical communications throughout West County, but typical of most microwave equipment, it will still have additional channel capacity that can be used for other medically related police and fire service communications needs.

Based on emergency medical service requirements and of benefit to other services for medically related uses, the following grant assistance will be available:

Microwave Link--Bald Peak to Nicholl Knob (Richmond)

$ 27,000

LEAA

The Law Enforcement Assistance Administration (LEAA) has in the past funded many hardware programs. The Contra Costa project, by any standard, is a hardware program. The funding has traditionally flowed through two channels: regional criminal justice planning agencies such as Contra Costa's own Region G, and directly from the parent organization in the form of discretionary funds. The magnitude of the project is so great that it would require the total appropriation of the local region for three years to establish the system. This is unacceptable. Discretionary funding is the only avenue suitable for a project as large as consolidating Contra Costa's public safety communications systems.

LEAA is now in an indeterminant posture with respect to funding hardware projects due to their inability to equate funds expended with a reduction of crime. The only information available from the LEAA agencies indicates that they are now more interested in returning to their original objectives--that of funding completely different, innovative projects and studies. The Communications Consolidation Study is neither new nor innovative and as such, might not qualify for grant

LEAA (Cont'd)

assistance. Conversely, LEAA has recently funded a large multi-city communications consolidation project in Southern California which nearly parallels the goals of the Contra Costa Study.

Discretionary funds are normally budgeted well in advance based on the number and validity of applications, adherence to criteria and available monetary resources. Since the project still requires decisions on which dispatch options will be used and who will participate, it is premature to expect grant aid from LEAA within the next two budget cycles.

Local Base

Even with all available grant funding, there remains a substantial one-time cost to establish a consolidated communications complex, whether it be single, two or three dispatch centers. This remaining cost must be borne by local governments; the County, its cities and districts.

The attached schedules set forth the cost burden for police and fire services based on assessed valuation, population and responses (usage). It is clear that there is a considerable variation in levies with the different bases, and any attempt to mix the bases in order to smooth out the cost variations becomes subjective. These schedules call for 70% of the total costs being paid for by the police agencies and 30% by fire agencies. This 70%-30% split was calculated based upon the present differences between the aggregate annual operating cost of these two services within the county.

PART C - ON-GOING COSTS

On-Going Costs

The police and fire schedules also set forth the apportionments to each police and fire service agency for on-going costs. The same problem exists with on-going as well as with implementation costs. Existing formulas standing alone create an uneven cost spread, and a mix of formulas becomes empirical and subjective. In defense of assessed valuation, however, is the fact that most of the existing dispatch centers now serving police and fire services are budgeted on revenue based on the assessed valuation of the entity. Therefore, it can be said that assessed valuation already has a precedent and could be the base for on-going funding of the communications system.

On-going costs, being of a known and perpetual nature, do lend themselves to being funded through a completely different vehicle; functional consolidation. This calls for the transfer, from one agency to another, of the responsibility for providing a service as well as the responsibility for levying a tax to pay for it. The agency accepting the responsibility could raise its tax, provided that the relinquishing entity lowered its tax to compensate.

This functional communication plan was adopted in the County of Santa Clara and was made available to all participants in their four-center consolidated communications system. This precedent demonstrates the acceptability of this transfer of taxing responsibilities under Senate Bill 90 and Article Eight of Assembly Bill 2008. This appears to be a workable plan for the County of Contra Costa.

EXHIBIT 10A
Contra Costa County
Emergency Communications Consolidation ( 911 ) Study
Estimated Cost Sharing by Agencies - Assessed Value

| Police Agency | 6/30/77 Assessed Value | Police Percentage | Establishment Costs Single Center | Establishment Costs Two Center | Establishment Costs Three Center | Operational Costs Single Center | Operational Costs Two Center | Operational Costs Three Center |
|---|---|---|---|---|---|---|---|---|
| Antioch PD | $ 116,868,220 | 3.15% | $ 102,411 | $ 132,871 | $ 157,429 | $ 43,797 | $ 54,218 | $ 59,131 |
| Brentwood PD | 9,945,903 | .27% | 8,778 | 11,389 | 13,494 | 3,754 | 4,647 | 5,068 |
| Clayton PD | 15,275,578 | .41% | 13,330 | 17,294 | 20,491 | 5,700 | 7,057 | 7,696 |
| Concord PD | 428,916,596 | 11.55% | 375,505 | 487,194 | 577,240 | 160,587 | 198,801 | 216,813 |
| El Cerrito PD | 116,769,883 | 3.15% | 102,411 | 132,871 | 157,429 | 43,797 | 54,218 | 59,131 |
| Hercules PD | 28,277,335 | .76% | 24,709 | 32,058 | 37,983 | 10,567 | 13,081 | 14,266 |
| Kensington PD | 34,242,102 | .92% | 29,910 | 38,807 | 45,979 | 12,791 | 15,835 | 17,270 |
| Lafayette PC | 131,642,389 | 3.55% | 115,415 | 149,743 | 177,420 | 49,358 | 61,103 | 66,639 |
| Martinez PD | 118,386,309 | 3.19% | 103,711 | 134,558 | 159,428 | 44,353 | 54,907 | 59,882 |
| Moraga PC | 87,811,848 | 2.36% | 76,727 | 99,548 | 117,947 | 32,813 | 40,621 | 44,301 |
| Pinole PD | 61,243,588 | 1.65% | 53,644 | 69,599 | 82,463 | 22,941 | 28,400 | 30,973 |
| Pittsburg PD | 81,701,750 | 2.20% | 71,525 | 92,799 | 109,951 | 30,588 | 37,867 | 41,298 |
| Pleasant Hill PD | 115,377,303 | 3.11% | 101,110 | 131,184 | 155,430 | 43,240 | 53,530 | 58,380 |
| Richmond PD | 553,276,367 | 14.90% | 484,418 | 628,503 | 744,664 | 207,165 | 256,462 | 279,698 |
| San Pablo PD | 51,753,122 | 1.39% | 45,191 | 58,632 | 69,469 | 19,326 | 23,925 | 26,093 |
| Walnut Creek PD | 320,622,377 | 8.63% | 280,573 | 364,025 | 431,306 | 119,989 | 148,541 | 161,999 |
| Total Police Departments | $2,272,110,670 | 61.19% | $1,989,368 | $2,581,075 | $3,058,123 | $ 850,766 | $1,053,213 | $1,148,638 |
| Sheriff (Unincorporated) | 1,440,998,032 | 38.81% | 1,261,765 | 1,637,057 | 1,939,627 | 539,602 | 668,004 | 728,528 |
| Total Law Enforcement | $3,713,108,702 | 100.00% | $3,251,133 | $4,218,132 | $4,997,750 | $1,390,368 | $1,721,217 | $1,877,166 |
| Total Fire Districts | $3,713,108,702 | 100.00% | 1,393,342 | 1,807,771 | 2,141,893 | 595,872 | 737,664 | 804,499 |
| State Paid 911 Telephone Costs | N/A | N/A | 549,665 | 599,605 | 608,640 | 527,935 | 546,551 | 566,922 |
| Total County | $3,713,108,702 | 100.00% | $5,194,140 | $6,625,508 | $7,748,283 | $2,514,175 | $3,005,432 | $3,248,587 |

EXHIBIT 10B

Contra Costa County

Emergency Communications Consolidation ( 911 ) Study

Fire Estimated Cost Sharing by Agencies - Assessed Value

| Fire District | Code | 6/30/77 Assessed Value | Fire Percentage | Establishment Costs | | | Operational Costs | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Single Center | Two Center | Three Center | Single Center | Two Center | Three Center |
| Bethel Island FPD | 2003 | $ 16,806,116 | .49% | $ 6,827 | $ 8,858 | $ 10,495 | $ 2,920 | $ 3,615 | $ 3,942 |
| Brentwood FPD | 2004 | 34,234,908 | .99% | 13,794 | 17,897 | 21,205 | 5,899 | 7,303 | 7,965 |
| Byron FPD | 2005 | 19,610,537 | .57% | 7,942 | 10,304 | 12,209 | 3,396 | 4,205 | 4,586 |
| Contra Costa County FPD | 2025 | 1,387,865,350 | 40.15% | 559,428 | 725,821 | 859,970 | 239,242 | 296,171 | 323,006 |
| Crockett - Carquinez FPD | 2028 | 18,028,933 | .52% | 7,245 | 9,400 | 11,138 | 3,099 | 3,836 | 4,183 |
| Danville FPD | 3005 | 194,909,368 | 5.64% | 78,584 | 101,958 | 120,803 | 33,607 | 41,604 | 45,374 |
| Eastern FPD | 2013 | 7,996,947 | .23% | 3,205 | 4,158 | 4,926 | 1,371 | 1,697 | 1,850 |
| El Cerrito FD | | 116,769,883 | 3.38% | 47,095 | 61,103 | 72,396 | 20,140 | 24,933 | 27,192 |
| Kensington FPD | 3007 | 34,242,102 | .99% | 13,794 | 17,897 | 21,205 | 5,899 | 7,303 | 7,965 |
| Moraga FPD | 2010 | 104,102,563 | 3.01% | 41,940 | 54,414 | 64,471 | 17,936 | 22,204 | 24,215 |
| Oakley FPD | 2017 | 24,278,125 | .70% | 9,753 | 12,654 | 14,993 | 4,171 | 5,164 | 5,631 |
| Orinda FPD | 2018 | 111,342,562 | 3.22% | 44,866 | 58,210 | 68,969 | 19,187 | 23,753 | 25,905 |
| Pinole FPD | 2019 | 18,648,075 | .54% | 7,524 | 9,762 | 11,566 | 3,218 | 3,983 | 4,344 |
| Richmond FD | | 553,845,837 | 16.02% | 223,214 | 289,605 | 343,131 | 95,458 | 118,174 | 128,881 |
| Riverview FPD | 2022 | 504,198,630 | 14.58% | 203,149 | 263,573 | 312,288 | 86,878 | 107,551 | 117,296 |
| Rodeo FPD | | 54,473,466 | 1.58% | 22,015 | 28,563 | 33,842 | 9,415 | 11,655 | 12,711 |
| San Ramon FPD | 3070 | 59,732,849 | 1.73% | 24,105 | 31,274 | 37,055 | 10,309 | 12,762 | 13,918 |
| Tassajara FPD | 2023 | 4,632,969 | .13% | 1,811 | 2,350 | 2,784 | 775 | 959 | 1,046 |
| Valley Comm. Services Dist. | 4025 | 54,414,963 | 1.57% | 21,875 | 28,382 | 33,628 | 9,355 | 11,581 | 12,631 |
| West County FPD | 2011 | 137,045,971 | 3.96% | 55,176 | 71,588 | 84,819 | 23,597 | 29,211 | 31,858 |
| Public Fire Districts Assessed Value | | $3,457,180,154 | 100.00% | $1,393,342 | $1,807,771 | $2,141,893 | $595,872 | $737,664 | $804,499 |
| Private Fire Protection Areas | | 255,928,548 | | | | | | | |
| Total County Assessed Value | | $3,713,108,702 | | | | | | | |

EXHIBIT 10C
Contra Costa County
Emergency Communications Consolidation ( 911 ) Study
Estimated Cost Sharing by Agencies - Population

| Police Agency | 1/1/77 Estimated Population | Police Percentage | Establishment Costs Single Center | Establishment Costs Two Center | Establishment Costs Three Center | Operational Costs Single Center | Operational Costs Two Center | Operational Costs Three Center |
|---|---|---|---|---|---|---|---|---|
| Antioch PD | 34,700 | 5.80% | $ 188,566 | $ 244,652 | $ 289,870 | $ 80,641 | $ 99,831 | $ 108,876 |
| Brentwood PD | 3,880 | .65% | 21,132 | 27,418 | 32,485 | 9,037 | 11,188 | 12,202 |
| Clayton PD | 2,640 | .44% | 14,305 | 18,560 | 21,990 | 6,118 | 7,573 | 8,260 |
| Concord PD | 97,700 | 16.31% | 530,260 | 687,978 | 815,133 | 226,769 | 280,730 | 306,165 |
| El Cerrito PD | 22,650 | 3,78% | 122,893 | 159,445 | 188,915 | 52,556 | 65,062 | 70,957 |
| Hercules PD | 850 | .14% | 4,552 | 5,905 | 6,997 | 1,947 | 2,410 | 2,628 |
| Kensington PD | 5,290 | .88% | 28,610 | 37,120 | 43,980 | 12,235 | 15,147 | 16,519 |
| Lafayette PC | 19,450 | 3.25% | 105,662 | 137,089 | 162,427 | 45,187 | 55,940 | 61,008 |
| Martinez PD | 20,050 | 3,35% | 108,913 | 141,307 | 167,425 | 46,577 | 57,661 | 62,885 |
| Moraga PC | 14,950 | 2.50% | 81,278 | 105,453 | 124,944 | 34,759 | 43,030 | 46,929 |
| Pinole PD | 15,500 | 2.59% | 84,204 | 109,250 | 129,442 | 36,011 | 44,580 | 48,619 |
| Pittsburg PD | 26,450 | 4.42% | 143,700 | 186,441 | 220,900 | 61,454 | 76,078 | 82,971 |
| Pleasant Hill PD | 25,200 | 4.21% | 136,873 | 177,583 | 210,405 | 58,534 | 72,463 | 79,029 |
| Richmond PD | 70,000 | 11.69% | 380,057 | 493,100 | 584,237 | 162,534 | 201,210 | 219,440 |
| San Pablo PD | 18,850 | 3.15% | 102,411 | 132,871 | 157,429 | 43,797 | 54,218 | 59,131 |
| Walnut Creek PD | 48,200 | 8.05% | 261,716 | 339,560 | 402,319 | 111,925 | 138,558 | 151,111 |
| Total Police Departments | 426,360 | 71.21% | $2,315,132 | $3,003,732 | $3,558,698 | $ 990,081 | $1,225,679 | $1,336,730 |
| Sheriff (Unincorporated) | 172,340 | 28.79% | 936,001 | 1,214,400 | 1,438,852 | 400,287 | 495,538 | 540,436 |
| Total Law Enforcement | 598,700 | 100.00% | $3,251,133 | 4,218,132 | 4,997,750 | $1,390,368 | $1,721,217 | $1,877,166 |
| Total Fire Districts | 598,700 | 100.00% | 1,393,342 | 1,807,771 | 2,141,893 | 595,872 | 737,664 | 804,499 |
| State Paid 911 Telephone Costs | | | 549,665 | 599,605 | 608,640 | 527,935 | 546,551 | 566,922 |
| Total County | 598,700 | 100.00% | $5,194,140 | $6,625,508 | $7,748,283 | $2,514,175 | $3,005,432 | $3,248,587 |

Exhibit 10D
Contra Costa County
Emergency Communicaitons Consolidation ( 911 ) Study
Fire Estimated Cost SHaring by Agencies - Population

| Fire District | 1/1/77 Estimated Population | Fire Percentage | Establishment Costs Single Center | Establishment Costs Two Center | Establishment Costs Three Center | Operational Costs Single Center | Operational Costs Two Center | Operational Costs Three Center |
|---|---|---|---|---|---|---|---|---|
| Bethel Island FPD | 1,980 | .33% | $ 4,593 | $ 5,966 | $ 7,068 | $ 1,966 | $ 2,434 | $ 2,655 |
| Brentwood FPD | 6,730 | 1.12% | 15,605 | 20,247 | 23,989 | 6,674 | 8,262 | 9,010 |
| Byron FPD | 1,470 | .25% | 3,483 | 4,519 | 5,355 | 1,490 | 1,844 | 2,011 |
| Contra Costa County FPD | 261,100 | 43.61% | 607,637 | 788,370 | 934,080 | 259,861 | 321,696 | 350,843 |
| Crockett - Carquinez FPD | 3,280 | .55% | 7,663 | 9,943 | 11,780 | 3,277 | 4,057 | 4,425 |
| Danville FPD | 26,650 | 4.45% | 62,004 | 80,446 | 95,314 | 26,516 | 32,826 | 35,800 |
| Eastern FPD | 640 | .11% | 1,533 | 1,989 | 2,356 | 655 | 811 | 885 |
| El Cerrito FD | 22,650 | 3.78% | 52,663 | 68,334 | 80,964 | 22,524 | 27,884 | 30,410 |
| Kensington FPD | 5,290 | .88% | 12,262 | 15,908 | 18,849 | 5,244 | 6,491 | 7,080 |
| Moraga FPD | 17,710 | 2.96% | 41,243 | 53,510 | 63,400 | 17,638 | 21,835 | 23,813 |
| Oakley FPD | 5,240 | .88% | 12,262 | 15,908 | 18,849 | 5,244 | 6,491 | 7,080 |
| Orinda FPD | 13,860 | 2.32% | 32,326 | 41,940 | 49,692 | 13,824 | 17,114 | 18,664 |
| Pinole FPD | 21,580 | 3.60% | 50,163 | 65,080 | 77,108 | 21,451 | 26,556 | 28,962 |
| Richmond FD | 70,000 | 11.69% | 162,882 | 211,328 | 250,387 | 69,657 | 86,233 | 94,046 |
| Riverview FPD | 71,700 | 11.98% | 166,922 | 216,571 | 256,599 | 71,386 | 88,373 | 96,379 |
| Rodeo FPD | 6,190 | 1.03% | 14,351 | 18,620 | 22,061 | 6,137 | 7,598 | 8,286 |
| San Ramon FPD | 8,600 | 1.44% | 20,064 | 26,032 | 30,843 | 8,581 | 10,622 | 11,585 |
| Tassajara FPD | 720 | .12% | 1,672 | 2,169 | 2,570 | 715 | 885 | 965 |
| Valley Community Services District | 10,430 | 1.74% | 24,244 | 31,455 | 37,269 | 10,368 | 12,835 | 13,998 |
| West County FPD | 42,880 | 7.16% | 99,763 | 129,436 | 153,360 | 42,664 | 52,817 | 57,602 |
| Total County Population | 598,700 | 100.00% | $1,393,342 | $1,807,771 | $2,141,893 | $595,872 | $737,664 | $804,499 |

Exhibit 10E
Contra Costa County
Emergency Communications Consolidation ( 911 ) Study
Estimated Cost Sharing by Agencies - Estimated Usage

| Police Agency | Approximate Annual Case Load | Police Percentage | Establishment Costs Single Center | Establishment Costs Two Center | Establishment Costs Three Center | Operational Costs Single Center | Operational Costs Two Center | Operational Costs Three Center |
|---|---|---|---|---|---|---|---|---|
| Antioch PD | 22,611 | 6.13% | $ 199,294 | $ 258,571 | $ 306,362 | $ 85,230 | $ 105,511 | $ 115,070 |
| Brentwood PD | 1,317 | .36% | 11,704 | 15,185 | 17,992 | 5,005 | 6,196 | 6,758 |
| Clayton PD | 1,006* | .27% | 8,778 | 11,389 | 13,494 | 3,754 | 4,647 | 5,068 |
| Concord PD | 51,688 | 14.02% | 455,809 | 591,383 | 700,685 | 194,929 | 241,315 | 263,179 |
| El Cerrito PD | 12,585 | 3.41% | 110,864 | 143,838 | 170,423 | 47,412 | 58,693 | 64,011 |
| Hercules PD | 680* | .18% | 5,852 | 7,593 | 8,996 | 2,503 | 3,098 | 3,379 |
| Kensington PD | 1,968 | .53% | 17,231 | 22,356 | 26,488 | 7,369 | 9,122 | 9,949 |
| Lafayette PC | 7,410* | 2.01% | 65,348 | 84,784 | 100,455 | 27,946 | 34,596 | 37,731 |
| Martinez PD | 18,300 | 4.96% | 161,256 | 209,219 | 247,888 | 68,962 | 85,372 | 93,107 |
| Moraga PC | 5,695* | 1.54% | 50,067 | 64,959 | 76,965 | 21,412 | 26,507 | 28,908 |
| Pinole PD | 12,382 | 3.36% | 109,238 | 141,729 | 167,924 | 46,716 | 57,833 | 63,073 |
| Pittsburg PD | 22,827 | 6.19% | 201,245 | 261,103 | 309,361 | 86,064 | 106,543 | 116,197 |
| Pleasant Hill PD | 18,132 | 4.92% | 159,956 | 207,532 | 245,889 | 68,406 | 84,684 | 92,357 |
| Richmond PD | 91,100 | 24.69% | 802,705 | 1,041,458 | 1,233,944 | 343,281 | 424,969 | 463,471 |
| San Pablo PD | 19,597 | 5.31% | 172,635 | 223,983 | 265,381 | 73,829 | 91,397 | 99,678 |
| Walnut Crrek PD | 15,952 | 4.32% | 140,449 | 182,223 | 215,903 | 60,064 | 74,357 | 81,094 |
| Total Police Departments | 303,250 | 82.20% | $2,672,431 | $3,467,305 | $4,108,150 | $1,142,882 | $1,414,840 | $1,543,030 |
| Sheriff (Unincorporated) | 65,653 | 17.80% | 578,702 | 750,827 | 889,600 | 247,486 | 306,377 | 334,136 |
| Total Law Enforcement | 368,903 | 100.00% | $3,251,133 | $4,218,132 | $4,997,750 | $1,390,368 | $1,721,217 | $1,877,166 |
| Total Fire Districts | | 100.00% | 1,393,342 | 1,807,771 | 2,141,893 | 595,872 | 737,664 | 804,499 |
| State Paid 911 Telephone Costs | | | 549,665 | 599,605 | 608,640 | 527,935 | 546,551 | 566,922 |
| Total County | | | $5,194,140 | $6,625,508 | $7,748,283 | $2,514,175 | $3,005,432 | $3,248,587 |

Exhibit 10F
Contra Costa County
Emergency Communications Consolidations ( 911 ) Study

Fire Estimated Cost Sharing by Agencies - Estimated Usage

| Fire District | 1977 Annual Responses | Fire Percentage | Establishment Costs Single Center | Establishment Costs Two Center | Establishment Costs Three Center | Operational Costs Single Center | Operational Costs Two Center | Operational Costs Three Center |
|---|---|---|---|---|---|---|---|---|
| Bethel Island FPD | 272 | .97% | $ 13,515 | $ 17,535 | $ 20,776 | $ 5,780 | $ 7,155 | $ 7,804 |
| Brentwood FPD | 224 | .80% | 11,147 | 14,462 | 17,135 | 4,767 | 5,901 | 6,436 |
| Byron FPD | 100 | .36% | 5,016 | 6,508 | 7,711 | 2,145 | 2,656 | 2,896 |
| Contra Costa County FPD | 8,322 | 29.77% | 414,798 | 538,173 | 637,642 | 177,392 | 219,602 | 239,499 |
| Crockett - Carquinez FPD | 275 | .98% | 13,655 | 17,716 | 20,991 | 5,840 | 7,229 | 7,884 |
| Danville FPD | 1,369 | 4.90% | 68,274 | 88,581 | 104,953 | 29,198 | 36,146 | 39,420 |
| Eastern FPD | 95 | .34% | 4,737 | 6,146 | 7,282 | 2,026 | 2,508 | 2,735 |
| El Cerrito FD | 939 | 3.36% | 46,816 | 60,741 | 71,968 | 20,021 | 24,786 | 27,031 |
| Kensington FPD | 277 | .99% | 13,794 | 17,897 | 21,205 | 5,899 | 7,303 | 7,965 |
| Moraga FPD | 914 | 3.27% | 45,562 | 59,114 | 70,040 | 19,485 | 24,122 | 26,307 |
| Oakley FPD | 290 | 1.04% | 14,491 | 18,801 | 22,276 | 6,197 | 7,672 | 8,367 |
| Orinda FPD | 831 | 2.97% | 41,382 | 53,691 | 63,614 | 17,697 | 21,909 | 23,894 |
| Pinole FPD | 1,183 | 4.23% | 58,938 | 76,469 | 90,602 | 25,205 | 31,203 | 34,030 |
| Richmond FD | 4,377 | 15.65% | 218,058 | 282,916 | 335,206 | 93,254 | 115,444 | 125,904 |
| Riverview FPD | 4,198 | 15.01% | 209,141 | 271,346 | 321,498 | 89,440 | 110,723 | 120,755 |
| Rodeo FPD | 583 | 2.08% | 28,982 | 37,602 | 44,551 | 12,394 | 15,343 | 16,734 |
| San Ramon FPD | 493 | 1.76% | 24,523 | 31,817 | 37,697 | 10,487 | 12,983 | 14,159 |
| Tassajara FPD | 17 | .06% | 836 | 1,085 | 1,285 | 358 | 443 | 483 |
| Valley Community Services District | 1,008 | 3.60% | 50,160 | 65,080 | 77,108 | 21,451 | 26,556 | 28,962 |
| West County FPD | 2,198 | 7.86% | 109,517 | 142,091 | 168,353 | 46,836 | 57,980 | 63,234 |
| Total County | 27,965 | 100.00% | $1,393,342 | $1,807,771 | $2,141,893 | $595,872 | $737,664 | $804,499 |

## ESTABLISHMENT AND OPERATIONAL FUNDING FOR CONSOLIDATED CENTERS

Alternative A - Total County Support

Advantages:

1) Precedent set by Santa Clara County

2) Each citizen pays an equal share of costs for a system which allows equal access by all citizens

3) Fair to both cities and districts

4) No subjective formulas involved

5) Independent of growth shift and population changes

6) Compatible with County operating dispatch center complex

Disadvantages:

1) Fear of County domination of center operation

2) Complicated tax readjustment required

3) County Board of Supervisors may be reluctant to accept additional tax burden

ESTABLISHMENT AND OPERATIONAL FUNDING
FOR CONSOLIDATED CENTERS (Cont'd)

Alternative B - Charges to Agencies Based on Assessed Valuation

Advantages:

1) Assessed valuation is now the basis for paying for existing centers

2) Costs spread over broad base

Disadvantages:

1) No relation between use of center and assessed valuation

2) Difficulty in separating police/fire service costs

3) Assessed valuations do not change County-wide at the same time

Alternative C - Charges to Agencies Based on Population

Advantages:

1) Population has a relationship to activity

2) Population statistics are current and readily available

Disadvantages:

1) Population does not recognize the day-night population fluctuations caused by people working in industrial centers and residing in suburbs

2) Population does not reflect fire service requirements to protect valuable property which is often located in sparsely populated areas

3) Unequal levy on heavily and sparsely populated areas

ESTABLISHMENT AND OPERATIONAL
FUNDING FOR CONSOLIDATED CENTERS (Cont'd)

Alternative D - Call Volumes (Chapter X, Page 117)

Advantages:

1) Ability to exactly measure by using computer reports

2) Each agency pays only for the service it receives

Disadvantages:

1) Police bear most of cost

2) Requires billing in arrears

3) Totally dependent on computer for accurate cost determination

Recommendation Concerning Establishment Costs:

The Study Team finds that assessed valuation is the most commonly used basis for funding the present assembly of public safety dispatch centers; therefore, it should be the base for apportioned cost participation to defray initial equipment acquisition and constructions costs. This initial cost should be reduced to the extent possible by the pursuance of grant funding from all available sources.

Recommendation Concerning Operational Costs:

The Study Team recommends that the ongoing costs be borne by the County of Contra Costa. This would parallel the action of Santa Clara County whereby consolidated public safety dispatching systems are County funded. According to the Stanford Research Institute, in their interim study of Santa Clara County dated 1974, Assembly Bill 2008 passed by the 1972-73 California Legislature provides in Article 8, that: "In instances of functional consolidation, the tax rate may be increased to pay the actual cost of providing the consolidated service". Functional Consolidation is defined as the transfer, from one agency to another, of the responsibility for providing a service, as well as the responsibility for levying a tax to pay for it. AB 2008 also provides, according to the SRI report, that the agency which surrenders the service, and consequently the fiscal responsibility, must reduce its property tax rate by the amount that was necessary to pay for the service in the last full year that it was retained.

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EMERGENCY COMMUNICATIONS CONSOLIDATION AND 911 STUDY

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Pomery Ambulance Company

Alameda Contra Costa Medical Assn.
Bay Area Air Pollution

# APPENDICES

# 911

# SYSTEM STANDARDS AND PLANNING GUIDELINES MANUAL

SECOND EDITION

STATE OF CALIFORNIA

# TABLE OF CONTENTS

# GLOSSARY

**This glossary is provided to establish a uniformity of terms and terminology as used in this Manual. All plans, reports, and other communications to or from Communications Division, State of California, must use the following definitions.**

**AB 515 (1972)** — The California Assembly Bill which required the implementation of 911 throughout the State by December 31, 1982.

**AB 416 (1976)** — Follow-on legislation amending AB 515 and adding part 20 to the Revenue and Taxation Code. Refer to Appendix B.

**ADJACENT AGENCY** — *See Contiguous Agency.*

**ADVISORY COMMITTEE** — Advisory Committee on the State Emergency Telephone Number established by AB 416 to assist General Services. *See Gov. Code 53115.1, Appendix B.*

**ALI** — Automatic Location Identification: identifies address of calling party's telephone number.

**ALTERNATE ROUTING** — To have separate physical routes for 911 lines from the central office to the Public Safety Answering Point (PSAP).

**ANI** — Automatic Number Identification: identifies originating telephone number of the incoming call.

**ANSWERING POSITION** — Location where incoming 911 calls are answered.

**AREA CODE** — The three-digit code used when dialing calls from one Numbering Plan Area (NPA) to another.

**AUDIBLE SIGNAL** — A sound to indicate an incoming call.

**AUTOMATIC CALL ROUTING** — *See Selective Routing*

**AUTOMATIC CALL DISTRIBUTOR** — Equipment to distribute in the order received, large volumes of incoming calls to answering positions not already working on calls and to "store" calls until positions become available.

**BASE RATE** — The established telephone exchange service rate, exclusive of mileage, for main telephone, auxiliary line, or trunk line service.

**BASE RATE AREA** — That portion of the exchange area within which exchange service, other than rural line service, is offered at base rates for each grade of service without mileage or construction charges.

**BASIC SYSTEM** — Allows a person dialing 911 to be connected to a PSAP via normal telephone facilities.

**CALLED PARTY HOLD** — Enables the public safety answering point to control the telephone connection for confirmation and tracing of a call.

**CENTRAL OFFICE** — Sometimes called a wire center; the smallest switching center subdivision within the telephone system which has relatively permanent geographic boundaries. It may serve more than one prefix.

**CENTRAL OFFICE AREA** — The geographic area that receives its regular telephone service from a particular central office.

**CENTRAL OFFICE IDENTIFICATION** — Dedicated trunking from the central offices serving the PSAP.

**CENTREX** — A type of private branch exchange in which incoming, outgoing, and intercom calls can be dialed direct without an operator's assistance.

**CID** — Centralized Interrogating/Dispatch.

**CIT** — Centralized Interrogating/Transfer.

**CNIL** — Calling Number Identification and Location; sometimes used by the telephone industry in referring to the combination of automatic number identification and automatic location identification.

**COMMUNICATIONS DIVISION** — California Department of General Services, Communications Division.

**CONFERENCE TRANSFER** — Primary answerer remains connected with a caller after the caller is transferred to a subsequent agency.

**CONTIGUOUS AGENCY** — An agency whose area of responsibility is adjacent to the 911 plan area.

**DDD** — Direct Distance Dialing; telephone service which permits subscribers to dial their own long distance calls.

**DEDICATED FACILITY** — Telephone circuits assigned exclusively to an operation.

**DEFAULT ANSWERING** — Answering at a specific alternative PSAP when the primary PSAP cannot be contacted in selectively routed systems.

**DIAL TONE FIRST** — Allows a 911 call from a coin telephone to be completed without the deposit of a coin.

**DID** — Direct Inward Dialing; an incoming call dialed directly to an extension without an operator's assistance.

**DIRECT DISPATCH METHODS** — All call answering and dispatching is done by the personnel at the public safety answering point.

**DISTINCT TONE** — A 120 IPM tone at the PSAP if an abandoned call is answered or an idle trunk is seized by the operator.

**DOD** — Direct Outward Dialing; an outgoing call dialed directly without an operator's assistance.

**EAS** — Extended Area Service; telephone service that allows subscribers in an exchange area to pay flat monthly or measured rates instead of long distance charges for calls to nearby exchange areas. *See Exchange.*

**EMERGENCY CALL** — A call that requires immediate action.

**EMERGENCY MEDICAL SERVICES (EMS)** — Those communications, transportation, medical, and related services rendered in response o the perceived individual need for immediate medical care in order to prevent unnecessary suffering, disability, or death.

**ESS** — Electronic Switching System; a modern central office with programmable telephone switching logic.

**EXCHANGE** — A defined area, served by one or more telephone central offices.

**EXPANDED 911 SYSTEM** — *See Selective Routing.*

**FINAL PLAN** — That plan which must be filed with California Communications Division and telephone industry by July 1, 1978. It must describe the 911 system's technical and operational features in compliance with the mandates of the California law.

**FIRM ORDER** — An order for a 911 system as approved by the Communications Division to the appropriate telephone company or companies.

**FORCED DISCONNECT** — The capability of the 911 PSAP to disconnect a 911 call.

**FOREIGN EXCHANGE SERVICE** — A telephone line served by an exchange or central office foreign to the exchange or central office in which it is installed.

**GENERAL SERVICES** — California Department of General Services.

**INCREMENTAL COST** — Non-telephone 911 costs. *See Chapter IV, Incremental Costs.*

**INTERCEPT** — A call to a specific number, which cannot be completed by the switching equipment (for other than a busy condition), is routed to either a recorded announcement or an operator.

**JOINT POWERS AGREEMENT** — An agreement that agencies may make for 911 systems which cross jurisdictional (political) boundaries and other contiguous systems. *(See Section 53118 of the California law and Appendix C, Joint Powers Agreement Guide.)*

**KEY TELEPHONE SYSTEMS (KTS)** — Systems that are made up of instruments that have the capability of multiple line terminations. Each line is accessed by depressing its associated button (key).

**KTS** — *See Key Telephone Systems.*

**LOCAL PHONE SERVICE AREA** — That area that can be called without incurring multimessage units or a toll charge.

**MESSAGE UNIT** — The unit of measurement for charging for local message use, based upon time and distance.

**MULTIJURISDICTIONAL SYSTEM** — A system covering more than one political area or agency.

**NETWORK** — A series of points interconnected by communications channels.

**911 LAW** — Government Code Sections 53100-53118 and Revenue and Taxation Code Sections 41001-41150.

**NO COIN DIALING** — *See Dial Tone First.*

**NON-PUBLISHED NUMBER** — A telephone number which is not listed in any telephone directory or in Directory Assistance records available to the general public.

**OVERFLOW ANSWERING** — Backup answering positions for every 911 call arriving at a PSAP.

**P LEVEL OF SERVICE** — Percentage of busy responses encountered by callers in a system. (P.01 = one busy per 100 attempts.)

**PABX** — Private Automatic Branch Exchange; *see PBX explanation.*

**PARTICIPATING AGENCY** — A public safety agency which provides emergency services as part of a 911 plan.

**PBX** — Private Branch Exchange; a telephone switchboard with many stations not individually identifiable to the telephone company's switching network.

**PSAP** — Public Safety Answering Point; the initial answering location for a 911 call.

**PUBLIC AGENCY** — "Public agency" means the state, any city, county, city and county, municipal corporation, public district, or public authority located in whole or in part within this state which provides or has authority to provide firefighting, police, ambulance, medical, or other emergency services.

**PUBLIC SAFETY AGENCY** — "Public safety agency" means a functional division of a public agency which provides firefighting, police, medical, or other emergency services.

**DISTINCT TONE** — A 120 IPM tone at the PSAP if an abandoned call is answered or an idle trunk is seized by the operator.

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**PUBLIC SAFETY AGENCY** — "Public safety agency" means a functional division of a public agency which provides firefighting, police, medical, or other emergency services.

**REFERRAL METHOD** — Calling party referred to a secondary number in nonemergency cases.

**RELAY METHOD** — The call is answered at the PSAP where the pertinent information is gathered and then the interrogator relays that information to the proper public safety agency for their action.

**RING BACK** — Permits the answering point to ring the hung up telephone on a held circuit.

**SELECTIVE ROUTING** — A feature that automatically routes the 911 call to the proper PSAP serving its community regardless of municipal and telephone company wire center boundary alignments.

**SOPHISTICATED SYSTEM** — *See Chapter II, Section A-1-C.*

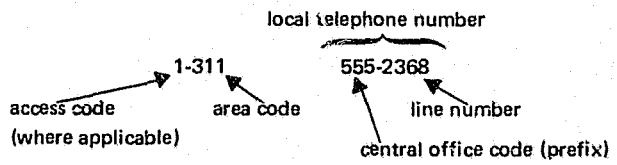
**SUBSEQUENT AGENCY** — A participating agency in a plan whose calls are all handled by transfer or relay rather than by direct dispatch.

**SWITCHED NETWORK** — A complex of diversified channels and equipment that automatically routes communications between the calling and called person or data equipment.

**SWITCHHOOK STATUS** — Enables the PSAP to determine, by means of supervisory lamps, whether a calling 911 line is on-hook or off-hook at any time after the connection has been established.

**TELEPHONE LINE** — A line from a telephone company central office that is connected to key or nonkey telephone equipment.

**TELEPHONE NUMBER** —




**TENTATIVE PLAN** — As used in the California law, a document which was filed with the California Communications Division and the telephone industry serving area by January 1975.

**TRANSFER METHOD** — The PSAP interrogator determines the proper responding agency and connects the caller to the agency that will dispatch the necessary emergency service in accordance with prearranged plans with cooperating agencies.

**TRUNK** — A line from a telephone company central office to a subscriber's PBX or PABX equipment.

**UNLISTED** — *See Non-Published Number.*

**WIRE CENTER** — *See Central Office.*

# CONTINUED

# 3 OF 4

# INTRODUCTION

## HISTORY OF 911

Nine-One-One (911) is the three digit emergency telephone number adopted by the telephone industry as the nationwide emergency number. The universal emergency number concept was initially introduced in Great Britain in the late 1930's when "999" was designated the nationwide telephone number to be used in emergencies.

The American Telephone and Telegraph Company (AT&T) announced on January 12, 1968 that 911 would be made available throughout the country in response to urgings of concerned citizens and officials for a universal emergency telephone number.

## ADVANTAGES OF 911

The three digit number 911 replaces seven-digit emergency numbers which are more difficult to remember. It is important to note that 911 is a short, easy-to-remember telephone number that will shorten the time in the total emergency response cycle between the detection of an event and the dispatch of assistance to that event. In some situations, implementation of 911 can result in a reduction of costs to an agency or agencies and the elimination of some duplicated services.

The Emergency Telephone Number 911 contains three major advantages for the citizen seeking emergency aid: (1) It relieves citizen doubt about the proper emergency response agency. One call can bring multiple agency responses when necessary; (2) It is easier to remember the same number for all emergencies, and the number will be universal throughout the State; (3) It is easier and faster to dial under adverse conditions than a seven-digit number.

Citizens often dial "operator" to report an emergency. The telephone operator must interrogate the caller and then find and dial the number for the appropriate service agency and transfer the call. It is sometimes difficult to reach a telephone company operator because of busy conditions on the system. A 911 Public Safety Answering Point (PSAP) operator, on the other hand, is a specialist in emergency requests and has direct access to speeding emergency services to the assistance of the citizen calling 911.

## PROGRAM OBJECTIVE

California's 911 Program objective is to provide a rapid and effective means to request emergency help from any telephone in the State.

Government Code 53100 provides for implementing 911 emergency telephone systems throughout the State. These systems will establish uniform emergency telephone communications for emergency police, fire, medical, and ambulance services.

The 911 Law was amended by the Legislature in 1976. The amendment provided for subvention funding for the 911 program to assure availability of 911 to all Californians by December 31, 1984. *(See Appendix B)*

## THE MANUAL AND ITS USE

This manual has been prepared with the cooperation of many public safety agencies and the telephone industry to clearly describe 911, and assist planners and implementers to meet the requirements of the California law.

The intent of the manual is to make 911 planning and implementation as easily understood as possible. This manual describes 911 planning requirements and State assistance available for 911 system implementation. It outlines the program responsibilities of local and State agencies. Elements of the 911 program which may be covered by State subvention are also indicated.

# CHAPTER I — STANDARDS

## A. NEED FOR MANDATORY 911 SYSTEM STANDARDS

The primary impetus for the State 911 Program is the Legislature's recognition of the statewide need to provide a simple means to speed telephone requests for emergency services.

A critical factor in any emergency is the time delay between the detection of an incident and the notification of the proper public safety agency. The time lapse caused by indecision, use of wrong numbers, or in looking up the appropriate seven-digit emergency number for the various emergency services will be minimized by implementation of 911.

These standards are mandatory requirements for all 911 Systems. The standards were developed in cooperation with local public safety agencies and the telephone industry. The State of California, Communications Division, will be responsible for updating and distributing revisions in each even-numbered year and whenever necessary.

## B. MANDATORY STANDARDS

1. The primary published emergency number shall be 911, and will be the only emergency number published on the "Emergency" page of the public telephone directory. A 7-digit emergency backup number must be maintained for each PSAP.

2. The telephone companies shall take annual service measurements, or as required by the local agency, on the 911 terminating line/trunk groups to determine the actual grade of service being experienced to satisfy the agency's answering requirements. The telephone companies will provide the involved agencies and the State of California, Communications Division with an appropriate report on the results of these service measurements.

3. All 911 lines shall have visual and audible indication of an incoming call. Tone signals (audible ringing, busy tone, and all trunks busy) will be provided to the 911 calling party in the normal manner.

4. Each PSAP shall be responsible for 911 calls 24 hours per day, 7 days per week. 911 lines/trunks may be switched to another answering point in systems with low call volume during slack periods.

5. When employing the Transfer Method, procedures will be developed to advise the calling party that the call is being transferred and to remain on the line.

6. All PSAP's will maintain interagency communications capabilities for emergency coordination purposes.

7. All PSAP's will be responsible for all 911 calls they receive, ensuring the proper public safety agency is notified of the emergency.

8. The telephone companies shall provide mechanical intercept of 911 calls from non-participating central offices contiguous to a 911 serving central office whenever equipment arrangement code conflicts are not involved. The intercept recording will inform callers that 911 is not available from their telephones.

9. All facilities associated with 911 service shall be equipped at all exposed terminations, including central office distributing frames, with protective devices that prevent accidental workman contact. Each protected termination shall be marked so as to make it easy to identify circuits.

10. Safeguarded circuits shall not be opened, grounded, short circuited, or manipulated in any way by telephone company workmen until the local test desk obtains prior circuit release from the appropriate 911 PSAP.

11. Telephone company supervision shall assure that all telephone company employees, whose normal activities may involve contact with facilities associated with the 911 service, are familiar with the procedures of safeguarding these facilities.

## C. NONMANDATORY FEATURES

The following is a list of nonmandatory features. Agencies who have the resources should, where appropriate, consider these features to enhance their operations.

1. During the average busy hour of each shift of the busy day, all calls be answered within 10 seconds.

2. Written procedures and appropriate training be provided to the operators and documented.

3. The date and time of receipt for each 911 emergency call be documented (written or tape recorded) and retained for at least 90 days or for that period of time established by local requirements.

4. Access control and security of PSAP's and associated dispatch centers be designed to prevent disruption of operations.

5. Sophisticated system features (where not part of the line/trunk rate).

6. Automatic Number Identification ANI.

7. Automatic Location Identification ALI.

8. Default Answering.

9. If all incoming PSAP positions are busy, the calls waiting should reach a recorded message informing the caller that:

   a. The 911 emergency number has been reached, and an operator will answer as soon as possible.

   b. Major emergency incidents, once reported, will be placed on the recorder to advise callers action has been taken. The caller will be advised to remain on the line if the call is nonrelated to this incident.

10. A short-term recording and replay capability be provided for each operator position.

11. Alternate means of communicating with public safety agencies.

12. Physical environmental factors affecting human effectiveness be engineered to provide the best possible lighting, acoustics, air conditioning, etc.

13. Emergency electrical power (battery and/or emergency generator) be provided for the PSAP environment that will ensure continuous operations and communications (telephone, radio, etc.) during a commercial power outage.

14. Alternate entrance route for primary power to the PSAP.

15. Alternate central office telephone cable routes to and from the PSAP.

# CHAPTER II — PLANNING FOR THE 911 SYSTEM

## A. PLANNING CONSIDERATIONS FOR 911

There are many factors to be considered for 911 to be successful. This chapter discusses some of the major issues involved in 911 planning.

Multijurisdictional cooperation is essential during planning to assure the development and implementation of an effective and successfully operated 911 system. The law mandates cooperative answering of all police, fire, and medical emergency calls at a central PSAP. Systems should be aligned with emergency services dispatch systems to minimize delays caused by call transfer, relay, or referral. Centralization and coordination are encouraged and should be considered during the planning stages for 911 implementation. The telephone company central office (wire center) boundaries are the smallest manageable unit for 911 purposes. Political boundaries are rarely concurrent with central office boundaries.

Overlapping political and central office areas present no real problem with regard to almost any other telephone service. With 911, however, these areas require adequate planning and cooperation among the participants to assure that calls reach the appropriate agency. Those central office areas which lie wholly within a jurisdiction present no particular problem in providing 911 service to that jurisdiction, although a number of telephone exchanges may be involved. There will be central offices (wire centers), however, which serve several adjacent communities. Citizens in adjacent communities using the same central office could dial 911 and instead of reaching their own police or fire department, would get that of another agency.

Interjurisdictional cooperation is paramount in this situation in that procedures must be established to answer the calls from another community and then dispatch, transfer, relay, or (for nonemergencies only) refer them to appropriate local emergency service agencies. Cooperation among the police, fire, and medical emergency services of participating jurisdictions is essential throughout the planning process to assure adherence to the minimum standards.

Careful consideration should be given to planning a 911 system in order to provide the minimum number of transfers between the calling party and the responding emergency service agency.

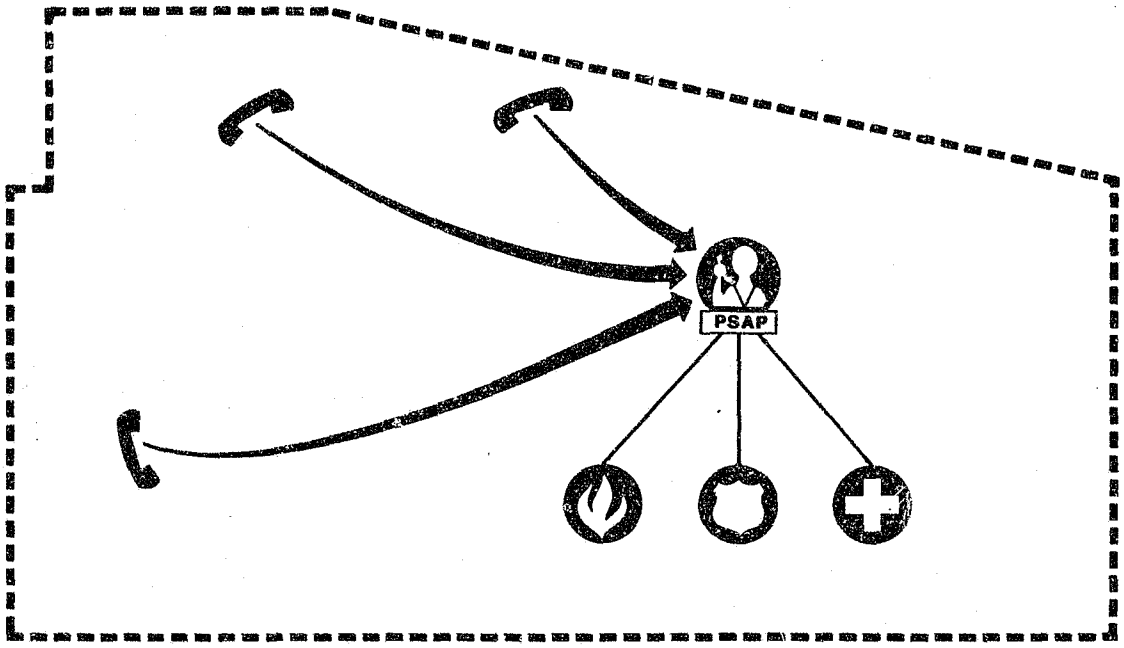
The following section defines and illustrates the common 911 system configurations and the four approved methods of communication between the Public Safety Answering Point and responding emergency service agencies. Local 911 system designs may be combinations of these illustrated systems if they satisfy the State 911 Standards in Chapter I.

1. **911 System Definitions**

a. **Basic 911 System**

The "basic 911 system" allows a person dialing 911 to be connected to a PSAP via normal telephone facilities. All 911 calls from lines served by a central office or central offices will be routed to one PSAP. The following illustration depicts a basic 911 system. Consideration should be given to public education of telephone subscribers located within the 911 planning area but served by other central offices. They should be informed that until adjacent jurisdictions have 911, they should use a designated seven-digit emergency number. Stickers or other means of showing the special number should be provided for the appropriate telephones.

**BASIC 911 SYSTEM**




Legend:
PSAP — Public Safety Answering Point
Central Office (CO) Boundary (Telephone number prefix)

b. **Selective Routing**

Selective Routing is a telephone arrangement which will automatically route calls from a predetermined geographical area to a PSAP serving that area regardless of municipal and central office boundary alignments.

c. **Sophisticated 911 Systems**

Sophisticated telephone system features may enhance the command and control capabilities of a PSAP.

(1) The following Sophisticated System features will be authorized for State financial reimbursement if they are not included in telephone company basic line/trunk rates:

- *Central Office Identification* — When a PSAP serves more than one central office, dedicated lines or trunks are used to identify each central office.
- *Distinct Tone* — Differentiates between a caller who abandons a 911 call before the PSAP answers and a caller who is connected but cannot speak.
- *Forced Disconnect* — Allows PSAP operators to force release of the 911 incoming line.
- *Called Party Hold* — Enables the PSAP operator to control the connection for confirmation and tracing of a call (requires dedicated trunks).

(2) Additional Sophisticated features which are not included in telephone company basic line/trunk rates or authorized for state reimbursement, are as follows:

- *Switchhook Status* — Alerts PSAP operator when calling party hangs up.
- *Ringback* — Enables PSAP to ring back a calling telephone party in conjunction with Called Party Hold.
- *Automatic Number Identification (ANI)* — Automatically displays the calling telephone number at the PSAP.
- *Automatic Location Identification (ALI)* — Automatically displays the address of the calling telephone at the PSAP.

2. **System Configurations**

a. **Basic 911 (Decentralized System) Configuration**
Figure 1 illustrates basic decentralized 911 with three telephone central offices and three cities.

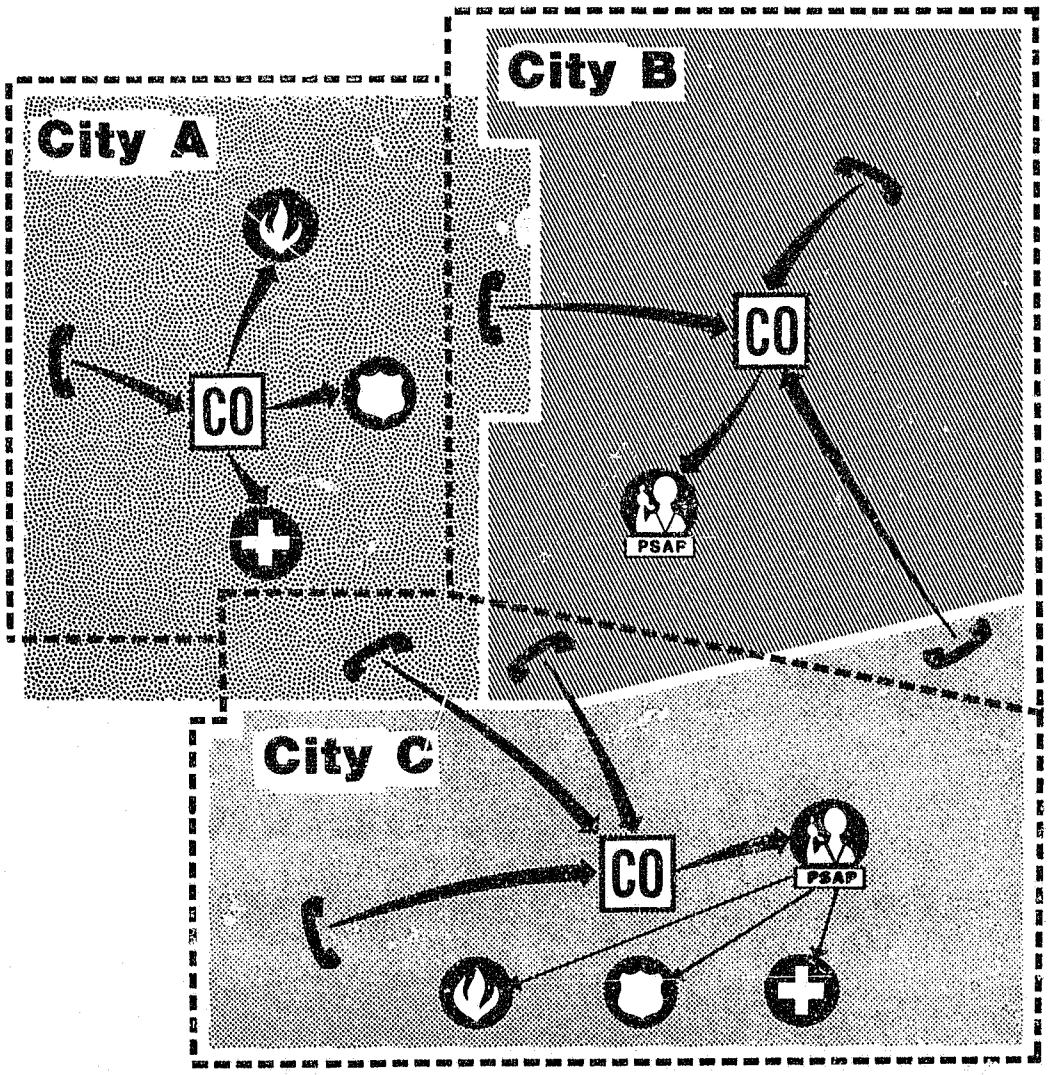



**FIGURE 1**

**Legend:**
PSAP — Public Safety Answering Point
CO — Telephone Central Office
----- — Central Office (CO) Boundary

(1) In City A (Figure 1) where 911 has not been implemented, calls for fire, police ambulance services are dialed direct using separate seven-digit numbers. The public should be informed and provided with seven-digit emergency number telephone stickers.

(2) City B (Figure 1) is a system that utilizes the Direct Dispatch method from a single PSAP. There are telephones that are within City B boundaries and outside of the City B boundaries, but all of them are within the same telephone wire center (dotted line). When 911 is dialed from any one of these telephones, the call is routed to City B's PSAP since a central office cannot differentiate between city boundaries. Direct transfer lines to adjacent agencies are provided.

(3) City C (Figure 1) depicts a system utilizing the Transfer Method. The caller dialing 911 reaches the PSAP where the call is transferred to the proper agency. Again, out-of-jurisdiction calls would be transferred, relayed, or referred (for non-emergencies only) to the proper PSAP.

b. **Basic 911 (Centralized System) Configuration**

Figure 2 illustrates a basic centralized 911 system with the same three telephone central offices and cities employing one central PSAP. All 911 calls for the three cities are answered at a central PSAP. Each city would then be served by a combination of the four response methods of Direct, Transfer, Relay, or Referral (Government Code 53103 to 53106 and 53112).

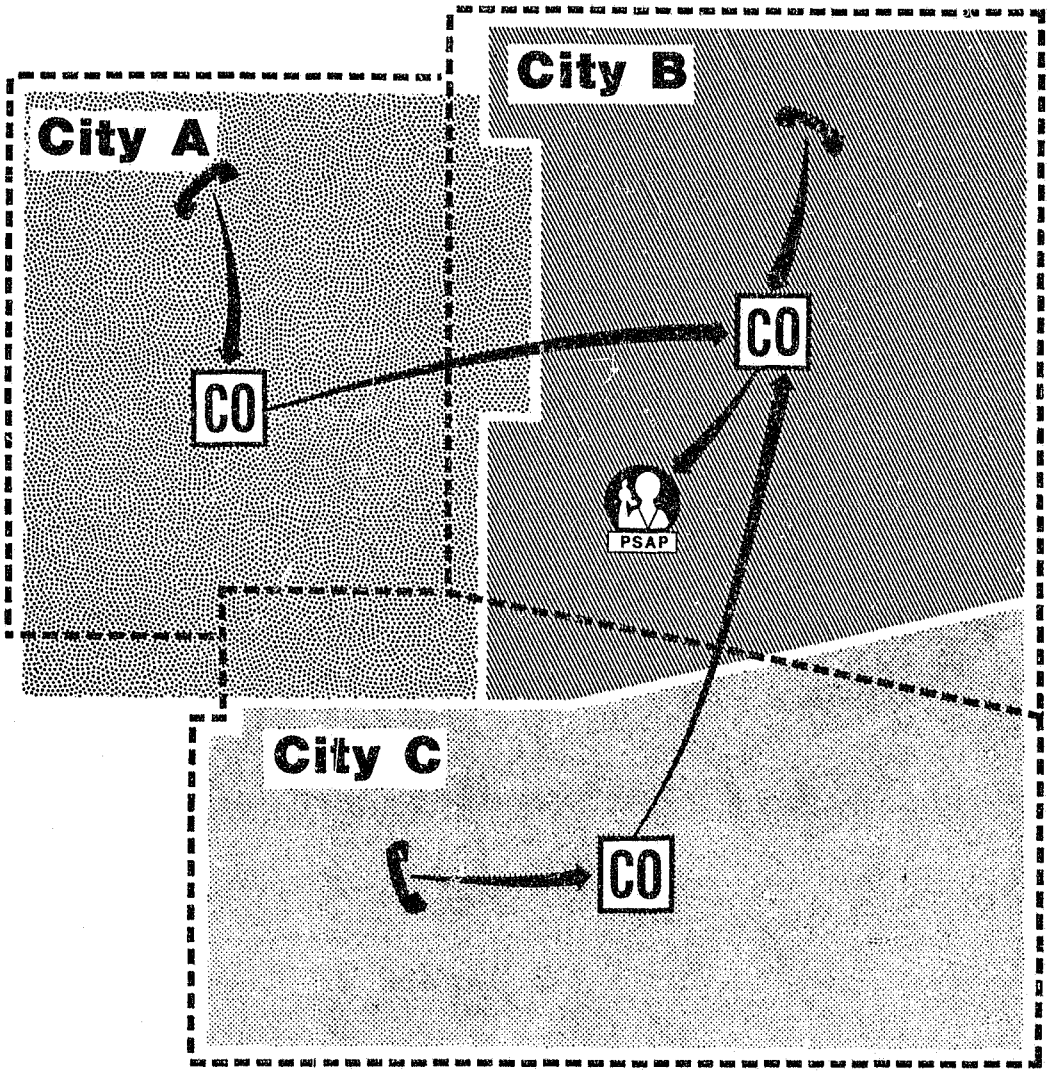



**FIGURE 2**

**Legend:**

PSAP — Public Safety Answering Point
CO — Telephone Central Office
---- — Central Office (CO) Boundary

c. **Selective Routing Configuration**
Figure 3 illustrates three cities having a sophisticated 911 system utilizing selective routing features, where, regardless of city and telephone central office boundary alignments, the call is automatically routed to the proper PSAP serving the caller's city.

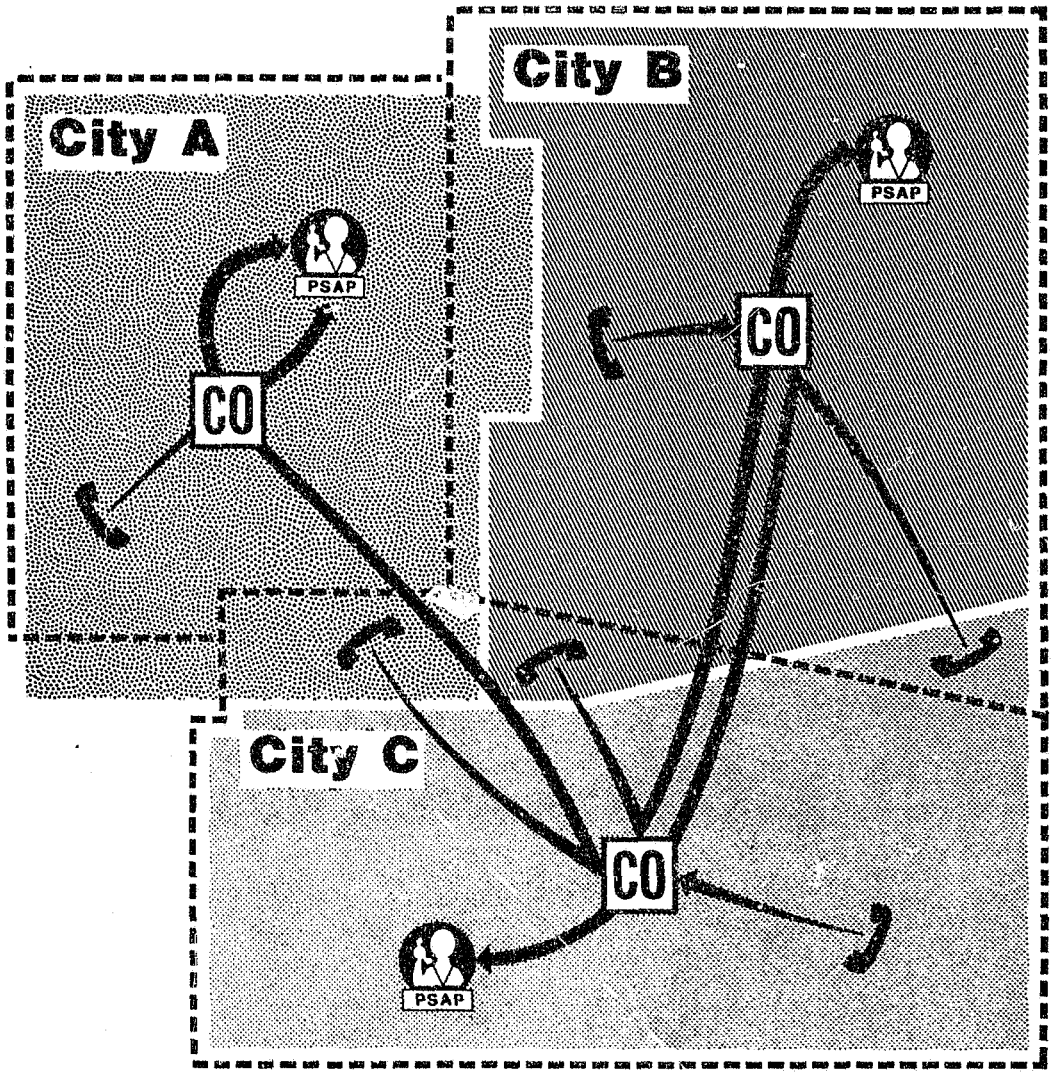



**FIGURE 3**

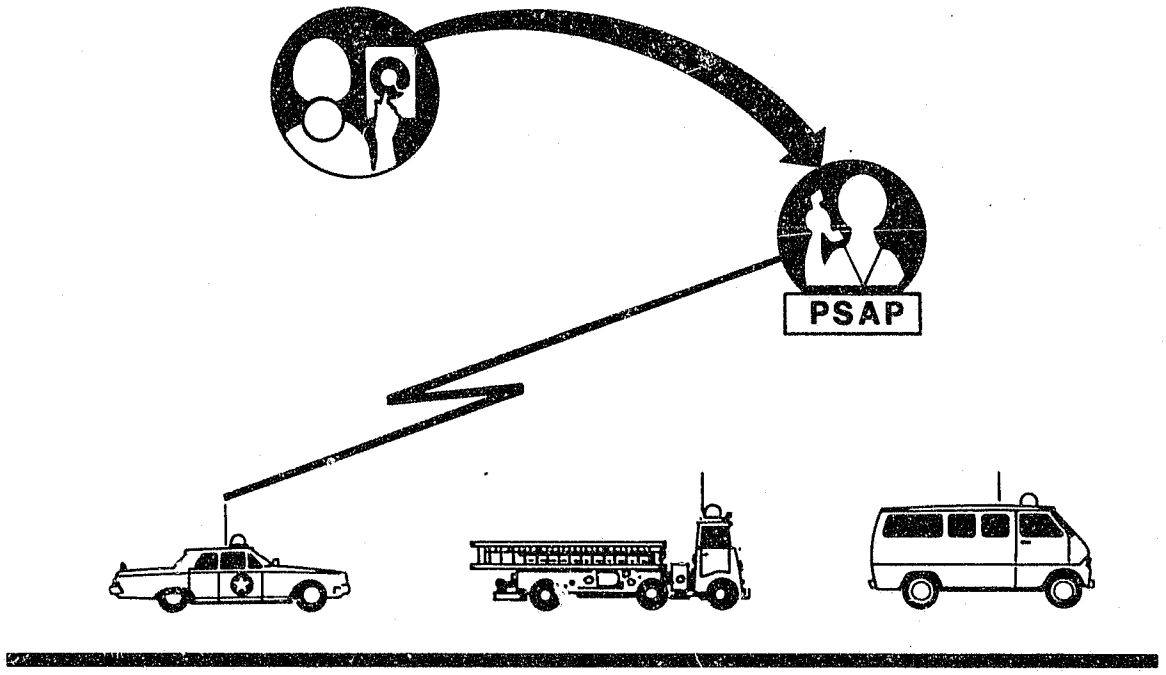
**Legend:**
PSAP — Public Safety Answering Point
CO — Telephone Central Office
------ — Central Office (Co) Boundary

### 3. Methods of Response

There are four methods of response for a PSAP to communicate the need for service to the responding emergency service agency. California law requires all systems to employ three of the following methods:

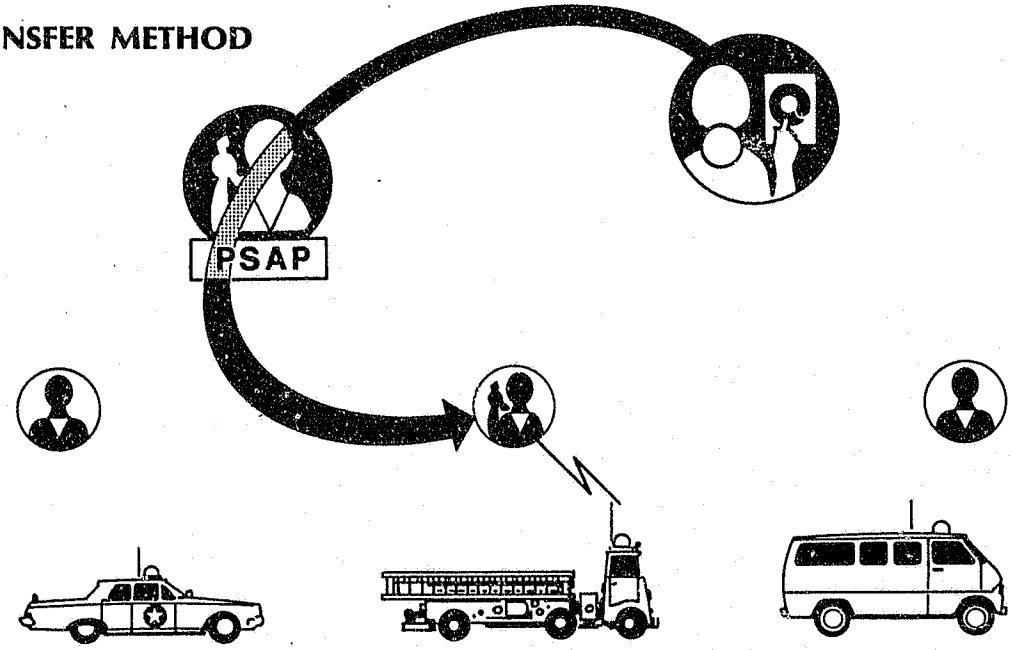
a. **Direct Dispatch Method.** In the "Direct Dispatch Method", all call answering and dispatching is done by the personnel at the PSAP.

**DIRECT DISPATCH METHOD**



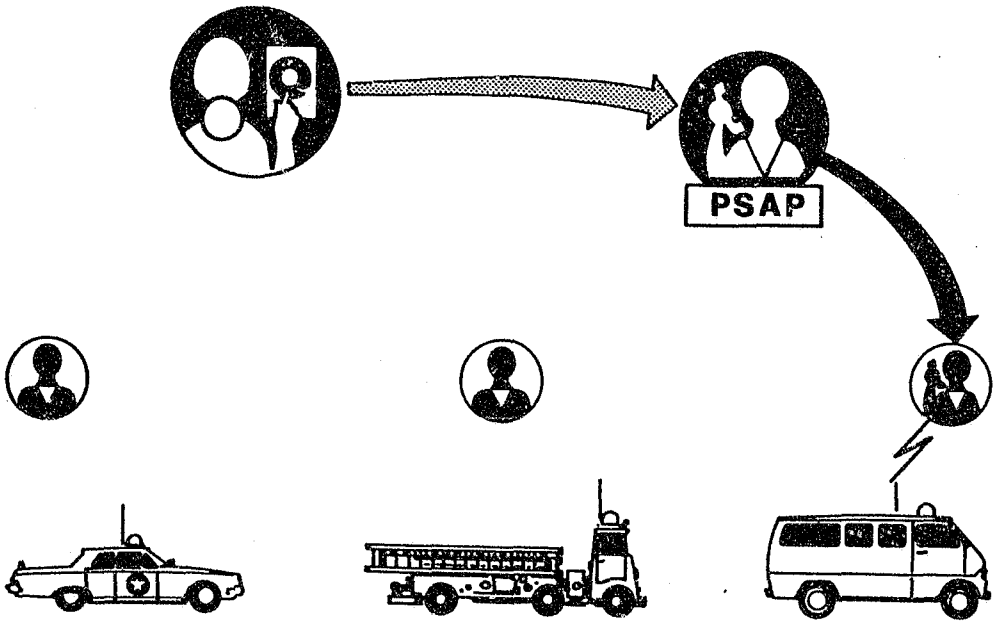

b. **Transfer Method.** In the "Transfer Method," personnel of the PSAP determines the proper responding agency and transfer the caller to that agency for further interrogation and for dispatch of the appropriate response.

**TRANSFER METHOD**



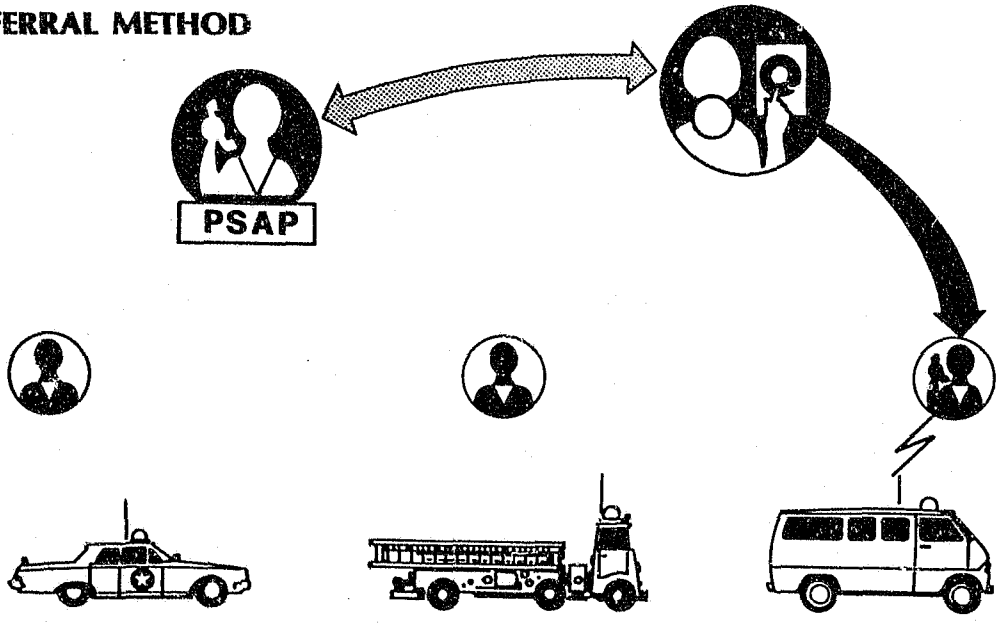
c. **Relay Method.** In the "Relay Method" of response, the call is answered at the PSAP where pertinent information is gathered; and then the PSAP personnel relay that information to the proper public safety agency for their action.

**RELAY METHOD**




d. **Referral Method.** The "Referral Method" is restricted to handling nonemergency calls only. In the "Referral Method," the call goes to the PSAP where personnel determines the nature of the call and refers the caller to the telephone number of the proper agency. The caller then reinitiates the call.

**REFERRAL METHOD**



# CHAPTER III — 911 PLANNING ACTIONS

## A. GETTING STARTED

The first step in 911 planning is to determine the affected geographic areas. A planning task force should be established with representatives of the participating local governments and emergency services. The task force should select a program manager, a users technical committee, and an executive operations committee. Committee members should be able to make decisions about how their respective organizations will operate within the planned 911 system. Each city, county, and emergency service agency is responsible to satisfy the requirements and time schedules specified by the 911 law.

Resolutions from the governing bodies of participating jurisdictions may be appropriate early in the plan development. The first resolution would be to participate in system planning. Later resolutions regarding division of responsibility and accepting the system design will be required in the final plan.

## B. ORGANIZING THE 911 PLAN

The following checklists are provided as a guide to the activities which are usually necessary in order to develop a 911 system. Not all the activities listed here will apply to every community.

### 1. 911 Participants

The participants in a 911 system in the State of California must include:

- All law enforcement emergency services within the 911 system
- All fire emergency services within the 911 system
- Emergency medical and ambulance services within the 911 system

a. Participants providing other emergency services may be included, for example:

- Poison control
- Suicide prevention
- Civil defense
- Public utilities for calls reporting dangerous conditions such as fallen power lines or gas leaks
- Drug abuse centers

### 2. Composition of a Planning Task Force

- Chief or Director of a Communications Agency
- Law Enforcement representatives
- Fire Service representatives
- Emergency Medical representatives
- Telephone Company representatives
- State of California, Division of Communications 911 Coordinator
- Others as needed

### 3. Sources of Information

- Review of existing information on 911
- Tentative plans
- Contacts with communities already having 911
- California 911 Coordinator, Communications Division
- Information provided by local telephone company

### 4. Decisions About Area

- Central office boundary considerations
- Single or multijurisdictional participation
- 911 calls from foreign exchange lines
- Costs

### 5. Inventory of Emergency Services in the Proposed 911 Area

- Fire Services: Local, State, and Federal
- Law Enforcement Agencies: Local, State, and Federal
- Ambulance services
- Hospitals
- Poison control centers
- Suicide prevention centers
- Drug abuse centers
- Civil defense agencies
- Weather warning stations
- Public utilities
- Others

### 6. Selection and Location of PSAP

- Law enforcement headquarters
- Fire station
- Separate communications center
- Other public safety locations

### 7. Decide Answering Center Modes of Operation

- Direct dispatch
- Transfer
- Relay
- Referral (for nonemergency calls only)
- Combination of above

## C. PLANNING ACTIVITIES CHECKLIST

1. Coordination with contiguous agencies.

- Arrangements for sharing responsibility for operating answering center.
- Accountability for service quality.
- Cost sharing arrangements.

2. Assignments of Responsibilities and Drawing Up of Cooperative Agreements with Participating Agencies.

3. Establishment of Procedures for Handling 911 Calls.

   - For emergency calls
   - For multilingual calls
   - For nonemergency calls
   - For nuisance or false alarm calls
   - Overflow calls
   - Others

4. Planning of Publicity Campaign.

   - 911 publicity coordinated with telephone company directories
   - Decals or signs painted on public safety vehicles
   - Telephone stickers
   - Dial access procedures for dial PBX, PABX, and Centrex systems.
   - Television, radio, newspapers
   - Printed materials
   - Presentations to school and citizens' groups
   - Other publicity activities, banks, utilities

## D. EQUIPMENT CONSIDERATIONS

Emergency telephone traffic studies must be made as soon as the participating agencies and geographic boundaries of the planned system are determined. Local telephone companies will install line counters for a fixed charge and collect the data needed to determine the number of 911 lines and telephone answering positions that are needed.

1. There are many factors to be considered in 911 equipment needs. The following list provides a framework which will aid operational agencies in identifying their equipment needs:

   - Number of emergency lines required.
   - Compliance with minimum State 911 standards.
   - The number and location of participating emergency agencies involved.
   - The use and integration of presently available and planned communications facilities, such as two-way radio, teletype, etc.
   - Expected amount of emergency traffic and answering positions required to handle it during normal and peak periods.

   The specific equipment needs will be dictated by features of a basic or sophisticated 911 system.

2. Features eligible for approved State financing are described in Chapter IV.

3. The California law requires, as a minimum, that three of the four response methods described in Government Code Sections 53103 through 53106 must be employed at the PSAP. These methods cover the procedure for handling an emergency call. They are:

   - Direct dispatch
   - Transfer
   - Relay
   - Referral (used only for nonemergency calls)

   Each one of these methods requires certain types of equipment considerations. Communications Division and telephone industry representatives can provide assistance and guidance in equipment needs for a particular situation.

## E. TECHNICAL INFORMATION REGARDING EQUIPMENT

The following technical information outlines descriptions of equipment that could be used in a 911 system. Complete information must be obtained from local telephone company representatives.

1. **Terminating Considerations.** The basic equipment required for call answering can range from an individual pushbutton-type telephone to a large pushbutton answering system, multiple switchboard, or automatic call distribution system. Most of the equipment can be furnished by the telephone industry under their current tariff schedules. Where certain configurations of required equipment are not offered in current industry tariffs, special assembly tariffs or contracts will be developed for a specific application. Also, there is a variety of equipment available from private vendors which may suit individual system needs.

2. **Pushbutton Telephone Equipment (KTS).** Incoming 911 lines, two-way lines, and direct tie lines are terminated on pushbuttons. The pushbutton modules are wired to an associated telephone set, headset, handset, or speaker-phone. An incoming call on a line is noted by a flashing lamp associated with a pushbutton and, an audible signal. Pushing the button answers the call. Pushbutton operated holding features allow calls to be held while other calls are answered or originated.

3. **Switchboard Equipment.** Switchboard's PBX's, and PABX's are available in manual and automatic versions and also in cord type or cordless, i.e., pushbutton or lever switch, attendant operation.

4. **Emergency Reporting Switchboard Equipment.** These switchboards are designed to answer calls from streetside emergency telephones as well as central office lines and usually are (or can be) equipped to "transfer" calls to other locations. Calls are answered by both pushbutton and cord and jack methods described above.

5. **Automatic Call Distributor.** Equipment to distribute large volumes of incoming calls to attendants not already working on calls and to "store" calls until attendants become available. It records call volume for traffic management purposes.

6. **Centrex.** A type of private branch exchange in which incoming calls can be dialed direct to any extension without an operator's assistance. Outgoing and intercom calls are dialed by the extension users.

7. **Specialized 911 Switching.** Switching equipment specially designed to serve 911 PSAP's by providing both basic and sophisticated features.

8. **Conferencing.** This feature in a PBX or Centrex system facilitates conference-style transfers of 911 calls.

9. **Called Party Hold.** Enables the public safety answering point to control the telephone connection for confirmation and tracing of a call and requires direct trunking from the calling party's central office to the public safety answering point.

## F. COST ESTIMATES

There is a general agreement among the telephone companies in California that they will make central office modifications to provide 911 capability without charge. Additional costs will be incurred for a sophisticated 911 system depending on what features are implemented. There will be no charge to the citizen for placing 911 calls.

A system designed for multijurisdictional or regional operation which provides for the consolation of services can, in many instances, result in cost savings and efficiencies. Local agencies are encouraged to investigate the advantages of consolidation.

Cost estimates will be based on the 911 system design and staffing needed to meet the operational requirements of all participating agencies. Telephone equipment costs will be estimated by the telephone company representative. Incremental non-telephone costs may be estimated by appropriate local experts in communications, construction, personnel, and public works. Cost estimating forms are provided in Chapter IV.

## G. SUMMARY OF 911 PLANNING CONSIDERATIONS

- Establish the local planning and policy organization.
- Identify the agencies and/or services to be included.
- Define the 911 system service boundaries.
- Define the serving telephone company(s) capabilities.
- Define and adopt appropriate response time criteria.
- Identify interagency and/or service intercommunications requirements.
- Prepare peak hour traffic requirements for initial implementation and future growth.
- Analyze and adopt a 911 system design concept for basic, expanded, sophisticated, or progressive upgrading.
- Identify and adopt procedures and policies for dealing with nonemergency calls.
- Define and adopt procedures and policies for dealing with fire and/or intrusion alarm servicing.
- Prepare initial and continued 911 operation personnel training.
- Provide for alternate back-up procedures, lines, power, etc.
- Determine the "host" or agency responsible for management and operation of the 911 system.
- Prepare uniform operational procedures, policies, and manuals.
- Identify and provide for the financial resources for implementing, expanding, and operating the system.
- Prepare an effective public information and education program.
- Identify and comply with all legal requirements.
- Prepare procedures which assure documentation of all aspects of the system planning, implementation, and operation.
- Provide for the secure operation of the system.
- Prepare for system flexibility and expansion requirements.
- Identify new communications technology.

# CHAPTER IV — PREPARING FINAL PLANS

## A. FORMAT AND CONTENTS OF PLANS

The following planning form pages must be completed and signed by authorized local officials for all 911 plan submissions. These forms provide the information necessary to ensure compliance with State law and to expedite review and approval by the Communications Division.

## B. REQUIRED PROCEDURES

Plans submitted by local agencies for State financial assistance with their 911 system costs can be approved if the following conditions are met:

Before any claims for costs can be filed, the plans for the system to be implemented must have been approved by the Communications Division. Government Code Section 53115(b) establishes the following dates as deadlines for certain actions:

1. July 1, 1978. Each agency must have provided the final plans of its system for the Communications Division approval by this date. The Communications Division will provide the following forms on which the details of the plans will be set forth.

2. July 1, 1979. By this date, a firm order for the system must have been placed, as approved, by the Communications Division.

3. December 31, 1984. All systems must be implemented by this date.

4. Once the plan for a system is approved and that system is implemented, bills for installation services and claims for incremental costs can be submitted.

   a. Claims are to be submitted on the form prescribed by General Services (Government Code Section 41141).

   b. These forms must be submitted to the Communications Division by July 1 to be eligible for payment one fiscal year later. This deadline will be strictly adhered to since the budget for the following year is prepared based upon the receipt of such bills.

   c. It must also be remembered that before payment can be made, all claims for incremental costs must be recommended for approval by the Advisory Committee and the Communications Division. (Government Code Section 41137(d).)

5. Plans and claims for 911 cost reimbursement must be submitted on the following plan forms as explained below. Forms are available from Communications Division 911 Coordinators.

## C. PLAN FORMS

The following forms must also be used for describing existing 911 systems as required by law for reimbursement. Incomplete plan forms will be returned to the submitting jurisdiction for correction

It is important to briefly describe each of the alternative system configurations that were considered, and why they were rejected in favor of the selected system.

The signed plan and two copies must be submitted within the time frame described above. One will be returned indicating Communications Division approval or rejection. The format for the plans are as follows:

1. Cover Sheet (Form 280)

   - This information identifies the city and/or county responsible for submitting each plan. It identifies the system director responsible for contractual agreements filed, and for administering the financial portion of the 911 system. Telephone representatives consulted are also to be listed.
   - Participants — Identify all participating agencies which provide the public safety services required for the 911 plan area. Appropriate officials must sign the plan for each agency involved in the 911 system. Contiguous agencies are those responsible for adjoining jurisdictions. Show which of the methods of response will be used to handle 911 calls to each of the participating and contiguous agencies.

2. Telephone Cost Forms

   - These forms must completely show all of the 911-related telephone costs authorized below. Unauthorized or omitted costs will not be eligible for reimbursement through the State 911 Program. The telephone companies will assist the local agencies in completing this form. Attach a copy of the telephone company(ies) proposal showing cost breakdown as summarized on the final plan.

3. The California Department of General Services will reimburse telephone costs of approved 911 Systems as follows:

a. Central office lines/trunks that fall under either a basic system, a basic system with central office identification, or a system with selective routing (see *Chapter II, Section 1-A-3*).

b. PSAP terminal telephone equipment (telephone sets) including common control equipment (lights, line hold, automatic call distributors, etc.) and transfer arrangements.

c. Transfer circuits to subsequent public safety agencies and contiguous PSAPs.

d. Toll or multimessage units of calls transferred over the telephone network.

e. Terminal telephone equipment at subsequent public safety agencies.

4. Incremental Cost Form

a. This form will not be required until the question of incremental cost support is answered.

Incremental costs will be considered for approval and reimbursement to local agencies when such costs are reasonable and necessary for the implementation of an efficient 911 system. Plans submitted by local agencies which include incremental costs will be submitted to the State Emergency Telephone Number Advisory Committee for their review and their recommended action to Communications Division. In reviewing incremental cost requested, the Advisory Committee and Communications Division will take into consideration the operational efficiencies as well as the cost effectiveness to be derived from those requested items or system features which fall within the category of incremental costs. The schedule for the reimbursement of incremental costs will be subject to the availability of funds.

5. Description of the Planned System (summarize in 200 words).

- Describe the type of system being planned and why it was selected. Use diagrams for clarification.
- Summarize other alternative configurations considered and why each one was rejected.

STATE OF CALIFORNIA — COMMUNICATIONS DIVISION

# EMERGENCY TELEPHONE SYSTEM PLAN

COM-280 (NEW 5-77)

*If Appropriate, Contracts or Agreements MUST be attached*

COUNTY

PUBLIC AGENCY RESPONSIBLE FOR OPERATION

| | |
|---|---|
| PSAP LOCATION | PSAP MANAGER |
| MANAGER'S ADDRESS | MANAGER'S TELEPHONE |

| | | |
|---|---|---|
| TELEPHONE COMPANY REPRESENTATIVE(S) | NAME AND TITLE | COMPANY |
| | NAME AND TITLE | COMPANY |

Statement of Compliance: We, each of the undersigned, affirm that the local public agency or public safety agency we represent will participate in the 911 Emergency Telephone System described in this plan in accordance with California Government Code 53100 et seq. and the California Standards for 911 Systems published by the California Department of General Services. The Responsible Public Agency of this plan will be the recipient of applicable State Financial assistance.

| | | | |
|---|---|---|---|
| OFFICIAL AUTHORIZED TO SIGN FOR THE RESPONSIBLE PUBLIC AGENCY | NAME AND TITLE | AGENCY | TELEPHONE |
| | ADDRESS | SIGNATURE ▶ | |

| PARTICIPATING AGENCIES (LIST BY MUNICIPALITY OR DISTRICT - SHOW CONTIGUOUS AGENCIES LAST) | METHOD OF HANDLING EMERGENCY CALLS | | | OFFICIALS LEGALLY DESIGNATED TO REPRESENT EACH PUBLIC AGENCY BY ITS GOVERNING BODY | |
|---|---|---|---|---|---|
| | DIRECT DISPATCH | TRANSFER | RELAY | SIGNATURE | TITLE |
| | | | | | |
| | | | | | |
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SYSTEM COSTS AUTHORIZED IN 911 SYSTEM STANDARDS & PLANNING GUIDELINES MANUAL, CHAPTER IV, AND DESCRIBED ON REVERSE AND SUBSEQUENT PAGES.

PROPOSED SYSTEM

| MONTHLY COST | ANNUAL COST | | INSTALLATION COST | | TOTAL FIRST YEAR COST |
|---|---|---|---|---|---|
| $ | $ | + | $ | = | $ |

| PLANNED INSTALLATION DATE | STATE USE ONLY | DATE RECEIVED | PLAN APPROVED BY/DATE | DATE CUTOVER |
|---|---|---|---|---|
| | | | | |

PSAP TELEPHONE COSTS

COM-280 (NEW 5-77)
REVERSE

If more space is needed, attach additional sheet(s) indicating item(s) that apply.

PAGE | OF

PUBLIC AGENCY RESPONSIBLE FOR OPERATION

PSAP LOCATION

| | | QUANTITY | UNIT PRICE | MONTHLY CHARGE | INSTALLATION CHARGE |
|---|---|---|---|---|---|
| 1. PSAP ANSWERING TERMINAL(S) | PRESENT | | | | |
| | PROPOSED | | | | |
| | PRESENT | | | | |
| | PROPOSED | | | | |
| 2. 911 CENTRAL OFFICE LINES/TRUNKS | PRESENT | | | | |
| | PROPOSED | | | | |
| 3. FOREIGN CENTRAL OFFICE LINE/TRUNK GROUPS FROM: A. | PRESENT | | | | |
| | PROPOSED | | | | |
| B. | PRESENT | | | | |
| | PROPOSED | | | | |
| C. | PRESENT | | | | |
| | PROPOSED | | | | |
| D. | PRESENT | | | | |
| | PROPOSED | | | | |
| E. | PRESENT | | | | |
| | PROPOSED | | | | |
| 4. 7-DIGIT BACKUP LINES/TRUNKS | PRESENT | | | | |
| | PROPOSED | | | | |
| 5. PSAP TO PSAP LINES TO: A. | PRESENT | | | | |
| | PROPOSED | | | | |
| B. | PRESENT | | | | |
| | PROPOSED | | | | |
| C. | PRESENT | | | | |
| | PROPOSED | | | | |
| D. | PRESENT | | | | |
| | PROPOSED | | | | |
| 6. COMMON CONTROL EQUIPMENT A. LINE HOLD | PRESENT | | | | |
| | PROPOSED | | | | |
| B. LINE LIGHTS | PRESENT | | | | |
| | PROPOSED | | | | |
| C. SYSTEM LIGHTS | PRESENT | | | | |
| | PROPOSED | | | | |
| D. ACDS | PRESENT | | | | |
| | PROPOSED | | | | |
| E. TRANSFER ARRANGEMENTS | PRESENT | | | | |
| | PROPOSED | | | | |
| F. COMLINE(S) | PRESENT | | | | |
| | PROPOSED | | | | |
| G. | PRESENT | | | | |
| | PROPOSED | | | | |
| H. | PRESENT | | | | |
| | PROPOSED | | | | |
| I. | PRESENT | | | | |
| | PROPOSED | | | | |

**SUBSEQUENT AGENCIES**
COM-280 (NEW 5-77)
PAGE 2

If more space is needed in item 4, attach additional sheet(s) indicating agency that applies.

PAGE | OF

PUBLIC AGENCY RESPONSIBLE FOR OPERATION

PSAP LOCATION

| AGENCY | | | QUANTITY | UNIT PRICE | MONTHLY CHARGE | INSTALLATION CHARGE |
|---|---|---|---|---|---|---|
| 1. ANSWERING TERMINALS | | PRESENT | | | | |
| | | PROPOSED | | | | |
| 2. PSAP TRANSFER CIRCUITS | | PRESENT | | | | |
| | | PROPOSED | | | | |
| 3. 7-DIGIT BACKUP LINES/TRUNKS | | PRESENT | | | | |
| | | PROPOSED | | | | |
| 4. COMMON CONTROL EQUIPMENT | A. LINE HOLD | PRESENT | | | | |
| | | PROPOSED | | | | |
| | B. LINE LIGHTS | PRESENT | | | | |
| | | PROPOSED | | | | |
| | C. SYSTEM LIGHTS | PRESENT | | | | |
| | | PROPOSED | | | | |
| | D. ACDS | PRESENT | | | | |
| | | PROPOSED | | | | |
| | E. TRANSFER ARRANGEMENTS | PRESENT | | | | |
| | | PROPOSED | | | | |
| | F. COMLINE(S) | PRESENT | | | | |
| | | PROPOSED | | | | |
| | | PRESENT | | | | |
| | | PROPOSED | | | | |

| AGENCY | | | QUANTITY | UNIT PRICE | MONTHLY CHARGE | INSTALLATION CHARGE |
|---|---|---|---|---|---|---|
| 1. ANSWERING TERMINALS | | PRESENT | | | | |
| | | PROPOSED | | | | |
| 2. PSAP TRANSFER CIRCUITS | | PRESENT | | | | |
| | | PROPOSED | | | | |
| 3. 7-DIGIT BACKUP LINES/TRUNKS | | PRESENT | | | | |
| | | PROPOSED | | | | |
| 4. COMMON CONTROL EQUIPMENT | A. LINE HOLD | PRESENT | | | | |
| | | PROPOSED | | | | |
| | B. LINE LIGHTS | PRESENT | | | | |
| | | PROPOSED | | | | |
| | C. SYSTEM LIGHTS | PRESENT | | | | |
| | | PROPOSED | | | | |
| | D. ACDS | PRESENT | | | | |
| | | PROPOSED | | | | |
| | E. TRANSFER ARRANGEMENTS | PRESENT | | | | |
| | | PROPOSED | | | | |
| | F. COMLINE(S) | PRESENT | | | | |
| | | PROPOSED | | | | |
| | | PRESENT | | | | |
| | | PROPOSED | | | | |

**SUBSEQUENT AGENCIES**
COM-280 (NEW 5-77)
PAGE 2

If more space is needed in item 4, attach additional sheet(s) indicating agency that applies.

PAGE | OF

PUBLIC AGENCY RESPONSIBLE FOR OPERATION

PSAP LOCATION

AGENCY

| | | QUANTITY | UNIT PRICE | MONTHLY CHARGE | INSTALLATION CHARGE |
|---|---|---|---|---|---|
| 1. ANSWERING TERMINALS | PRESENT | | | | |
| | PROPOSED | | | | |
| 2. PSAP TRANSFER CIRCUITS | PRESENT | | | | |
| | PROPOSED | | | | |
| 3. 7-DIGIT BACKUP LINES/TRUNKS | PRESENT | | | | |
| | PROPOSED | | | | |
| 4. COMMON CONTROL EQUIPMENT | | | | | |
| A. LINE HOLD | PRESENT | | | | |
| | PROPOSED | | | | |
| B. LINE LIGHTS | PRESENT | | | | |
| | PROPOSED | | | | |
| C. SYSTEM LIGHTS | PRESENT | | | | |
| | PROPOSED | | | | |
| D. ACDS | PRESENT | | | | |
| | PROPOSED | | | | |
| E. TRANSFER ARRANGEMENTS | PRESENT | | | | |
| | PROPOSED | | | | |
| F. COMLINE(S) | PRESENT | | | | |
| | PROPOSED | | | | |

AGENCY

| | | QUANTITY | UNIT PRICE | MONTHLY CHARGE | INSTALLATION CHARGE |
|---|---|---|---|---|---|
| 1. ANSWERING TERMINALS | PRESENT | | | | |
| | PROPOSED | | | | |
| 2. PSAP TRANSFER CIRCUITS | PRESENT | | | | |
| | PROPOSED | | | | |
| 3. 7-DIGIT BACKUP LINES/TRUNKS | PRESENT | | | | |
| | PROPOSED | | | | |
| 4. COMMON CONTROL EQUIPMENT | | | | | |
| A. LINE HOLD | PRESENT | | | | |
| | PROPOSED | | | | |
| B. LINE LIGHTS | PRESENT | | | | |
| | PROPOSED | | | | |
| C. SYSTEM LIGHTS | PRESENT | | | | |
| | PROPOSED | | | | |
| D. ACDS | PRESENT | | | | |
| | PROPOSED | | | | |
| E. TRANSFER ARRANGEMENTS | PRESENT | | | | |
| | PROPOSED | | | | |
| F. COMLINE(S) | PRESENT | | | | |
| | PROPOSED | | | | |
| | PRESENT | | | | |
| | PROPOSED | | | | |

# CHAPTER V — IMPLEMENTATION AND CONTINUED 911 OPERATIONAL CONSIDERATIONS

## A. IMPLEMENTATION ACTIVITIES

The planning of a 911 system should provide a logical base for the implementation of the system. Important factors to be considered in implementation are:

1. Responsiveness and accountability to the system users — Emergency service agencies and citizens.

2. Budgeting for 911 system — Consideration and mutual understanding of responsibilities for funding the 911 system must be documented.

3. Public education programs — Continuous review of programs and updating must be considered.

4. Telephone equipment modifications — These must be thought out and designed for operational agency needs.

5. Training of 911 operators — The type of training, duration, and responsibility must be delineated and understood by all.

6. Priority for accepting 911 calls — These procedures have to be documented and established at the beginning.

7. Discouraging nonemergency use of 911.

8. Record keeping activities — The types of records maintained and uses have to be understood and documented. Records regarding usage, time, number of calls, etc., have to be planned for implementation of 911.

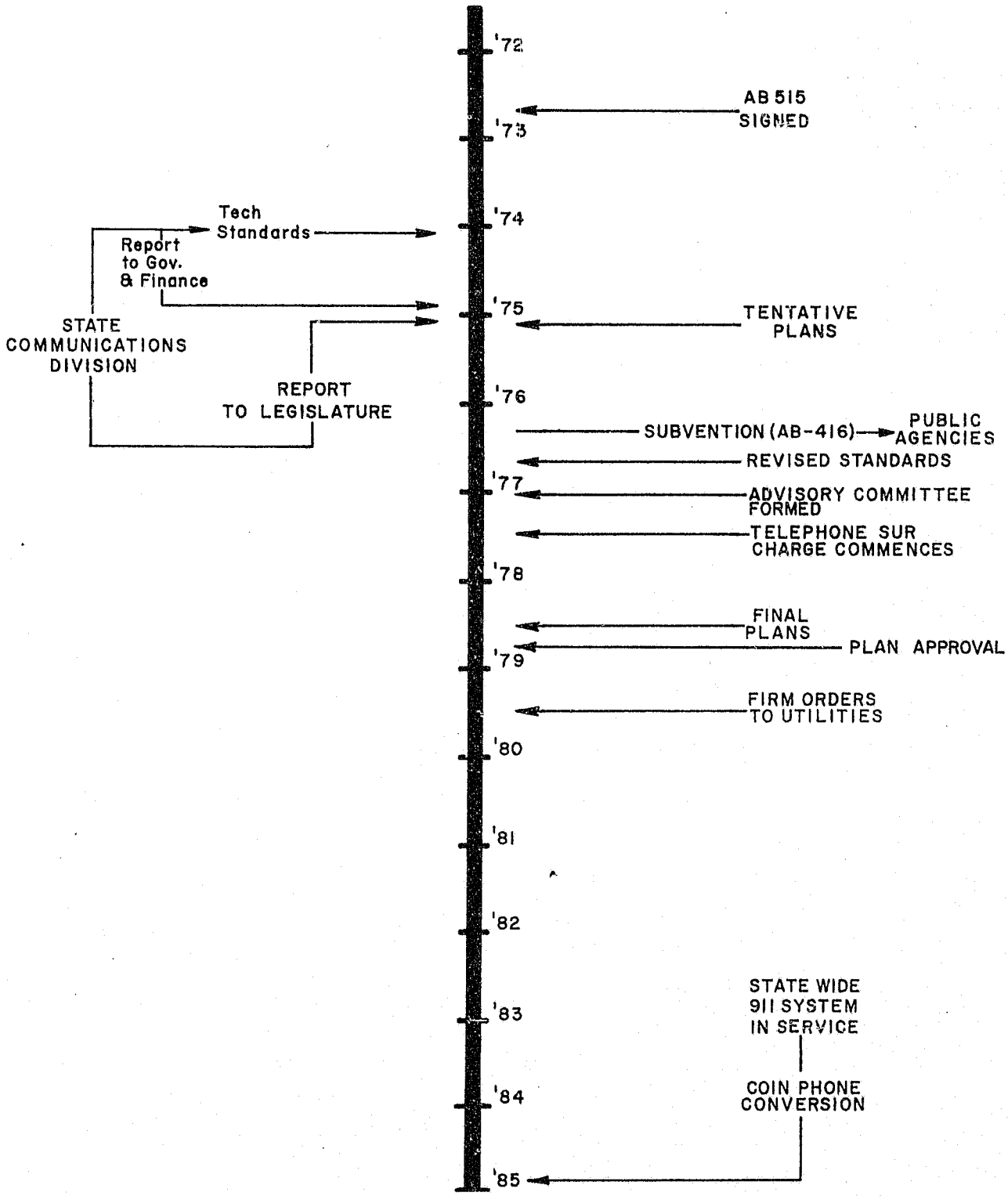
## B. ASSESSING CONTINUED OPERATIONAL CONSIDERATIONS

Once the 911 system has been implemented, a program for continued assessment and performance should be enacted. These activities are essential to assess future needs of a 911 system.

- Ongoing Training
- Expansion Considerations
- Workload and Performance Measurements
- Statistics and Records
- Public Education Programs

## APPENDIX A

# 911 TIME TABLE



# APPENDIX B

# EMERGENCY TELEPHONE NUMBER 911 LAW

### Article 6. Local Emergency Telephone Systems

**53100.** (a) This article shall be known and may be cited as the Warren-911-Emergency Assistance Act.

(b) The Legislature hereby finds and declares that it is in the public interest to shorten the time required for a citizen to request and receive emergency aid. There currently exist thousands of different emergency phone numbers throughout the state, and present telephone exchange boundaries and central office service areas do not necessarily correspond to public safety and political boundaries. Provision of a single, primary three-digit emergency number through which emergency services can be quickly and efficiently obtained would provide a significant contribution to law enforcement and other public service efforts by making it less difficult to quickly notify public safety personnel. Such a simplified means of procuring emergency services will result in the saving of life, a reduction in the destruction of property, quicker apprehension of criminals, and ultimately the saving of money. The Legislature further finds and declares that the establishment of a uniform, statewide emergency number is a matter of statewide concern and interest to all inhabitants and citizens of this state. It is the purpose of this act to establish the number "911" as the primary emergency telephone number for use in this state and to encourage units of local government and combinations of such units to develop and improve emergency communication procedures and facilities in such a manner as to be able to quickly respond to any person calling the telephone number "911" seeking police, fire, medical, rescue, and other emergency services.

**53101.** "Public agency," as used in this article, means the state, and any city, county, city and county, municipal corporation, public district, or public authority located in whole or in part within this state which provides or has authority to provide firefighting, police, ambulance, medical, or other emergency services.

**53102.** "Public safety agency," as used in this article, means a functional division of a public agency which provides firefighting, police, medical, or other emergency services.

**53103.** "Direct dispatch method," used in this article, means a telephone service providing for the dispatch of an appropriate emergency service unit upon receipt of a telephone request for such services and a decision as to the proper action to be taken.

**53104.** "Relay method," as used in this article, means a telephone service whereby pertinent information is noted by the recipient of a telephone request for emergency services, and is relayed to appropriate public safety agencies or other providers of emergency services for dispatch of an emergency service unit.

**53105.** "Transfer method," as used in this article, means a telephone service which receives telephone requests for emergency services and directly transfers such requests to an appropriate public safety agency or other provider of emergency services.

**53106.** "Referral method," as used in this article, means a telephone service which, upon the receipt of a telephone request for emergency services, provides the requesting party with the telephone number of the appropriate public safety agency or other provider of emergency services. The use of the referral method shall only be used for non-emergency situations.

**53107.** "Basic system," as used in this article, means a telephone service which automatically connects a person dialing the digits "911" to an established public safety answering point through normal telephone service facilities.

**53108.** "Sophisticated system," as used in this article, means a basic system with the additional capability of automatic identification of the caller's number, holding the incoming call, reconnection on the same telephone line, clearing a telephone line, or automatic call routing or combinations of such capabilities.

**53108.1.** "Incremental Costs," as used in this article, mean any costs necessary for the establishment of a system required by this article and recommended for reimbursement by the advisory committee established by Section 53115.1 other than costs for (1) a basic system, (2) a basic system with telephone central office identification, or (3) a system employing automatic call routing, which are reasonable, necessary and unique for the planning and efficient implementation of a local agency's 911 system.

**53108.5.** "Communications Division," as used in this article, means the Communications Divisions of the Department of General Services.

**53109.** Every local public agency within its respective jurisdiction shall establish and have in operation by December 31, 1984, a basic system as provided in this article, or be part of such a system.

The establishment of such systems shall be centralized to the extent feasible. Nothing in this article shall be construed to prohibit or discourage in any way the formation of multijurisdictional or regional systems, and any system established pursuant to this article may include the territory of more than one public agency or may include a segment of the territory of a public agency.

**53110.** Every system shall include police, firefighting, and emergency medical and ambulance services and may include other emergency services, in the discretion of the affected local public agency, such as poison control services, suicide prevention services, and civil defense services. The system may incorporate private ambulance service. In those areas in which a public safety agency of the state

provides such emergency services, the system shall include such public safety agencies.

**53111.** The digits "911" shall be the primary emergency telephone number within the system, but a public agency or public safety agency may maintain a separate secondary backup number, and shall maintain a separate number for nonemergency telephone calls.

**53112.** All systems shall be designed to meet the specific requirements of each community and public agency served by the system. Every system, whether basic or sophisticated, shall be designed to have the capability of utilizing at least three of the methods specified in Sections 53103 to 53106, inclusive, in response to emergency calls. The Legislature finds and declares that the most critical aspect of the design of any system is the procedure established for handling a telephone request for emergency services.

In addition, to maximize efficiency and utilization of the system, all pay telephones within each system shall, by December 31, 1984, enable a caller to dial "911" for emergency services, and to reach an operator by dialing "0", without the necessity of inserting a coin. At those "911" public safety answering points serving an area where 5 percent or more of the population, in accordance with the latest United States census information, speak a specific primary language other than English, operators who speak each such other language, in addition to English, shall be on duty or available through interagency telephone conference procedures at all times for "911" emergency services.

**53113.** The Legislature finds that, because of overlapping jurisdictions of public agencies, public safety agencies, and telephone service areas, a general overview or plan should be developed prior to the establishment of any system. In order to insure that proper preparation and implementation of such systems is accomplished by all public agencies by December 31, 1984, the Communications Division, with the advice and assistance of the Attorney General, shall secure compliance by public agencies as provided in this article.

**53114.** The Communications Division, with the advice and assistance of the Attorney General, shall coordinate the implementation of systems established pursuant to the provisions of this article. The Communications Division, with the advice and assistance of the Attorney General, shall assist local public agencies and local public safety agencies in obtaining financial help to establish emergency telephone service, and shall aid such agencies in the formulation of concepts, methods, and procedures which will improve the operation of systems required by this article and which will increase cooperation between public safety agencies.

**53114.1.** To accomplish the responsibilities specified in this article, the Communications Division is directed to consult at regular intervals with the State Fire Marshal, the State Department of Public Health, the Governor's Office of Traffic Safety, the Office of Emergency Services, the California Council on Criminal Justice, the public utilities in this state providing telephone service, the Associated Public Safety Communications Officers, the Bureau of Emergency Medical Service, the California Highway Patrol, and the State Division of Forestry. Such agencies shall provide all necessary assistance and consultation to the Communications Division to enable it to perform its duties specified in this article.

**53114.2.** Technical and operational standards for the development of the public agency systems shall be established and reviewed by the Communications Division on or before December 31, 1973, after consultation with all agencies specified in Section 53114.1. On or before December 31, 1976, and each even-numbered year thereafter, after consultation with all agencies specified in Section 53114.1, the Communications Division shall review and update technical and operational standards for public agency systems.

**53115.** (a) On or before January 31, 1975, all public agencies shall submit tentative plans for the establishment of a system required by this article to the public utility or utilities providing public telephone service within the respective jurisdiction of each public agency. A copy of each such plan shall be filed with the Communications Division.

(b) On or before July 1, 1978, all public agencies shall submit final plans to the Communications Division for approval. On or before July 1, 1979 all public agencies shall place a firm order as approved by the Communications Division to the utility or utilities providing telephone service to the public agency, and shall make arrangements with such utilities for the implementation of the planned emergency telephone system no later than December 31, 1984.

(c) If any public agency has implemented or is a part of a system required by this article on a deadline specified in subdivision (a) or (b), such public agency shall submit in lieu of the tentative or final plan a report describing the system and stating its operational date.

(d) Plans filed pursuant to subdivisions (a) and (b) shall conform to minimum standards established pursuant to Section 53114.2.

(e) The Communications Division shall monitor all emergency telephone systems to ensure they comply with minimal operational and technical standards as established by the division. If any system does not comply the Communications Division shall notify in writing the public agency or agencies operating the system of its deficiencies. The public agency shall bring the system into compliance with the operational and technical standards within 60 days of notice by the division. Failure to comply within such time shall subject the public agency to action by the Attorney General pursuant to Section 53116.

**53115.1.** The Advisory Committee on the State Emergency Telephone Number is hereby created and established in the Department of General Services. The Communications Division shall provide staff services to the advisory committee.

It is the intention of the Legislature that the advisory committee will assist the Department of General Services in resolving conflicts between state and local government and the communications industry relating to implementation of the

emergency telephone number system when requested by the Communications Division.

It is the purpose of the advisory committee to evaluate requests from local agencies for state assistance for incremental costs and to recommend to the Chief of the Communications Division, Department of General Services when appropriation for reimbursement to a local agency for such incremental costs should be made. The advisory committee will be formed on or before January 1, 1977. A majority vote of the membership of the advisory committee shall be required for approval of plans referred to the committee. The committee shall elect a chairman and meet at the call of the chairman. The committee shall consist of nine members and shall be appointed in the following manner:

(a) Three of the members shall be selected from the largest service suppliers of intrastate communications services in the state to represent all service suppliers, to be appointed by the Director of General Services.

(b) Three of the members shall be selected from local agencies to be appointed by the Director of General Services. Urban and rural local agencies shall be represented.

(c) One member shall represent the Department of Finance, selected by the Director of Finance.

(d) Two of the members shall be representatives of the Legislature. One shall be designated by the Speaker of the Assembly and one shall be designated by the Senate Rules Committee.

The members of the advisory committee shall receive no compensation for their services, but shall be reimbursed for any actual and necessary expenses incurred in connection with the performance of their duties. Members shall serve one-year terms subject to reappointment. If a member misses two successive meetings without approval by the chairman, then in that event that member's position shall be considered vacant. Prior to the next meeting a new member to fill the vacancy shall be appointed.

**53115.2.** The committee shall only review final plans which have been referred for consideration for incremental funding by the Communications Division at the request of a local agency. The committee shall make a recommendation to the Communications Division regarding state appropriation for payment or reimbursement for incremental costs.

The committee may also act in a general advisory capacity to the Communications Division relative to the implementation of any "911" system.

**53116.** The Attorney General may, in behalf of the Communications Division or on his own initiative, commence judicial proceedings to enforce compliance by any public agency or public utility providing telephone service with the provisions of this article.

**53117.** (a) On or before February 16, 1975, the Communications Division shall report to the Legislature the progress in the implementation of systems required by this article. Such reports shall contain its recommendations for additional legislation.

(b) In December of 1973 and in December of 1974 the Communications Division, with the advice and assistance of the Attorney General, shall submit recommendations to the Department of Finance and to the Governor specifying amounts necessary to further implement the organization of telephone systems specified in this article during the succeeding fiscal year. The report specified in this subdivision shall contain, in addition, an estimate of the fiscal impact to local public agencies which will be caused by implementation of the provisions of this article.

**53118.** The Legislature declares that a major purpose in enacting this article is to eliminate instances in which a responding emergency service refuses to render aid to the requester because the requester is outside of the jurisdictional boundaries of the emergency service. A public safety agency which receives a request through the system for emergency services outside its jurisdictional boundaries shall transmit the request to the proper public safety answering point or public safety agency utilizing the methods described in Sections 53103 to 53105, inclusive. In the event an emergency is dispatched in response to a request through the system, such unit shall render its services to the requesting party without regard to whether the unit is operating outside its normal jurisdiction boundaries until properly relieved by the public safety agency responsible for that geographical area. Public agencies within a single system and public agencies in different systems but whose jurisdictional boundaries are contiguous are authorized to enter into joint powers agreements or any other form of written cooperative agreement to implement this requirement. These agreements may further provide for a public safety agency to render aid outside its normal jurisdictional boundaries when need arises on a day-to-day basis.

## Article 2. Disposition of Proceeds

**41135.** All amounts required to be paid to the state under this part shall be paid to the board in the form of remittances payable to the Board of Equalization of the State of California. The Board shall transmit the payments to the State Treasurer to be deposited in the State Treasury to the credit of the State Emergency Telephone Number Account in the General Fund, which is hereby created.

**41136.** Funds in the State Emergency Telephone Number Account shall, when appropriated by the Legislature, be spent solely for the following purposes.

(a) To pay refunds authorized by this part.

(b) To pay the State Board of Equalization for the cost of the administration of this part.

(c) To pay the Department of General Services for its costs in administration of the "911" emergency telephone number system.

(d) To pay bills submitted to the Department of General Services by service suppliers or communications equipment companies for the installation and ongoing communications services supplied local agencies in connection with the "911" emergency phone number system:

(1) A basic system.

(2) A basic system with telephone central office identification.

(3) A system employing automatic call routing.

(4) Approved incremental costs.

(e) To pay claims of local agencies for approved incremental costs, not previously compensated for by another governmental agency.

(f) To pay claims of local agencies for incremental costs and amounts, not previously compensated for by another governmental agency, incurred prior to the effective date of this part, for the installation and ongoing expenses for the following communication services supplied in connection with the "911" emergency phone number system:

(1) A basic system.

(2) A basic system with telephone central office identification.

(3) A system employing automatic call routing.

(4) Approved incremental costs. Such incremental costs shall not be allowed unless such costs are recommended by the advisory committee and concurred in by the Communications Division.

**41137.** The Department of General Services shall pay, from funds appropriated from the State Emergency Telephone Number Account by the Legislature, as provided in Section 41138, bills submitted by service suppliers or communications equipment companies for the installation and ongoing costs of the following communication services provided local agencies by service suppliers in connection with the "911" emergency telephone number system:

(a) A basic system.

(b) A basic system with telephone central office identification.

(c) A system employing automatic call routing.

(d) Approved incremental costs which have been recommended by the advisory committee and concurred in by the Communications Division.

**41137.1.** The Department of General Services shall pay, from funds appropriated from the State Emergency Telephone Number Account by the Legislature, as provided in Section 41138, claims submitted by local agencies for approved incremental costs.

**41138.** The department shall pay such bills as provided in Section 41137 only under the following conditions:

(1) The department shall have received the local agencies "911" emergency telephone number system plan by July 1 of the prior fiscal year and approved such plan by October 1 of the prior fiscal year.

(2) The Legislature has appropriated in the Budget Bill an amount sufficient to pay such bills.

(3) The amounts to be paid shall not exceed the contract or established tariff rates for the costs of telephone equipment.

(4) The amounts to be paid shall not exceed approved incremental costs.

**41139.** From funds appropriated by the Legislature from the Emergency Telephone Number Account, the department shall begin paying such bills as provided in Sections 41137, 41137.1, and 41138 in the 1977-78 fiscal year for plans submitted by local agencies by July 1, 1976 to the department which the department has approved.

**41140.** The Department of General Services shall reimburse local agencies, from funds appropriated from the Emergency Telephone Number Account by the Legislature, for amounts not previously compensated for by another governmental agency, which have been paid by such agencies for approved incremental costs or to service suppliers or communication equipment companies for the following communications services in connection with the "911" emergeny phone number, provided such local agency plans had been approved by the department:

(1) A basic system.

(2) A basic system with telephone central office identification.

(3) A system employing automatic call routing.

(4) Approved incremental costs.

**41141.** Claims for reimbursement shall be submitted by local agencies by July 1 to be eligible for payment in the following fiscal year. The department shall prescribe the form on which the claims shall be made and shall reduce the claim for charges which exceed the approved incremental costs, approved contract amounts or the established tariff rates for such costs. No claim shall be paid until funds are appropriated by the Legislature.

**41142.** Notwithstanding any other provision of this article, if the Legislature fails to appropriate an

amount sufficient to pay bills submitted to the Department of General Services by service suppliers or communications equipment companies for the installation and ongoing communications services supplied local agencies in connection with the "911" emergency phone number system, and to pay claims of local agencies which, prior to the effective date of this part, paid amounts to service suppliers or communications equipment companies for the installation and ongoing expenses in connection with the "911" emergency phone number system, the obligation of service suppliers and local agencies to provide "911" emergency telephone service shall terminate and such service shall not again be requireduntil the Legislature has appropriated an amount sufficient to pay such bills or claims. Nothing in this part shall preclude local agencies from purchasing or acquiring any communication equipment from companies other than the telephone service suppliers.

### Article 3. Notices

**41144.** A certificate by the board or an employee of the board stating that a notice required by this part was given by mailing or personal service shall be prima facie evidence in any administrative or judicial proceeding of the fact and regularity of the mailing of personal service in accordance with any requirement of this part for the giving of notice. Unless otherwise specifically required, any notice required by this part to be mailed or served may be given by mailing or personal service in the manner provided for giving notice of a deficiency determination.

### Article 4. Purpose

**41150.** The Legislature hereby declares and finds that to enable public agencies to implement "911" emergency phone systems required by the provisions of Chapter 1005 of the 1972 Regular Session [Article 6 (commencing with Section 53100) of Chapter 1 of Part 1 of Division 2 of Title 5 of the Government Code] it is necessary that a surcharge be imposed upon amounts paid by every person in the state for intrastate telephone communication services in this state. The bill will provide funding for basic 911, basic 911 (including telephone central office identification) 911 with selective routing or a combination of the above. These services will include incoming 911 lines/trunks, 911 answering positions including common control equipment, transfer lines and transfer positions. In addition, this part will provide funding for incremental costs.

**SEC.8.** The funding for any additional requirements shall be borne by local agencies.

**SEC. 9.** Notwithstanding Section 2231 of the Revenue and Taxation Code, there shall be no reimbursement arising out of the enactment of Part 20 of Division 2 of the Revenue and Taxation Code or of the rules and regulations that are adopted pursuant thereto for the administration thereof by the State Board of Equalization.

**SEC. 9.5.** There is hereby appropriated from the General Fund to the Department of General Services, for the 1976-77 and 1977-78 fiscal years, the sum of one million two hundred twenty-two thousand dollars ($1,222,000), to pay bills as provided in Sections 41136, 41137, 41137.1, 41138 and 41140 of the Revenue and Taxation Code, as added by Section 7 of this act.

**SEC. 10.** If any provision of this act or the application thereof to any person or circumstances is held invalid, such invalidity shall not affect other provisions or applications of the act which can be given effect without the invalid provision or application, and to this end the provisions of this act are severable.

**SEC. 11.** This act provides for a tax levy within the meaning of Article IV of the Constitution and shall go into immediate effect.

# APPENDIX C

## JOINT POWERS AGREEMENT GUIDE

Government Code Section 53118 permits public agencies within a single system or different systems whose jurisdictional boundaries are contiguous to enter into joint powers agreements in order to implement the requirement that an emergency unit will render services to the requesting party regardless of whether the unit is outside its normal jurisdictional boundaries. These agreements may further provide for a public safety agency to render aid outside its normal jurisdictional boundaries when need arises on a day-to-day basis. It is up to each individual agency to tailor its own individual written cooperative agreement to its own needs and situation. However, generally, all joint powers agreements must have certain provisions as required by Government Code Sections 6500, *et seq.* Provisions for strict accountability of all funds, detailed fiscal procedures, the duration of the agreement, an agreed list of specific activities and functions to be performed, equipment to be used, the level of service to be provided, the administrative unit or units offering or performing the service and responsible for its administration, and any limitations or restrictions imposed upon the performance of the service or the function are among the important, but by no means total, areas to be considered. For this reason, it is recommended that each agency consult with its respective city attorney, county counsel, or other legal advisor concerning the advisability of such agreements, keeping in mind that each local agency's circumstances will require different attention and emphasis.

# APPENDIX D

## ADVISORY COMMITTEE
## ON THE
## STATE EMERGENCY TELEPHONE NUMBER

### I. ADVISORY COMMITTEE AUTHORIZATION

Section 53115.1 of the Government Code created the Advisory Committee on the State Emergency Telephone Number. The Committee is made up of nine members as follows:

a. Six members appointed by the Director of the Department of General Services.

   Three members appointed from the largest suppliers of State communications services.

   Three members appointed to represent urban and rural local government agencies.

b. One representative appointed by the Director of the Department of Finance.

c. One representative appointed by the Speaker of the Assembly.

d. One representative appointed by the Senate Rules Committee.

### II. ADVISORY COMMITTEE RESPONSIBILITIES (AS DEFINED BY LAW)

a. Evaluate requests for incremental costs and issue recommendations to Communications Division as to when reimbursement would be appropriate.

b. Act in a general advisory capacity to the Communications Division regarding implementation of any 911 system.

c. Review final 911 plans which have been referred for consideration for incremental funding by Communications Division at the request of a local agency.

d. Assist when requested in resolving conflicts between local governmental agencies, the State, and the Communications Division.

# APPENDIX E

## 911 GUIDELINES MANUAL
## REVISION RECORD SHEET
## JUNE 1977

This updated Revision Record Sheet is provided with each distribution of manual revisions. It will provide a ready check for the currency of the manual in Appendix E.

**Example:**

| DATE | REVISION NUMBER | CHAPTER | PAGE |
|---|---|---|---|
| 12/1/77 | 1 | 1 | 3 |
| 1/1/78 | 2 | 1 | 3 |

| DATE OF REVISION | REVISION NUMBER | CHAPTER | PAGE |
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## DESCRIPTION OF CALL FLOW

1 Procedure starts; citizen dials "911".

2 Telephone company 911 equipment sends call to dispatch center. Automatic request for ALI.

3 Automatic call distributor sends call to idle complaint board operator. CBO work station has display of ALI.

4 If call not 911, assigned CBO receives call and begins interrogation.

5 Record automatically made of incoming calls.

6 All calls voice recorded; both CBO and citizen.

7 Magnetic tape made of incoming call origin, date, time and call duration.

8 For 911 calls, caller's telephone number is displayed.

9 For 911 calls - address, date, time, community, class of service and if business, name of business.

10 CBO interrogates caller as to nature of emergency.

11 CBO, using keyboard, types in location.

12 Computer verifies that address is valid.

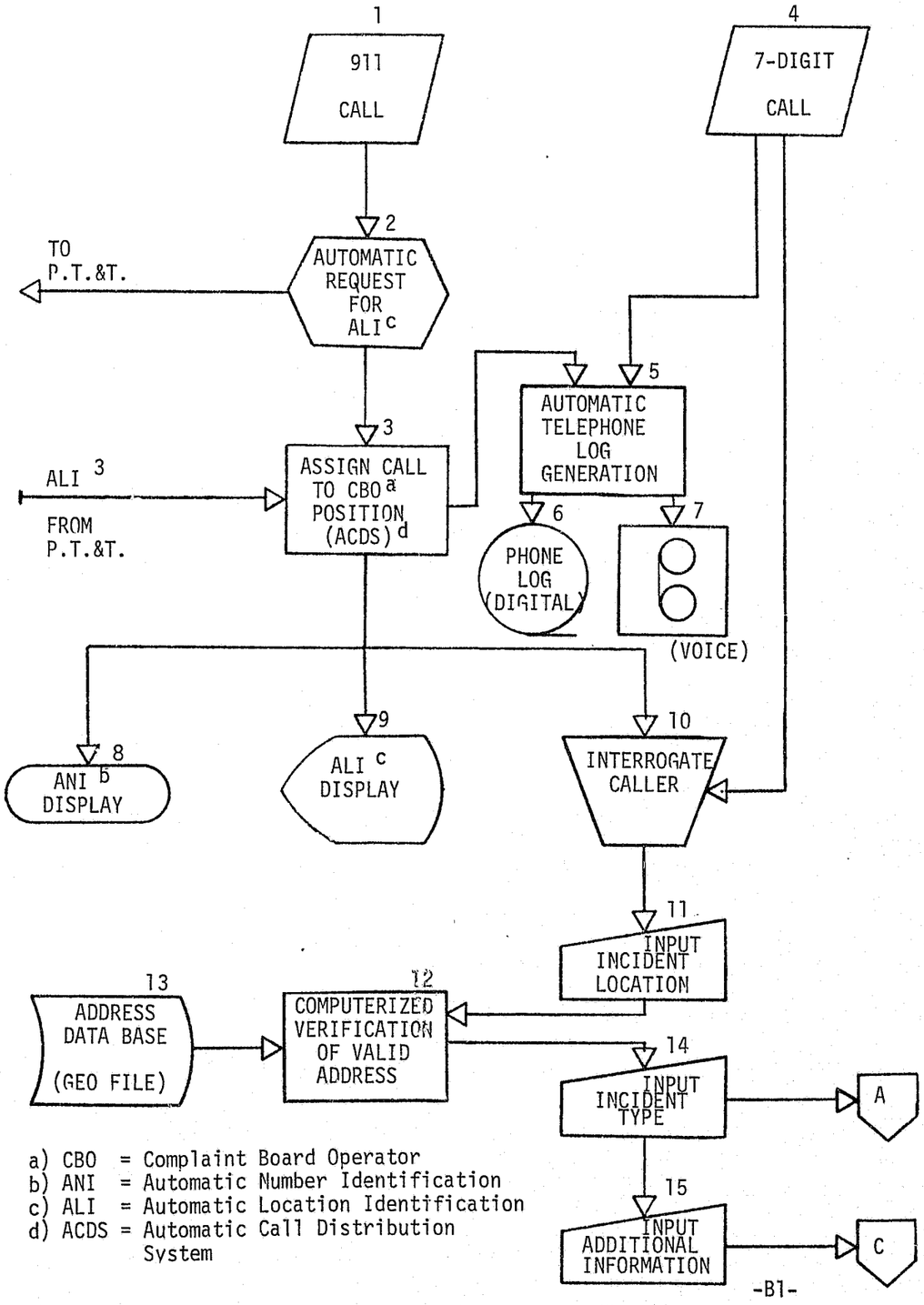
13 Data base provided by all agencies using the center showing good address.

14 CBO, using keyboard, types in type of incident and sends all information to dispatcher via instant link.

15 In event that more information becomes available on the same call, CBO inputs and sends on to dispatcher; i.e., second calls, changed priorities, cancellations.

## COMPLAINT BOARD OPERATOR

## CALL RECEIPT AND INCIDENT ENTRY




a) CBO = Complaint Board Operator
b) ANI = Automatic Number Identification
c) ALI = Automatic Location Identification
d) ACDS = Automatic Call Distribution System

## DESCRIPTION OF CALL FLOW

16 Mobile, fire or police, reports an incident to the dispatcher by radio.

17 Dispatcher (in same way as complaint board operator) enters incident location.

18 Computer verifies that address is valid (time required - 5 milliseconds).

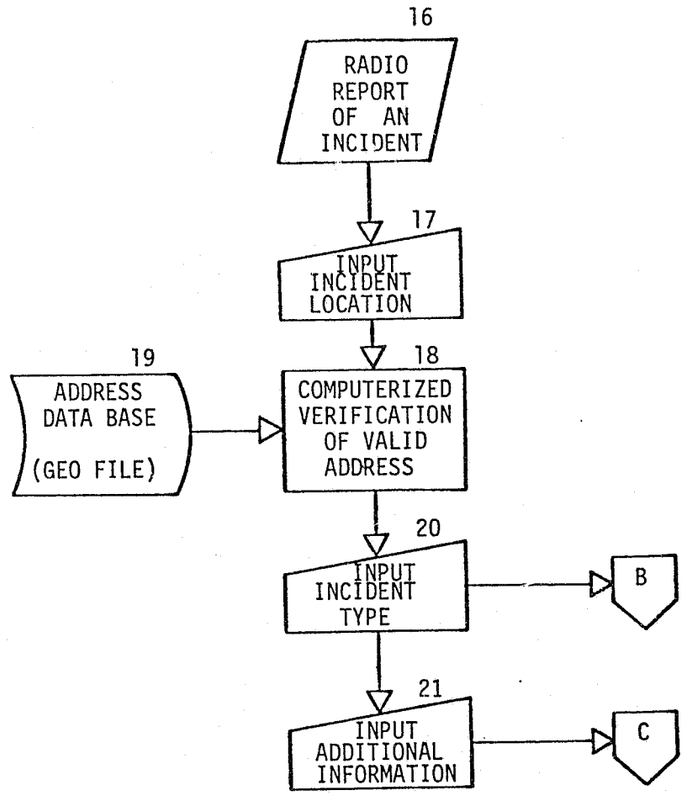
19 Data base provided by users showing good addresses.

20 Dispatcher, using keyboard, inputs type of incident. Send to computer selection system.

21 In event of additional information, dispatcher updates action; i.e., known false alarm, changed priority or second call on same incident.

## DISPATCHER

## FIELD INCIDENT REPORT AND ENTRY



## DESCRIPTION OF CALL FLOW

22 Dispatch center receives alarm signal from police for fire emergency.

23 Signal goes to computer. Computer matches alarm with address and type of business.

24 Police and fire alarm data base provided by dispatch center users.

25 Computer assigns calls from 911, 7 digit, field units or alarms to incident log production.

26 Computer produces record of incident.

27 Magnetic tape of all incidents prepared.

28 Hard copy (printed page) is prepared of each incident.

29 Computer search of any known hazard that may be encountered.

30 Hazardous information data base provided by dispatch center users.

31 Computer indication of what action should be taken for this particular type of incident.

32 Reponse data base. Police beat, number of units. Fire house, apparatus, personnel.

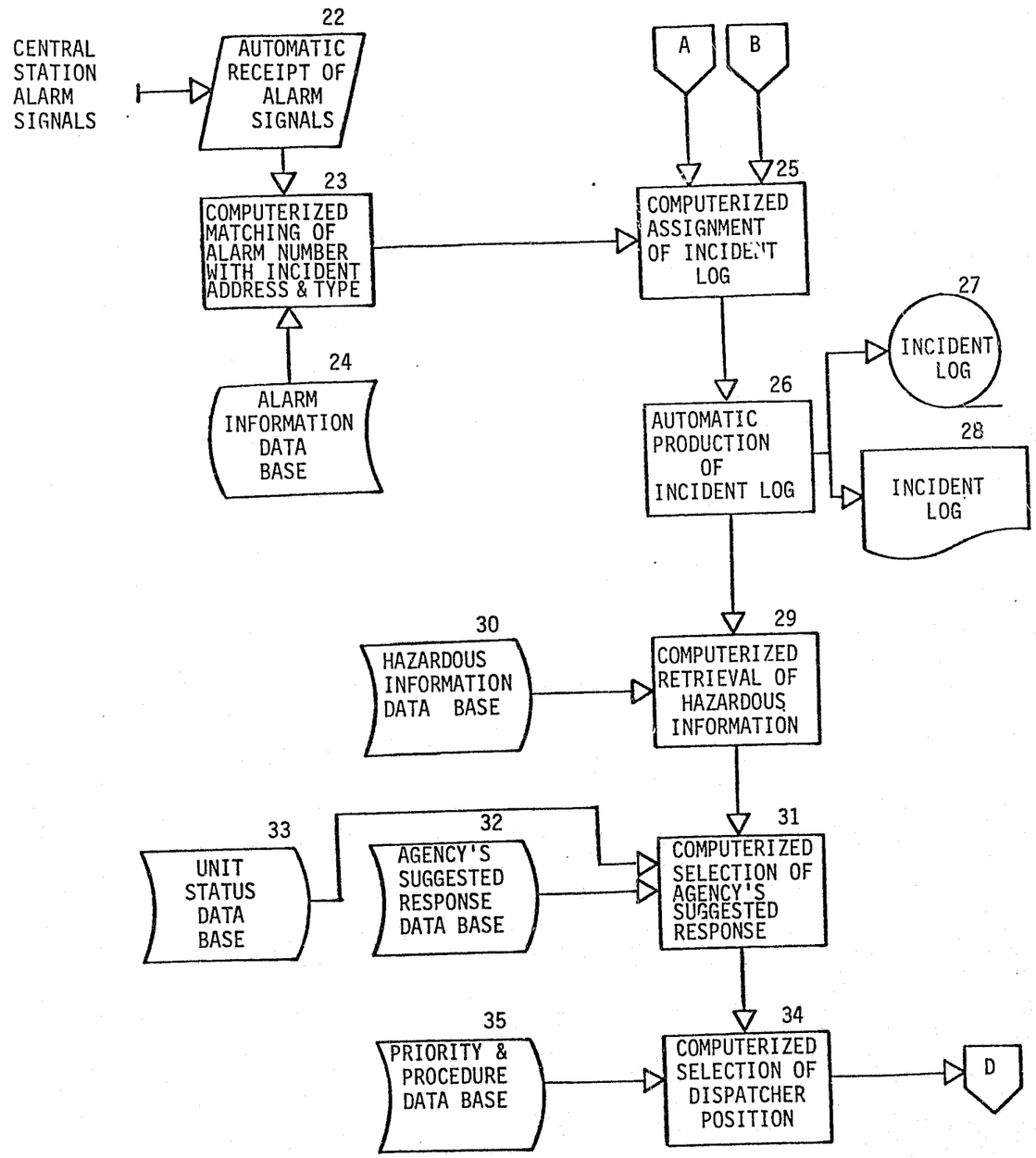
33 File showing police and fire resources immediately available.

34 Computer selects dispatcher. Police or fire. Geographical area. Dispatcher receives assignment.

35 Special procedures and priorities data base provided by police and fire users.

## COMPUTER

## AUTOMATIC INCIDENT PROCESSING



## DESCRIPTION OF CALL FLOW

35 (From Action #15) Dispatcher receives latest information, cancel, greater emergency, changed nature of call.

36 Update automatically incident information data base - no dispatcher action needed.

37 Dispatcher sees on CRT screen a complete description of the incident and what action the computer suggests to take.

38 Dispatcher selects response that is to be taken from the menu available provided by the computer.

39 Continuously updated data base showing what units are available.

40 CRT screen showing what units and resources immediately available.

41 Computer automatically creates a log of all actions taken; units selected, resources used.

42 Magnetic tape made of actions taken showing time, date, elapsed time and resources used.

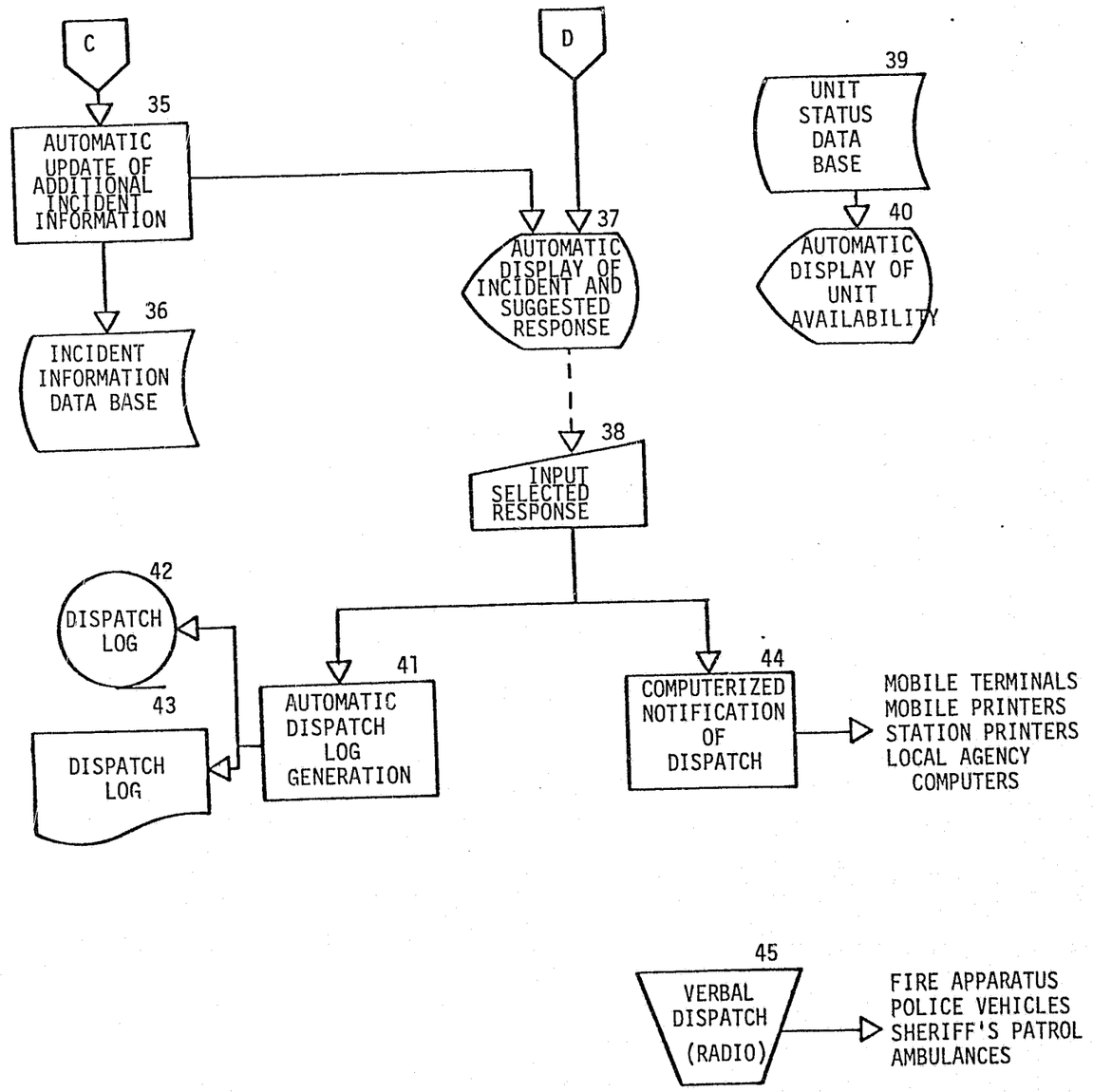
43 Hard copy (printed page) showing same as Action #42, but eye readable.

44 Non-voice dispatch of detail to police or fire mobile units using mobile printers or terminals or to local police or fire agency for their internal dispatching. (This assumes that the center received the call but was not responsible for the control of field forces of every agency.)

45 Voice dispatch of the detail directly to police units and fire stations apparatus and personnel.

## DISPATCHER

## DISPATCH SELECTION AND FIELD UNIT NOTIFICATION



## DESCRIPTION OF CALL FLOW

46 Using mobile digital status encoder, mobile control head with 10/7, 10/8, Code 7 and other pre-set codes, automatically update the dispatch center as to availability. Page 4, Action #39.

47 Using voice from mobile radio, tell dispatcher of status change.

48 Dispatcher, using keyboard, changes (updates) status of mobile.

49 Computer receives update information from mobile or dispatcher and updates data base.

50 Data base for keeping track of all field resources. Same as Page 4, Action #39.

51 Using mobile digital terminal, field officer initiates request for file check such as 10/28, 10/29. Security key required.

52 Using voice from mobile radio, ask dispatcher for same as Action #51.

53 Using peripheral terminal, police department initiates command for file check. Security key required.

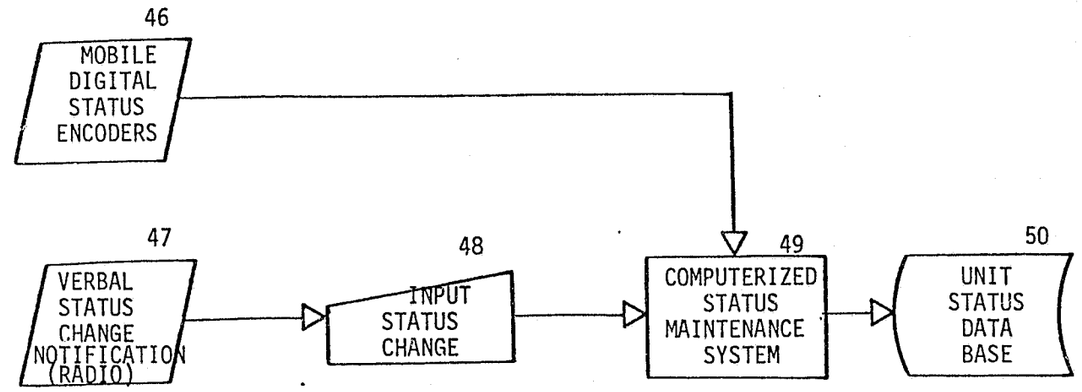
54 When field unit using voice requests file check, dispatcher, using keyboard, makes actual command. Security key required. P/O personnel screening.

55 Computer, according to command, interrogates whatever file is desired.

56 Local data base. Alpha file of all departments that do not have their own automated alpha file.

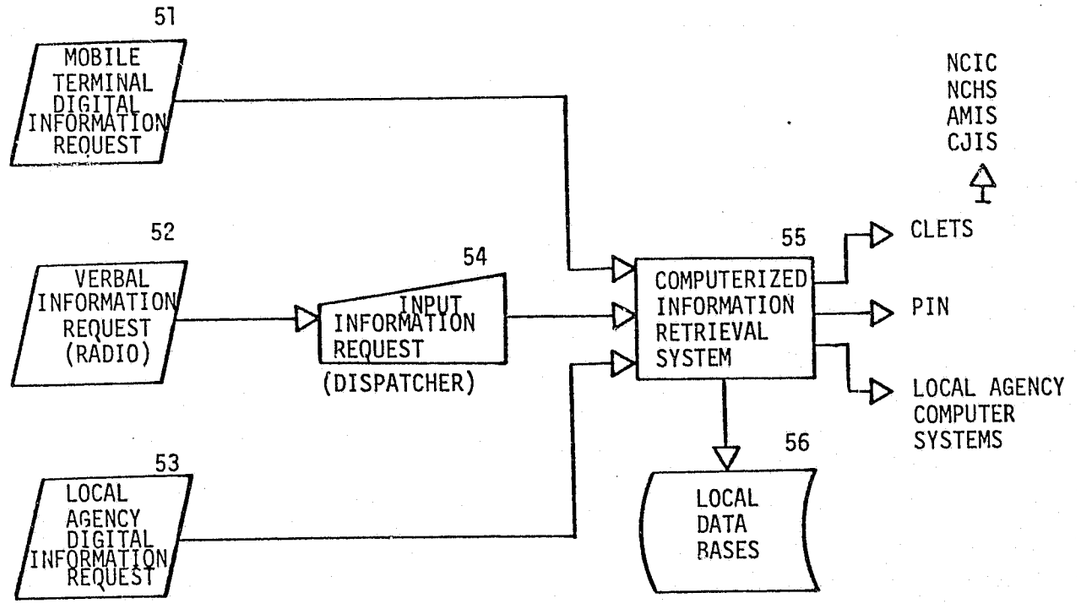
## DISPATCH

## STATUS CHANGES




## DISPATCH

## RECORD* INQUIRIES




* WANT AND WARRANT CHECKS

## DESCRIPTION OF CALL FLOW

57 At any time, a local agency can ask for specific statistics on a transaction - police, fire or medical emergency. Security key required.

58 According to a program, each agency can have reports of activity - police, fire or medical - by shift; daily, weekly or monthly.

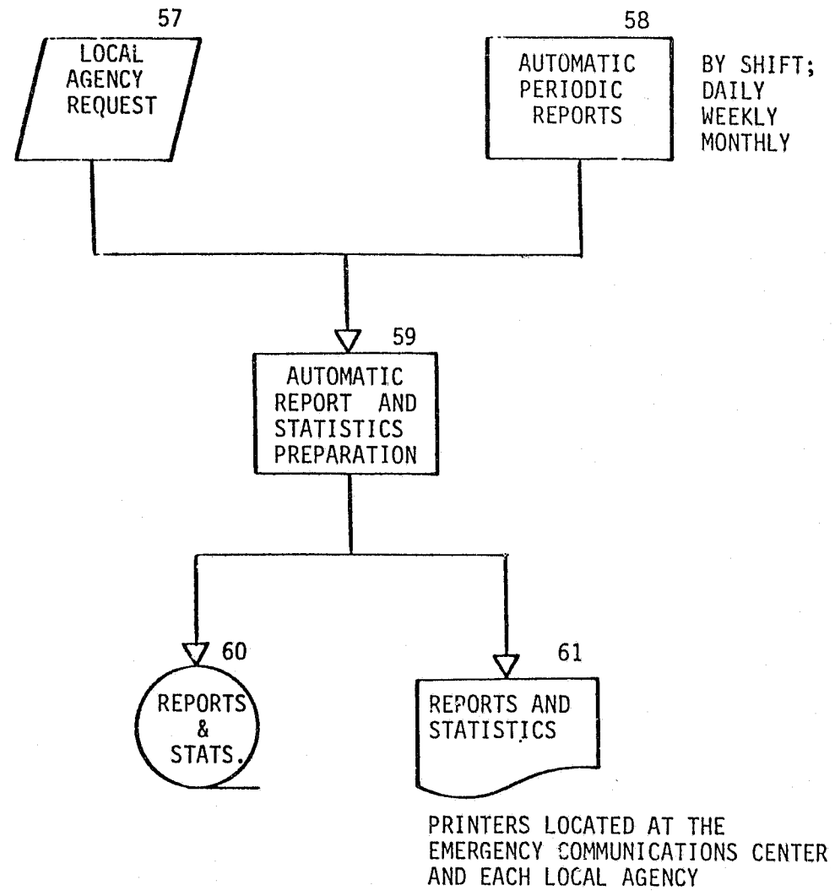
59 Computer search of all activities to select transactions of specific agencies. Agency requesting must have security key.

60 Magnetic tape of reports and statistics. Machine readable. Complies with fire service requirements (CFRS) and Uniform Crime Reporting requirements (FBI).

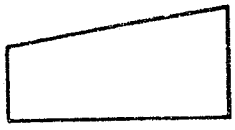
61 Eye readable hard copy of reports and statistics. Printer located at each agency and connected by dedicated circuits.

## COMPUTER

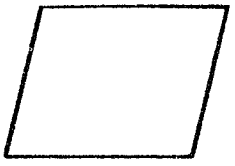
## REPORTS AND STATISTICS



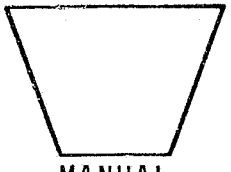
# FLOWCHARTING SYMBOLS



KEYBOARD ENTRY



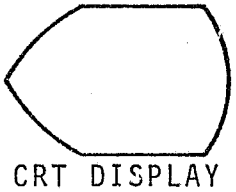
INPUT/OUPUT STAGE



MANUAL OPERATION

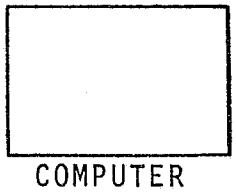
PREPARATION STAGE

ANI DISPLAY

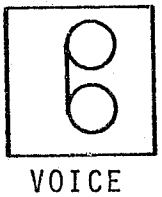


CRT DISPLAY

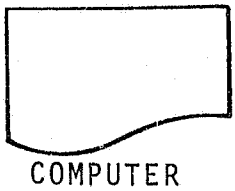
OFFPAGE CONNECTOR



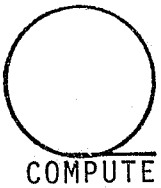
COMPUTER PROCESS



VOICE TAPE RECORDER



COMPUTER PRINT-OUT



COMPUTER MAGNETIC TAPE

BAY ALARM COMPANY
SINCE 1946



325 SEVENTH STREET • P.O. BOX 2080 • OAKLAND, CALIFORNIA 94607 • 415 • 452-3211

November 28, 1977

Mr. Willard W. Wehe, Manager
Communications Consolidated Project
Contra Costa County
Public Works Department
6th Floor, Administration Building
Martinez, California 94553

Dear Mr. Wehe:

Thank you for the 911 project interim report. I'd like to comment on Section 5 - Alarms, Police & Fire.

All alarms are designed in one of three ways. Local bell systems which sound only on the premises. Second, direct systems which are connected to police or fire departments using a leased telephone line or using the dial network and calling the police agency or fire department directly on a normal incoming line. The third type is a retransmitted alarm where the signal is sent to an alarm company central station or answering service. Alarm conditions are then retransmitted to the appropriate police or fire agency. The cost of direct and retransmitted alarms is generally about the same regardless of location of the dispatch center because line sharing is used for areas that are distant from the alarm central station and multiplexing or high density signal concentrator devices are available to reduce the telephone line cost. In one company's experience, the average line cost is less for central station type systems regardless of location compared to police connected or direct systems.

In Contra Costa County, less than 1/3 of the police alarms and less than 1/5 of the fire alarms are direct. It is apparent that the direct alarm systems are not a major factor in the consolidation of police services. There is no distinction for as far as ISO or insurance rating organizations go between central station or police connected systems with the exception that there is more credit available for a central station connected system in all cases. There are many municipal cost saving reasons for connecting alarms to central stations. Primarily, the confusion and false alarm problem created when a signal goes direct. The alarm company generally has no knowledge of the operation or problems with the system until the system faults reach a crisis level. The police dispatcher then takes direct action and contacts the alarm company. It is the industry's desire that police departments contact the companies after each alarm. In actual practice most times, this is not done. The alarm company must rely on the police dispatcher who often has other more important, pressing duties to perform.

There are inspections and tests made to various types of alarm systems on a continual basis. If the system goes direct to the police department, a test or inspection requires a telephone call to the agency thereby tying up the dispatcher and creating needless confusion. With the central station system, the testing and inspection function information is not transmitted to the police or fire department and the confusion and problems are omitted. Alarm signals are usually able to be filtered by the central station or alarm receiving facility and often alarms are responded to by the alarm company directly and police agencies are not requested to respond. In the case of fire alarm systems, a great majority of the fire alarm signals are actually not alarms at all but supervisory signals indicating for example that a sprinkler valve has been shut or water level in a supplementary tank is below a certain level or fire pump power is off. In these cases, the alarm personnel handle the transaction directly with the alarm subscriber. In the case of a direct connected system, many of these signals, although not fire, would be handled by the receiving agency.

The alarm industry generally supports the idea of consolidation and removal of alarm systems from police and fire departments. As a practical economic matter, the alarm industry saves a substantial amount of money by having systems go direct to police departments. If the County will receive alarms directly, a good point could be made by the industry for transferring all of the alarms presently transmitted to central stations into the county facility. The average cost to monitor alarms for a central station is in the neighborhood of $10.00 per month. There are approximately 1500 alarms terminating in remote points in addition to those presently terminating in police or fire departments directly. We would suggest then that if the County is willing to connect the 300 (approximately) existing police and fire alarms to the new consolidated facility, then they might consider the impact if an additional 1200 alarms were added to that 300 total. As a practical matter, it might be difficult, but it is a logical legal point to consider. For example, in 1976 all alarms terminating in the San Jose Police Department were removed when consolidation of that facility was made into Santa Clara County.

Banks and savings and loan companies are under some pressure from the federal government to use police connected systems. However, the Bank Protection Act of 1968 is explicit in stating that if police connected services are not available, then central station receipt of bank alarm systems is perfectly acceptable under the act. Historically, larger cities and in this case larger cities with naturally larger communication centers have determined that they will accept a flat number of alarm systems or no alarm systems but in no case, that the industry is familiar with, will a city monitor an unlimited number of alarm systems. As a matter of actual practice, when the number of alarms terminating in a municipal communication facility reaches 100, there is a universal feeling among the dispatchers and supervisory personnel in the communication center that the alarms are "more problems than they are worth" and in general this has been true in the Bay Area.

The next question would be if you want to limit the number of alarms to 100, which ones can be connected?

Cordially,

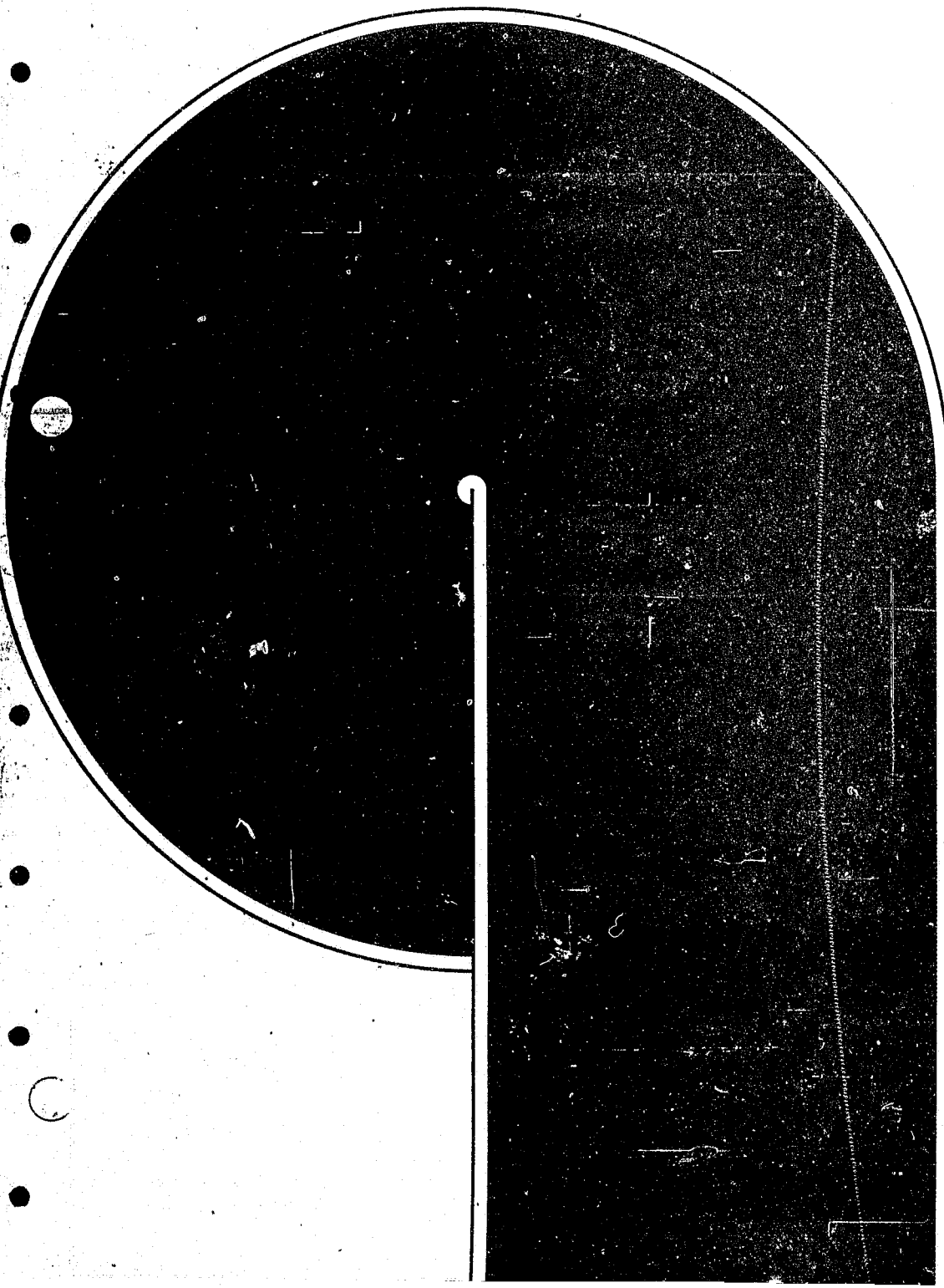
BAY ALARM COMPANY

Bruce Westphal

Bruce Westphal
Manager
Chairman, Technical Committee, WBFAA
Chairman, Computer Committee, WBFAA
Chairman, Bay Area Alarm Association

BW/sf

# mobile data communications systems by Motorola

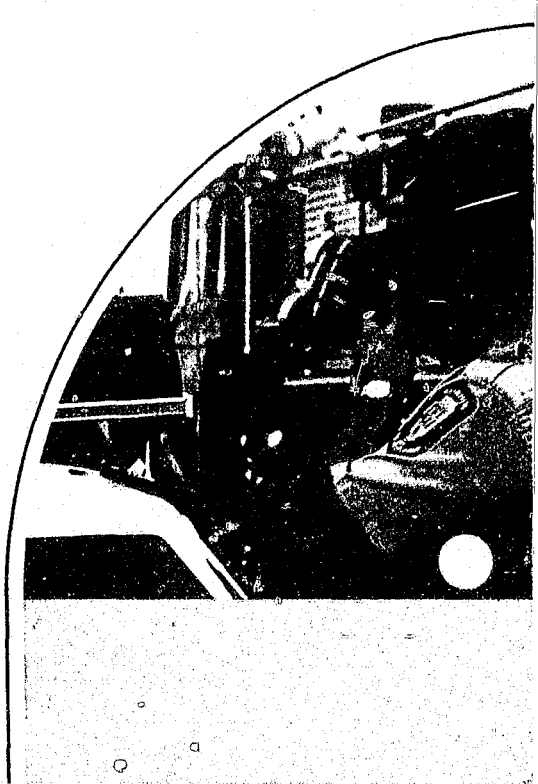


## computer aided dispatching system.

# why computer aided dispatching

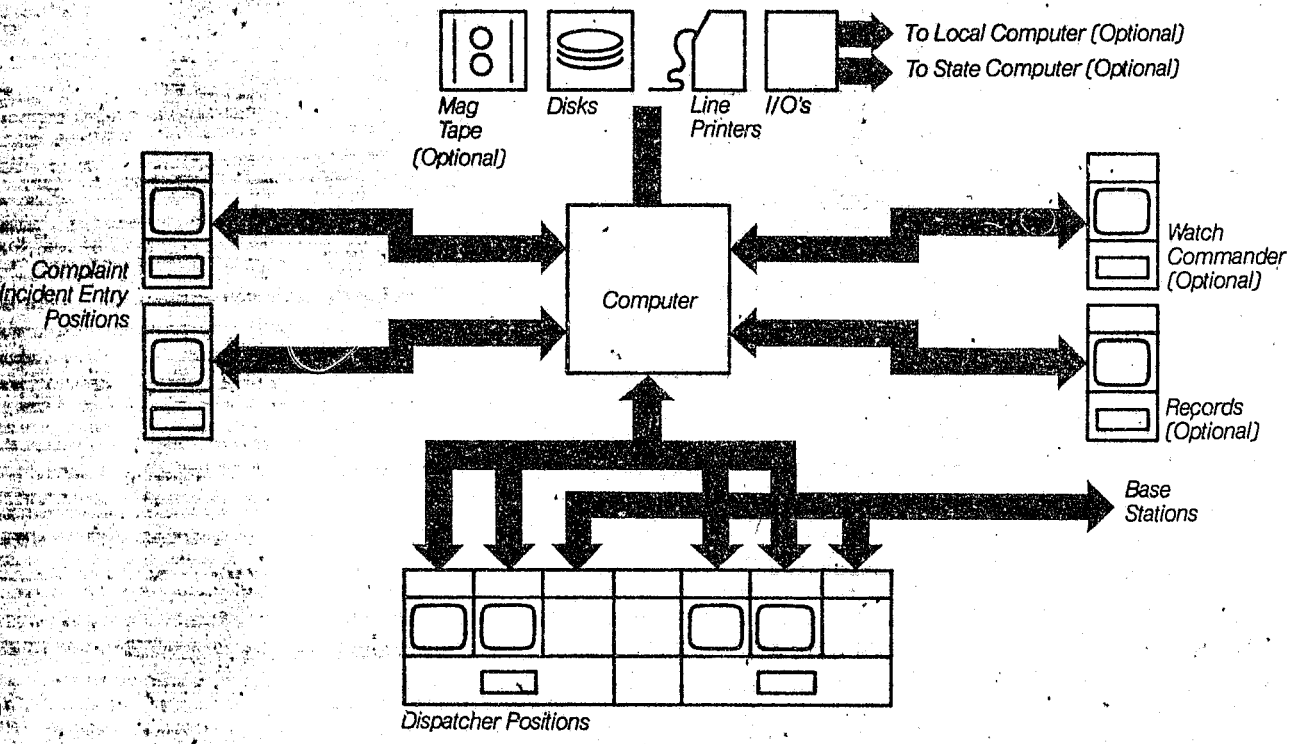
The purpose or objective of a computer aided dispatch system is to either eliminate or alleviate the following problems which currently exist in public safetly Communications Control Center Systems:

1. **TOO MUCH PAPERWORK**—The number of complaints handled by today's law enforcement departments result in large amounts of paper forms (IBM CARDS, COMPLAINT FORMS, ETC.)
2. **LEGIBILITY PROBLEMS**—In most manual complaint entry type systems, all complaints are initially written out (recorded) on a form by a Complaint or Incident Clerk. In addition to being quite slow, this "long hand" written procedure results in a significant number of legibility problems.
3. **INFORMATION TRANSFER PROBLEMS**—Most medium and large size law enforcement communications control centers use "hand to hand", belt conveyors, gravity chutes, messengers, or voice techniques to transfer the complaint information from the Complaint Clerk to the Dispatcher. These information transfer methods are quite slow, somewhat unreliable, cumbersome, and are time consuming.
4. **MANUAL TIME STAMP**—All Complaint entry forms (IBM cards, etc.) must currently be manually time stamped three different times—first when the case is received, second when dispatched, and third when resolved. The dispatcher spends approximately five percent of his time just using the time stamp machine.
5. **DATA PROCESSING PROBLEMS**—Most law enforcement departments that use computer data reduction techniques today, have an IBM card keypunch department which converts all of the complaint information into punched IBM cards. A very significant amount of money is spent just to convert the complaint information so that it can be entered into a computer data reduction system.
6. **MANUAL VEHICLE STATUS**—Most law enforcement departments currently record and update the status of their field units by using such manual devices such as: card slots, "light" boards, "spotting lights" on maps, status boards, light switch panels, and status sheets. All of these manual methods, to be successful, require the dispatcher to constantly follow-up and check to be certain that all of the status indicators for each mobile are correct. This is a very time-consuming and tedious job for the dispatcher.
7. **OVERLOADED CHANNELS**—Mobile Status Changes and short messages (acknowledgement, call requests, car stops) are currently reported to the dispatcher by a voice transmission from the mobile. This results in inefficient use of the channel and "crowding" on the channel.
8. **INEFFICIENT USE OF MOBILES**—The crowded channel conditions and the status errors that occur because of the manual status methods result in the inefficient use and assignment of mobiles.
9. **COMPLAINT BACKLOG & PRIORITY**—The watch commander and the dispatcher have no easy or quick means of knowing their current backlog of complaints per beat and also the priority of those complaints in a "paperwork type" complaint system.
10. **CASE REVIEW**—In a "paperwork" system, the dispatcher cannot easily or quickly review all of the cases that his assigned mobiles are working on. He must pull and review each complaint form individually. This is very time consuming.



# computer aided dispatch system






## SYSTEM HARDWARE

Basic system hardware:

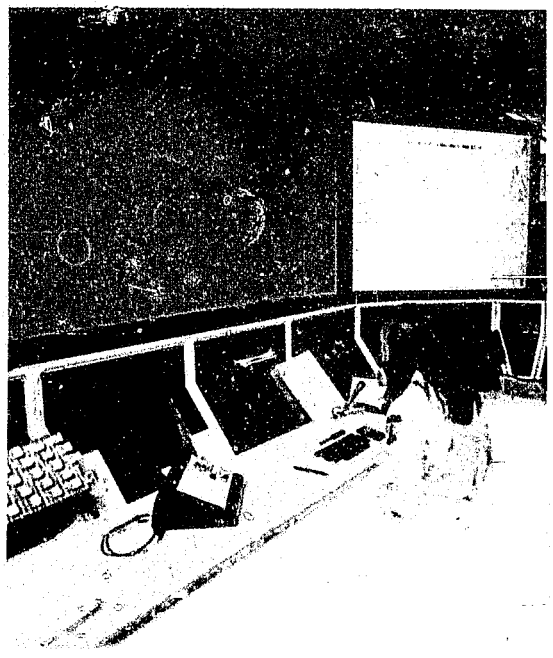
**Complaint Terminals,** each containing a CRT/Keyboard for complaint entry

**Dispatch Consoles, each with a**

(a) CRT/Keyboard for display of complaint information
(b) CRT Status display which shows current status of all units, digital messages, and "unit on radio" identification
(c) Radio control panels capable of controlling all radio channels

**Computer system, consisting of a**

(a) Minicomputer and disk units—the heart of the system for fast-access data storage and retrieval
(b) Magnetic Tape Unit (Optional)—to store information for data reduction
(c) Line Printers—for printed copy of incidents, field units status changes and messages, and "DATA BASE" inquiry and response messages
(d) Necessary computer system interface units



**Optional Hardware**

(a) "MODAT" Status/Message units for rapid, efficient transmission of unit status, messages and ID (identification) to the computer system for display on the dispatcher's CRT
(b) Advanced Mobile Data terminal for direct access from the vehicle, to Data Base Records. Also provides status/message/ID capability.
(c) Mobile printer for transmission of printed messages directly to the vehicle, and
(d) Flexible combination of status/message units, mobile data terminal, or either with a mobile printer to meet the specific operational requirements of different units.

# computer aided dispatching

To meet the challenge of providing more efficient law enforcement, and better use of tax dollars, new technology must be employed.

That technology means providing faster and more efficient ways of utilizing existing resources—men—patrol cars—dispatchers and complaint operators. It means developing a means to reduce response time, to improve safety for officers in the field, and to speed complaint entry.

It means having a computer aided dispatching system to accomplish these ends.

OVERALL BENEFITS

**INCREASE THE EFFICIENCY AND SAFETY OF THE OFFICER IN THE FIELD** by getting him more information before he responds to a call, getting it to him faster then ever before, and and minimizing his clerical work. The resultant benefits would make the officer more effective, increase his safety, and improve his response time.

**INCREASE EFFICIENCY IN THE COMMUNICATIONS COMMAND CENTER** by developing a more sophisticated complaint entry system, a dynamic display of forces available to the dispatcher, a real time display of complaint backlog and a faster means of getting information to field officers. The resultant benefits will improve service to the public, make more efficient use of personnel and, subsequently, reduce the cost of providing police services.

**PROVIDE MANAGEMENT INFORMATION DATA** by capturing relevant, timely and accurate information which enables the development of a data base of patrol and activity analysis with the intent of evaluating meeting future needs and determining crime trend analysis. The resultant benefits would provide an in-depth analysis of departmental performance with the intent of making more intelligent future resource allocation decisions.

# computer aided dispatch systems

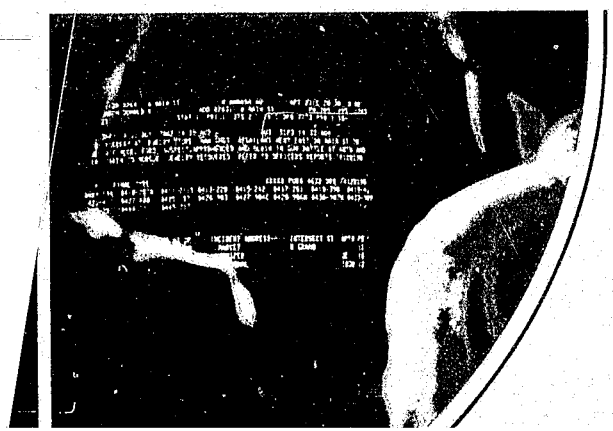
**Features & Benefits**

**NO PAPERWORK REQUIRED**—The Complaint/Incident CRT Display is used by the Complaint Operator to enter and display the new complaints that are received at the law enforcement department's control center operation. As new complaints are entered all previously entered complaints move down one position on the screen.

No paperwork is required to enter a complaint into the system. A trained complaint operator can type twice as fast as he can write and there are no legibility problems with a keyboard/CRT. The result is a significant increase in speed and accuracy when compared to the "paperwork" complaint form type of system.

**INSTANT INFORMATION TRANSFER**—When the Complaint Operator enters a new complaint into the computer, it is displayed in abbreviated form on the Complaint/Incident CRT. At the same time, it is also entered and displayed on the bottom part of the Dispatcher Incident CRT. The computer enters complaints on this screen according to complaint priority and then the time entered. Thus the dispatcher receives the new complaint instantly and there is no time lost waiting for a messenger, conveyor belt, or a gravity chute to deliver the complaint. In addition, the dispatcher has no legibility problems.

**AUTOMATIC TIME STAMPING**—When the Complaint Operator enters a new complaint into the computer, the time is automatically entered and associated with that complaint by the computer. The computer also automatically records the time when a complaint (case) is assigned to a mobile and also when the case is resolved and deleted from the computer system.



**FASTER, MORE ECONOMICAL DATA PROCESSING**—When a complaint is resolved and the dispatcher logs that case out of the active complaint computer files, the computer can automatically record all pertinent data on industry compatible magnetic tape. This data can then be directly entered and "data processed" for statistical purposes by any data processing center. No intermediate keypunch operations are required which results in a considerable savings to the police department.

**AUTOMATIC VEHICLE STATUS**—The Motorola MODAT system and the computer system now can provide the dispatcher with an automatic (continously updated) display of the status of the mobiles. The Dispatcher Status CRT Display is used to display the status of the mobiles. All of the information on this CRT is directly controlled by the computer. This automatic mobile status feature alone reduces the unreasonably heavy workload that the police dispatchers currently handle.

**ALLEVIATES OVERLOADED RF CHANNEL PROBLEM**—The use of the Motorola MODAT system which interfaces with the computer helps to decrease the "channel air time" required by using digital rather than voice transmissions. The MODAT System is used for reporting mobile status changes and "Messages."

**MORE EFFICIENT USE OF MOBILES**—By using automatic status with the computer, it is now possible for the Mobile operator to automatically and easily update his status condition as indicated to the dispatcher by the status display. This helps to insure that the dispatcher can make the best decisions when assigning mobiles to a case.

**COMPLAINT BACKLOG & PRIORITY**—The watch commander and the chief dispatcher can, from the Dispatcher Incident CRT display, determine the current backlog of unassigned complaints and also the priority of these cases. These features, provided by the computer system, help the watch commander to make the proper assignment of dispatchers which decreases the "police response time" and increases the effectiveness of the police force.

**INSTANT COMPLAINT RECALL**—The dispatcher can quickly call up and review, in full text form, any complaint that he and his assigned mobiles are working on. He no longer has to search through a stack of paper complaint forms to find the one desired.

**AUTOMATIC MOBILE PRINTER MESSAGES**—The computer system can automatically send out to any or all mobiles, via mobile printer, any complaint that the complaint operator initially entered into the computer files. The dispatcher does not have to type the complaint text on a terminal in order to send it via the mobile printer system.

**AUTOMATIC HARD COPY PRINT OUT OF COMPLAINTS AND MOBILE STATUS CHANGES**—The computer and the associated hard copy printers automatically produce a permanent "hard copy" record of all complaints handled and all mobile status changes that occur. These records are required by the police department for legal purposes.

**EMERGENCY CANNED MESSAGE**—By depressing the "EMERGENCY" button on his MODAT unit, a mobile operator can instantly inform the dispatcher that he has an emergency.

**ASSOCIATION OF MEN WITH CARS**—The dispatcher can request the computer to identify which officers are in a specific car.

**"UNIT ON RADIO" INDENTIFICATION**—Every time that a mobile transmits, its unit name is displayed on the dispatcher status CRT display.

**LOCAL/STATE DATA BANK INTERFACE**—An optional interface can be supplied with the computer system which provides the law enforcement department with an access to information on the following: 1. Stolen Vehicles 2. Wanted Persons 3. Vehicle Registrations 4. Driver's Licenses 5. Stolen Property 6. Firearms Records 7. Stolen Securities.

**VEHICLE & PERSONNEL FILES**—The computer files can be used to check the current status of all vehicles and personnel that are part of the department. The dispatcher uses these files to initially assign cars and men at the beginning of a shift.

# why Motorola is your best source for a computer aided dispatch system

The Motorola system offers many advantages to a law enforcement department. Three aspects of Motorola's offering deserve special emphasis.

**Proven Capability**—Motorola has the *proven* capability to deliver a system of this complexity and magnitude. The presently operational Computer Aided Dispatching System in Huntington Beach, California is very similar to this offering. The Orange County UHF law enforcement radio system, incorporates capability in advanced radio and mobile data systems. These performance proven systems incorporate all the technologies of Computer Aided Dispatch, message switching, receiver voting, base station control, microwave, two-way radios including mobile digital status and mobile printer. These are just two examples of Motorola's ability to implement advanced systems on a total system basis. Motorola assumes complete system responsibility until the customer accepts the system.

**Modular Systems**—Motorola offers an advanced generation system. The basic hardware and software have been debugged and proven in an operational environment.

The system is *modular in both hardware and software*, providing compatibility to meet future operational requirements.

Motorola offers the widest range of mobile data products that can be applied individually or in combinations to meet the specific operational requirements of each unit.

**Total System Supplier**—Finally, Motorola, as a leading supplier of communications systems has the resources to produce and implement the proposed system. A dedicated Program Manager will be assigned to this project. He will draw on the resources of plant and field engineering personnel to insure that program milestones are met. He will serve as *the* point of contact between the Department and Motorola.

In summary, Motorola offers an advanced, but proven system, has demonstrated the capability to deliver this type of system, and the management and resources to insure its timely implementation.

Motorola can supply the entire Computer Aided Dispatching package. All elements of the system can be provided from one source, for a total system.

- Communications Control Centers with CRT display systems and radio system control.
- Complete software support, including a complete array of functional application modules plus interface to remote data banks.
- MODAT mobile data systems, ranging from economical status and message entry systems through mobile printers, to complete mobile data terminal entry and display equipment.
- The most complete line of mobile, fixed, and portable radios available today.
- Complete parts and service through the Motorola National Parts and Service organization.
- Specialized communications processors to provide the necessary interfaces.
- Basic modular systems which can be expanded as your needs grow.
- Computer and associated peripherals.

And all Motorola systems are fully system tested, both hardware and software, prior to shipment.



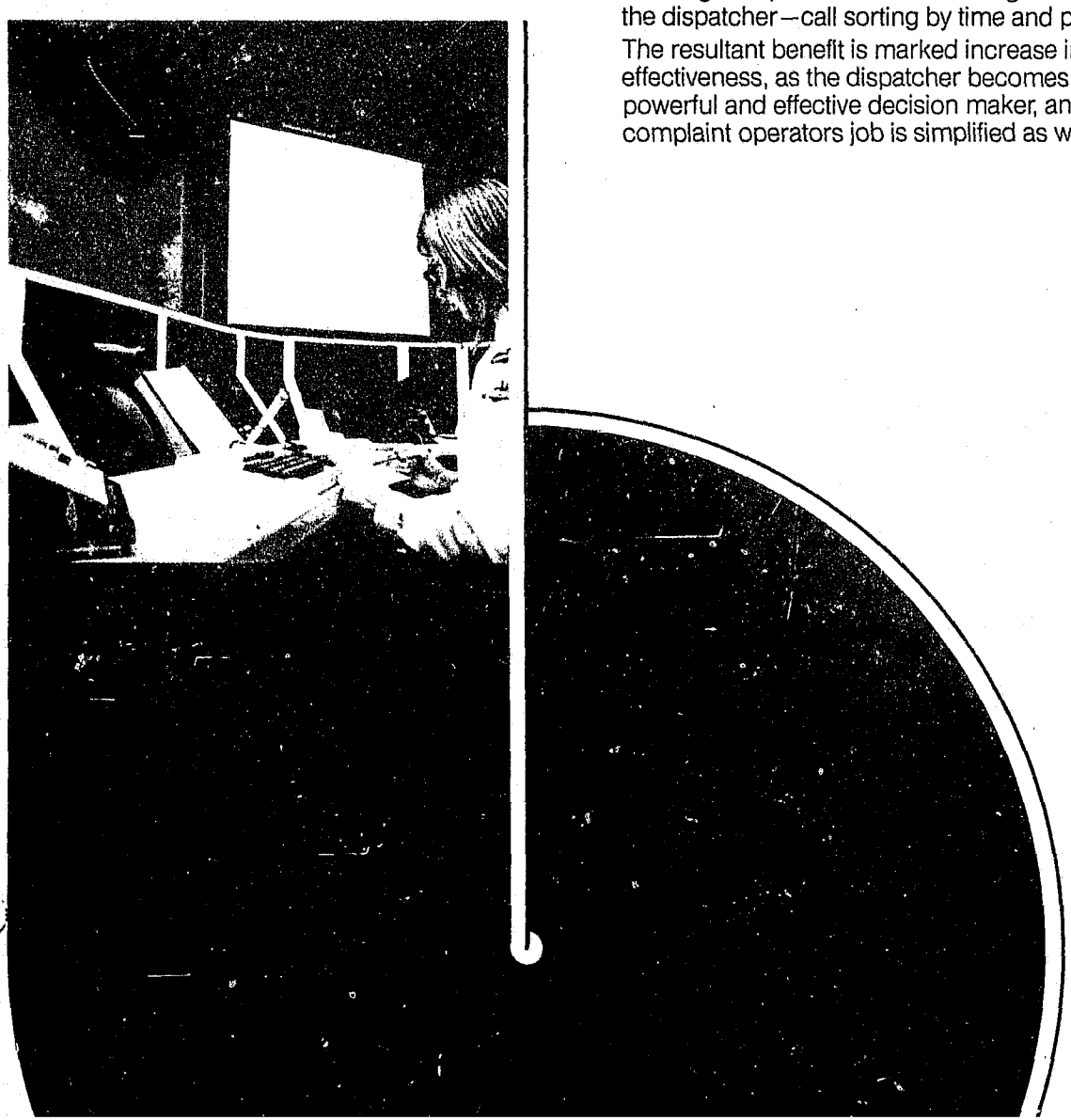
# Motorola's computer aided dispatch system

**Motorola's computer aided dispatch system It's based upon our history of providing systems to law enforcement agencies.**

Basically, our computer aided dispatching system is designed to enable a law enforcement agency to make most efficent use of its resources—men and their cars. Computer aided dispatching automates procedures in the complaint entry and dispatching process that enable departments to achieve new dimensions in efficiency. Manual paperwork tasks and complex status keeping functions are automated. The result is *less* processing time from the time that an operator receives a complaint to the time an officer arrives at the scene.

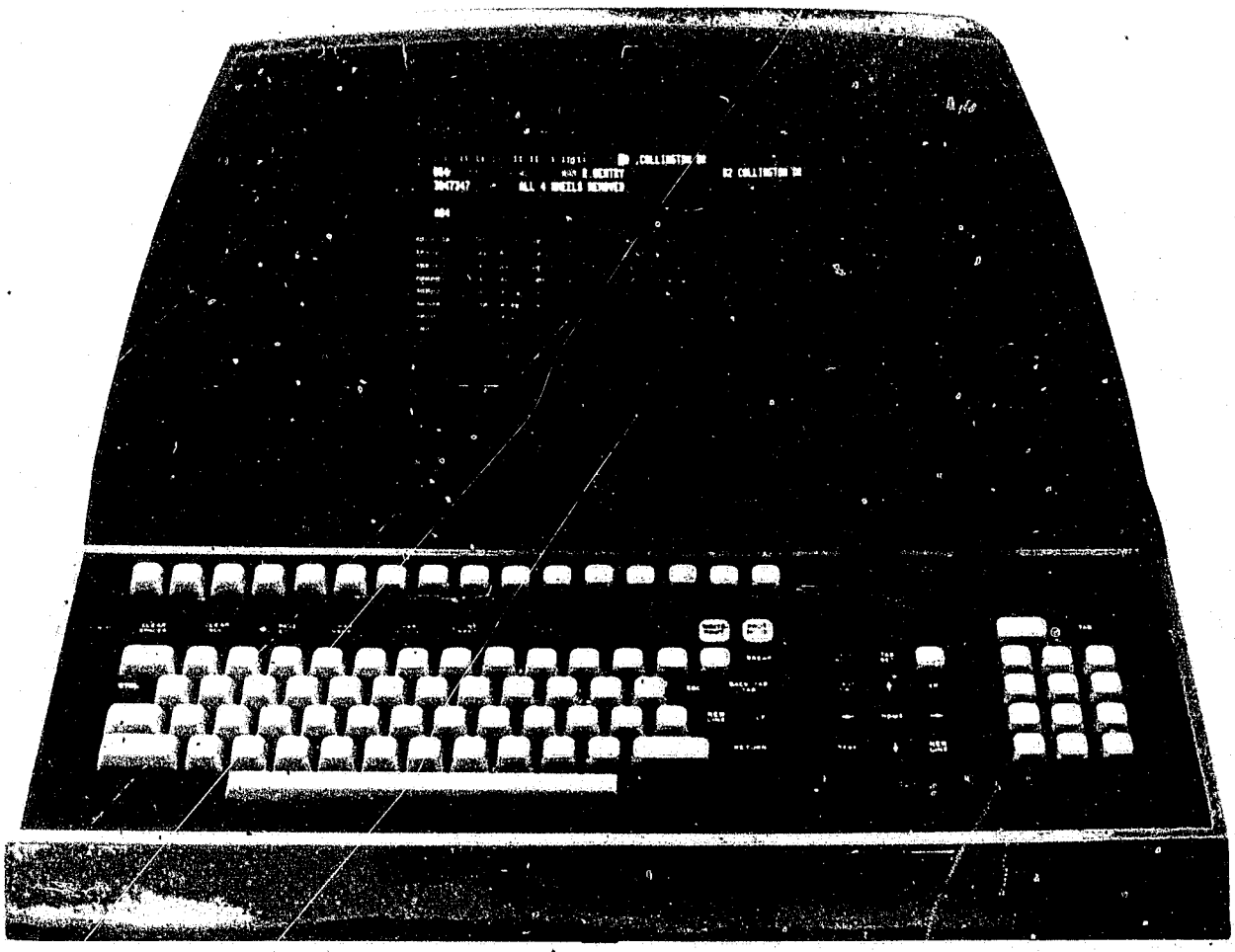
Typically substantial time and efficiency savings can be achieved in the following procedures—automatic time/date stamping—entering file and case numbers—typing of radio logs—changing status displays—recording status by time—entering complaints and transferring them to the dispatcher—call sorting by time and priority.

The resultant benefit is marked increase in effectiveness, as the dispatcher becomes more powerful and effective decision maker, and the complaint operators job is simplified as well.



# COMPUTER AIDED DISPATCH

## Efficient Public Safety Management



By Ron Sisson

Project Manager—CAD Systems
Mobile Radio Department
General Electric Company

Computer-aided dispatch (CAD) is proving to be a valuable tool in public-safety radio operations. An agency's ability to perform its service to the public in an efficient and timely manner can be significantly enhanced through the use of a computer and video (CRT) terminals.

## Benefits

The computer-aided dispatch system eliminates the need for the traditional conveyor belt and hand-written incident cards and exhibits many superior features in comparison.

For example, highly legible incident forms displayed on a CRT replace the hand-written cards. These forms are filled out via an alphanumeric keyboard, resulting in fewer operator mistakes which could cause improper response and possible risk of life or property. The computer outperforms the function of the conveyor belt by rapidly transferring the incident to the appropriate dispatcher's CRT.

Incident information is displayed to the dispatcher on a CRT terminal in an abbreviated priority queue for subsequent assignment as field forces become available. Thus, the system displays incidents in a concise and organized manner and eliminates the task of continually manipulating incident cards as traditionally done by the dispatcher. In addition, the system can automatically inform the dispatcher of the recommended units which are available to serve an incident.

Since information is stored in the system, it is available for immediate recall by all operators. For example, the incident file is available for review in summary form at all terminals. Subsequently, the details of any specific incident can be displayed in full.

A visual display of all units under control of a dispatcher is presented on a CRT. This display shows the updated status of each unit as maintained by dispatcher keyboard entry or by field units equipped with pushbutton status control heads. Information displayed adjacent to the unit and immediately available to the dispatcher includes current status, time of last status change, type of incident if on an assignment, and location. Therefore, this information is far more readily available to the dispatcher than is the case when using a manual card file system with status lamps. Also the information can be made available at a number of dispatch locations on request.

Message capability is provided between all operator CRT terminals.

A geographical file can be provided which automatically verifies the address and determines the sector in which the incident has occurred. This method of checking for a valid address can significantly reduce the time and errors associated with manual methods. Incorporation of the geographical file also allows the system to output messages automatically to the dispatcher concerning repeat incidents and outstanding warrants associated with the address in question as well as suggested correct addresses in the event an invalid address is entered.

The system supports automatic status and identification of patrol units. The display is an automatic identification

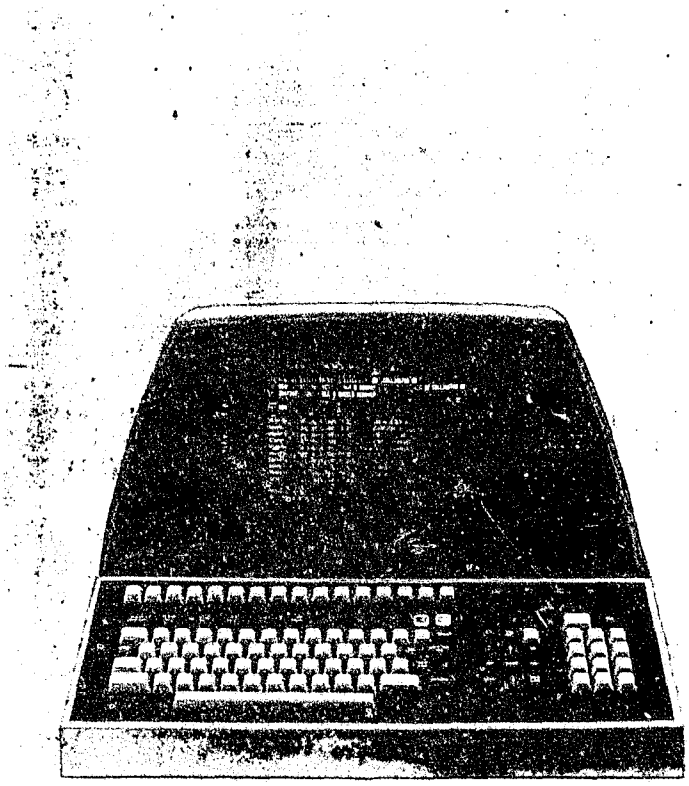


**Figure 1. CRT Terminal**

of each hand-held or mobile transmitting unit. Mobile units can be equipped with status-reporting equipment which allows field personnel to maintain their individual status on the CRT terminal, thereby eliminating the need for the dispatcher to maintain the status of field units by CRT keyboard entry.

The system can support the access and display of information stored in files. Examples of such information are stolen vehicles, outstanding warrants, and personnel records.

The system can support direct access from all CRT terminals to local, state and national files. Thus, access to the National Crime Information Center (NCIC) in Washington is immediately available to each operator. Access to such files in non-CAD systems is supported by a Teletype terminal.

Final disposition information on incidents can be entered prior to final close by dispatchers or other administrative personnel.

All incidents which have received final disposition can be automatically transferred to a city computer via a computer to computer link for subsequent operations analysis.

All incident and unit activity information is logged to magnetic tape for future processing on a city computer or on a back-up CAD computer in order to generate statistical reports for operational analysis. This eliminates the tedious task of manually searching an incident card file and/or keypunching of operations information.

Hard copy printers strategically located within each agency provide printed copies of incidents and unit activity as required. The system automatically provides a hard copy record of each incident as entered and as closed. The hard copy record of the closed incident includes all unit activity, message and disposition comments related to the incidents.

A full back-up computer system can be provided which will allow rapid failover in the event a failure occurs in the processor, memory, or any critical peripheral. The back-up system is configured to facilitate off-line hardware or software diagnostics, program development, and processing of

statistical reports for operation analysis via user-generated programs.

The system is designed to support dispersed multiple agency configurations for which the computer system is to be shared. Total separation and independence of agencies such as Police, Fire and Medical Services can be maintained.

**Designing the System**

The minimum system consists of a single processor and its core memory. Supporting peripherals located in the computer equipment room would include a control console for system commands, a high speed line printer for logging incidents and for system diagnostics, a disk for storage of large data files and a magnetic tape transport for maintaining a permanent record of all incidents and unit activity.

The system design supports a full, back-up computer option. The back-up computer is normally supplied with the full complement of support peripherals so that it can be completely independent and used for diagnostics, off-line programming, and data processing. This also allows the back-up system to take over in the event a failure occurs in either the processor or any of the critical support peripherals. Once the switch is made, the failed system is in a configuration such that proper diagnostic procedures can be performed. The back-up processor is provided with full core memory identical to that in the on-line processor. Therefore, there is no shared core in the system. This redundancy offers maximum protection against failure and allows the back-up system to be operated off-line with the complete operating software package for test purposes.

The remaining peripheral devices would be operated off a switchable communications bus in a system with a back-up computer primarily due either to their large numbers, such as CRTs, or being less critical in the event of failure. A modem would be required to support serial data communications with a local or state computer for accessing local, state, or national files such as the National Crime Information Center (NCIC) in Washington, D. C. An encoder/decoder would be required for every channel over which automatic status and identification is desired. The encoder/decoder would interface with transmitters and receivers to support two-way data communications with digitally equipped portable or mobile units.

The focus of operation is the CRT (cathode-ray-tube) terminal. The CRT terminal consists of a video display and a keyboard for data entry and system commands. The CRT terminal contains a character generator, memory, and control logic such that refreshing of the video display is performed within the CRT terminal. The control logic allows characters to be put on the display either from the keyboard or from a remote device, such as a computer, depending upon the state of the terminal. The typical CRT allows for the display of 1920 characters formed by 80 columns and 24 rows. The industry standard on screen size appears to be 12 inches diagonal; however, screen sizes of 14 inches and 15 inches are available.

Since the CRT terminal has its own internal memory, the terminal may be operated in what is commonly referred to as a "batch-entry" mode. This means that the operator may form the message within the terminal, perform editing as required, and send the entire text to the computer when satisfied the message is correct. This method of message formation is in contrast to a "character mode" in which a character is immediately transmitted to the computer as it is generated from the keyboard.

An important operational feature available in CRT terminals is what is referred to as "Format" mode. This is a mode in which formats or masks are displayed on the CRT with protected and unprotected fields. This is used extensively in CAD systems. For example, an incident form will consist of protected and unprotected fields. Typically the entire screen will be placed in a protected mode except for the specific areas in which the operator is expected to make entries associated with the particular task being performed. The main objective of this mode of operation is to keep the variable data restricted to known locations and lengths so that software can interpret it.

CRT terminals are available in two basic configurations. They can be supplied either with an integral or with a detachable keyboard. The detachable keyboard allows the operator to position the keyboard for maximum ease of operation and allows the video display to be built into a console if desired. The free-standing CRT (not built into the console) allows the unit to be added to an existing system with as little difficulty as adding a typewriter. Furthermore, it offers the advantage of easy maintenance by rapid replacement with a spare unit. Some of the other important characteristics of CRT terminals which should be taken into consideration are:

Ability to "blink" selected characters.

Ability to change intensity of selected characters—normally two levels.

A number of special-function keys to minimize operator key strokes.

A separate numeric key pad distinct from the main keyboard.

Figure 1 shows a photograph of an ADM-2 CRT terminal currently being supplied in General Electric CAD systems, and which exhibits the following characteristics:

High quality and reliability.

Nonglare etched screen.

16 special-function keys which can be used in both upper and lower case for 32 special system commands.

Status and message indicators which can be activated regardless of the state of the CRT.

The keyboard is a detachable unit and contains a separate numeric key pad. The group of keys between the numeric key pad and the main keyboard is provided for cursor control within the limits established by the protected format mode of operation. The 16 function keys are visible at the top of the keyboard.

Two types of CRT's are normally provided in CAD systems. One CRT is referred to as an "interactive" CRT and is supplied with a keyboard. Each operator must have an interactive CRT in order to interact with the system via the keyboard. The other CRT is referred to as a "status" CRT and is not equipped with a keyboard. Only operators such as dispatchers and supervisors who are normally concerned with status of units require a status CRT.

In typical systems the complaint-taker is equipped with a single interactive CRT for entering and displaying both incidents and messages. The dispatcher is equipped with both an interactive CRT and a status CRT. The status CRT is used to display the status of units under his control, unassigned complaints, and the identification of transmit-

miting units if portable or mobiles are digitally equipped for automatic status and identification.

Each CRT uses a "split-screen" format for which different sections or areas of each CRT are dedicated to the display of specific type of information. The interactive CRT at the complaint-taker and dispatch positions is divided into four areas as shown in Figure 2. The status CRT at the dispatch position is divided into three areas as shown in Figure 3. The type of information displayed in each area is identified in the figures.

The fundamental basis for the way information is distributed between the interactive CRT and status CRT is that the interactive CRT is off-line (not available for computer output) during operator entry, whereas the status CRT is always available for computer output. Thus, all critical information which should be displayed to the operator immediately and which is generated without his request is displayed on the status CRT.

**Processing Incidents**

Figure 4 shows the most fundamental information flow in the system. This flow is related to incident processing and involves the complaint-taker, dispatcher, and a high-speed line printer for producing hard-copy records of incidents. The following describes the key steps which are all initiated by operator command in processing an incident.

*Step 1* involves completing the incident form with information supplied by the person reporting the incident. Upon receiving a call from the public, the complaint-taker calls up a blank incident form via a special function key on the CRT keyboard. The complaint-taker enters information including location of the incident; incident type (signal code); name, address, and the telephone number of the person reporting the incident; and additional comments, if required. At some time during the process, the complaint-taker should scan the most recent (10) incidents displayed in the area immediately below the incident form. These represent the most recent (10) incidents entered into the system from all positions and are displayed at the time of output of the blank incident form.

If geographical street index file is incorporated, the complaint-taker may perform an intermediate address check immediately following entry of the address or allow it to be done following entry of the completed incident form. The system will automatically inform the operator of possible addresses with similar spelling or pronunciation in the event an invalid address is entered.

During entry of the information described above, the CRT is off-line and no information is being transmitted to the computer. Once the complaint-taker is confident that the information is complete and correct he is ready to enter the incident into the system. The complaint-taker may abort the process any time prior to the next step.

*Step 2* involves the entry of a completed incident form into the system. Basically, four important events occur upon incident entry. They are as follows:

1) Upon receipt of the incident by the computer, the following information is associated with the incident and is included in the form on any subsequent display of the incident:
   - Incident number
   - Date and time stamp
   - Operator identification
   - English translation of incident type
   - Priority based on incident type
   - Patrol area
   - Appropriate dispatcher for routing of incident

The appropriate dispatcher is determined either automatically based on patrol area or by an entry in the destination field by the complaint-taker. The patrol area is determined automatically from the location information if the geographical street index file is incorporated.

2) The incident is displayed in the appropriate dispatcher's unassigned incident queue on the status CRT according to its priority level as established automatically by incident type.
3) The incident is logged to a high-speed line printer in order that a hard copy is available in the event of a system failure.
4) The incident is rewritten in the incident-entry/display area of the complaint-taker's interactive CRT with all information including that supplied automatically by the computer as described in Step 1.

*Step 3* occurs when the dispatcher commands, by a special function key, the display of the full details of the incident on the interactive CRT. The incident remains displayed, in abbreviated form, in the unassigned incident queue until actual assignment. At the time the full details of the incident are displayed the system also displays a list of up to five recommended units. If the system includes a geographical street index file, it will also at the same time display up to eight repeat incidents which have occurred in the same block along with an outstanding-warrant display if one exists at the location of the incident.

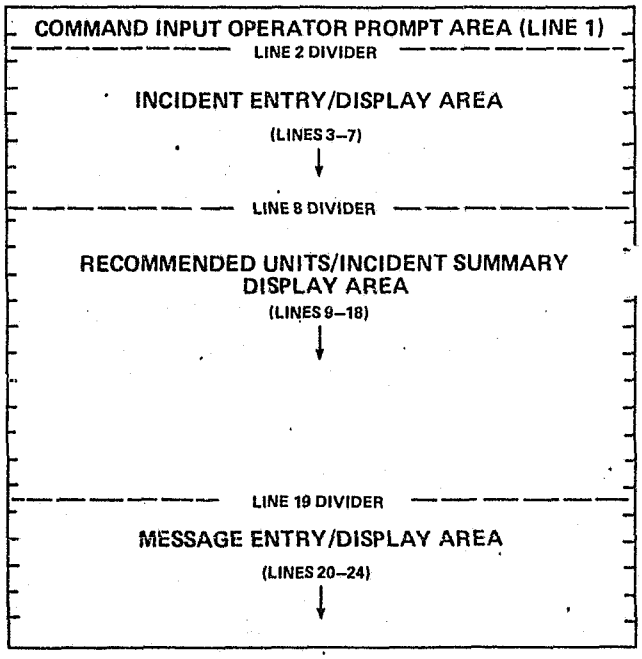



**Figure 2. Interactive Terminal information organization**

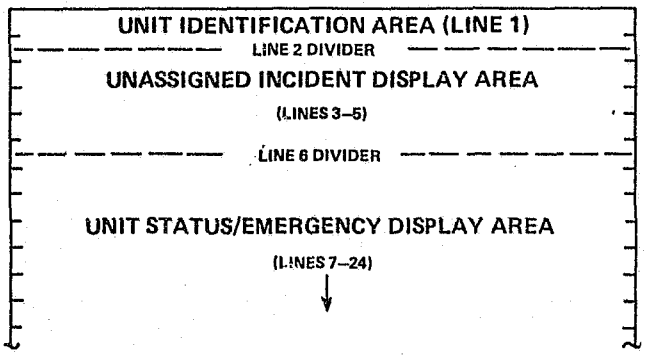



**Figure 3. Status Terminal information organization**

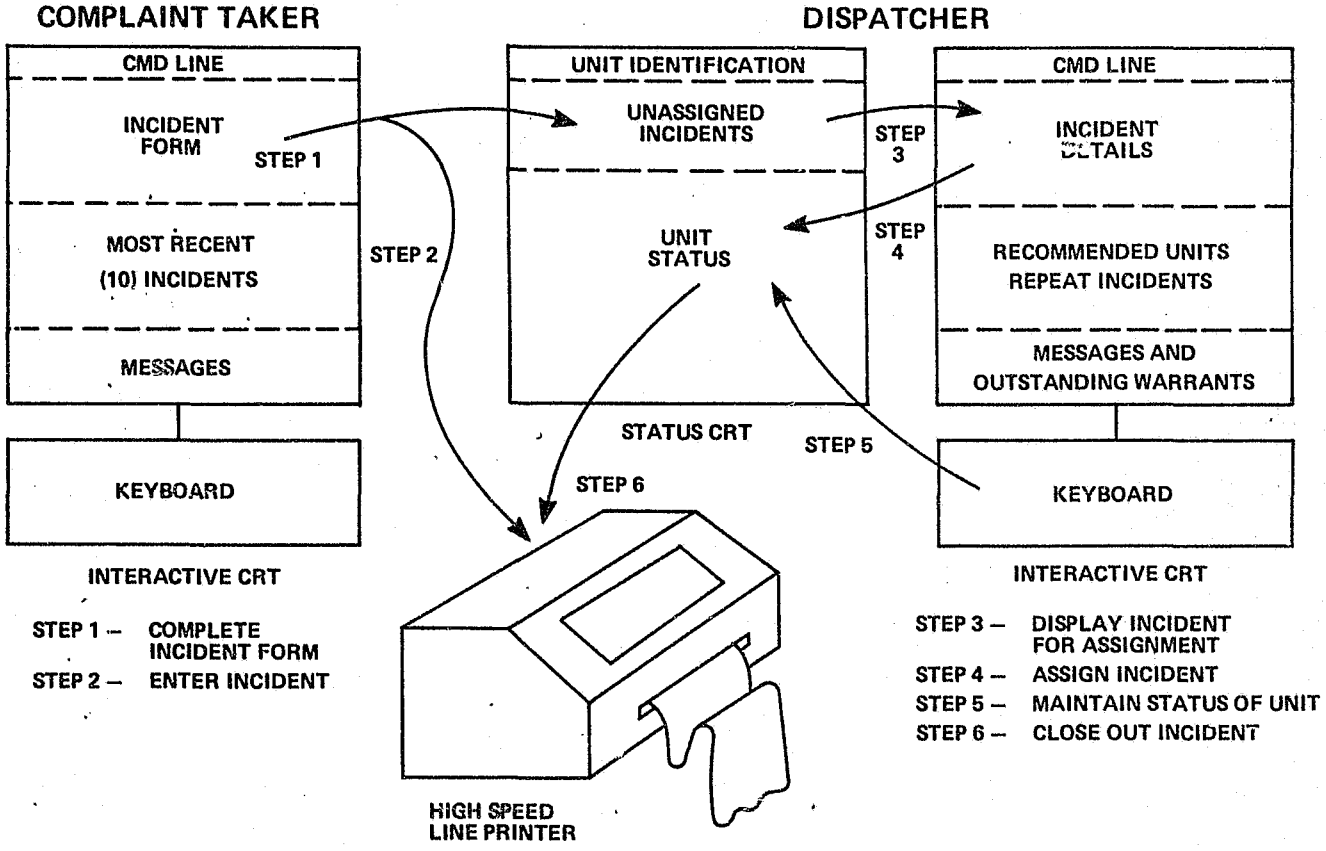



**Figure 4. Information flow for incident processing**

*Step 4* involves the actual assignment of the incident. The dispatcher can choose from the recommended units or from any available unit displayed on his status CRT. The unit(s) to be assigned are entered on the command line followed by a special-function key which causes the units entered to be assigned to the incident currently displayed on the interactive CRT. This results in the following events:

1) The incident is removed from the unassigned incident queue on the status CRT and all unassigned incidents are moved up accordingly.
2) The time of assignment, incident type, patrol area, and location of incident are displayed following the unit(s) identification on the status CRT. In addition, the status of the unit is automatically changed to indicate "On Assignment".
3) The incident is rewritten on the dispatcher's interactive CRT with the addition of the units assigned appearing at the bottom of the incident form.

*Step 5* relates to subsequent changes of unit status such as "At Scene" and back "In Service". These status changes are accomplished by keyboard entry and result in a change of the status indicator and an update of the time to reflect the time of the last status change. When the unit is put back "In Service", the incident type, patrol area, and location of the incident are all removed from the status CRT for that unit.

If the mobile units are equipped with automatic status and identification equipment, field personnel can maintain their own status, thereby eliminating the need for the dispatcher to perform this function from the CRT keyboard.

*Step 6* involves "close-out" of the incident. This is done by a special command being entered by the dispatcher and causes the incident to be logged out to the line printer for a hard copy of the incident and any related information such as unit activity and attached messages. At this time the incident is placed in a closed-out file on disk for subsequent log to magnetic tape upon supervisor command.

### CRT Terminal Formats

Photographs of typical displays are presented in Figures 5 through 10. These displays are presented in a logical order associated with the sequence of events occurring during the processing of a specific incident. The displays are organized around incident number 0000099 which was entered at 13:04.

The incident entry display (Figure 5) is a display of a complaint-taker's interactive CRT screen during the process of entering an incident. The operator has just performed an intermediate address check and is about to enter incident type (signal). The system has responded with the geographical block coordinates and map code on the top command line, thereby signifying that the address is valid. The system would have responded with possible valid addresses if the address entered by the operator were invalid.

The most recent 10 incidents are displayed immediately below the incident form for his review. A message previously entered is displayed. This message is related to incident 0000099 which was entered at 13:04 and can be observed as the second incident from the top in the display of the 10 most recent incidents. The incident which is currently in the process of being created does not yet have an incident number, date or time stamp, or operator identification. This information is added upon final entry into the system. *(See Step 2 above).* This information is inserted on line 3 prior to the location field.

The status display—normal (Figure 6) is a display of a dispatcher's status CRT and shows the next significant step

in the processing of an incident. Following entry by the complaint-taker, the incident appears in the unassigned incident quene on the appropriate dispatcher's status CRT. Incident number 0000099 is shown as the highest priority incident waiting to be dispatched. The information displayed for each unassigned incident includes the seven-digit incident number, time of entry, incident type (signal code), and patrol area. The first line of the screen is reserved for displaying the identification of transmitting units which are equipped with automatic status and identification equipment.

The area immediately below the unassigned incident queue is reserved for displaying the status of units. Three different formats are shown with varying degrees of information. The system provides a space between each group for clarity and allows any combination of the three to be used simultaneously.

The upper format contains two units per line for a maximum of 36 units in the status area. The information for each unit includes a single digit status indicator, unit number, time of last status change, incident type and priority, patrol area, and location of incident. The second format omits the patrol area and location in order to allow four units per line for a maximum of 72 units on display. The third format displays the status and unit number only and contains eight units per line for a total of 144 units on display.


**Figure 5. Incident entry display**

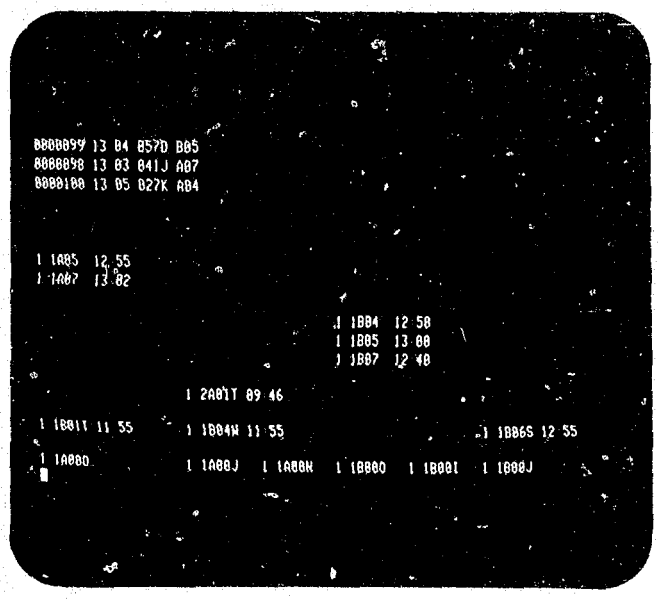



**Figure 6. Status display—normal**

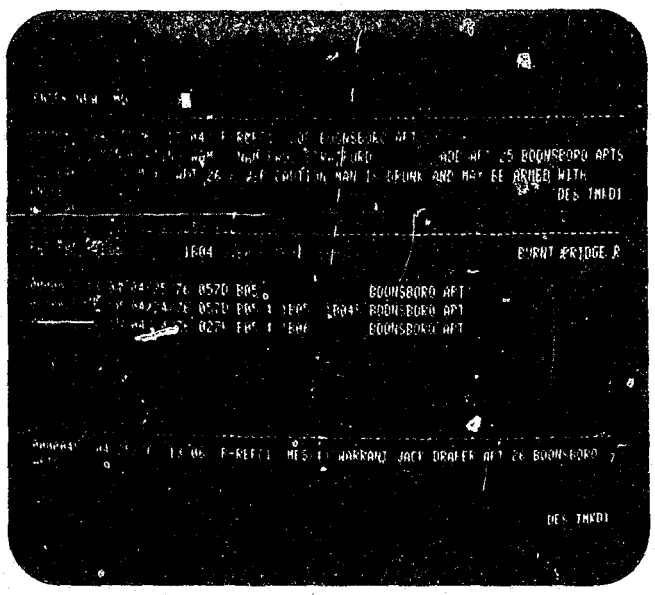



**Figure 7. Incident displayed for assignment**

The system allows units to be placed on the status display in numerical order, thereby simplifying the process of the dispatcher locating a specific unit on the display.

High-priority incidents and available units are shown in high intensity.

The incident displayed for assignment (Figure 7) is the display of the dispatcher's interactive CRT screen in which he has requested, by a special function key, the display of the details of the next most important incident. This has resulted in the display of incident number 0000099. In the area immediately below the incident is displayed the recommended units of which only 1B05 and 1B04 are available as indicated by their higher intensity. The nearest cross street is displayed on the right-hand side on the same line as the recommended units. In addition, three repeat incidents are displayed for which the most recent is incident number 0000099. In the message area is displayed an outstanding warrant for Jack Draper who is the occupant of Apartment 26 in the Boonsboro Apartments.

The assigned incident display (Figure 8) is a display which could exist following assignment of the units to incident number 0000099. The units were entered by the dispatcher on line one. The system has rewritten the incident and included the assigned units on the last line of the incident form. The dispatcher has called up a summary of 10 incidents in the system beginning with incident number 0000025 which was one of the repeat incidents previously displayed. The dispatcher has also called up a message sent by the complaint-taker which is related to incident number 0000099.

The status display—emergency (Figure 9) is a display of the dispatcher's status CRT following the receipt of an emergency message from a unit equipped with automatic status and identification equipment. The area reserved for status of units below the unassigned incident queue is rewritten with a flashing emergency banner and all known details concerning the activity and location of the unit.

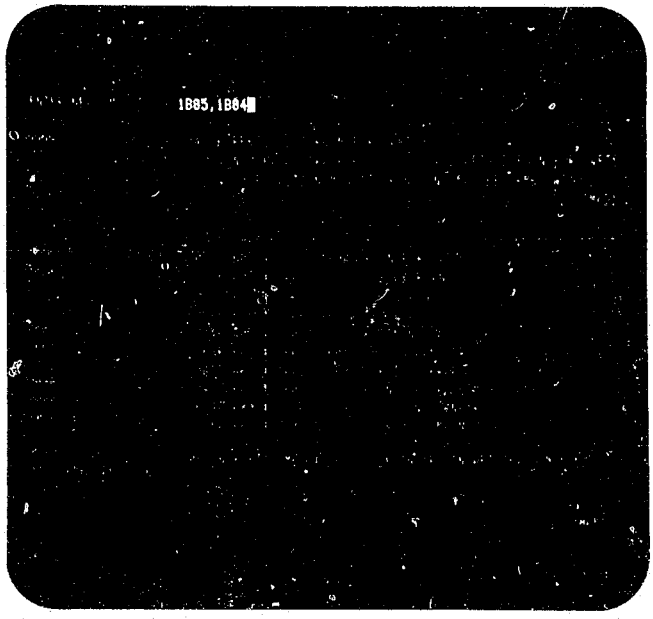



**Figure 8. Assigned incident display**

This display shows unit 1B05 to be in an emergency condition and to be currently working on incident 0000099 and at the scene of the Boonsboro Apartments.

The unassigned incident queue now reflects incident number 0000100 to be the highest priority incident.

The status display—all units (Figure 10) is a special display which is available to personnel such as supervisors and can display the status of up to 234 units in the system. The display is generated by the operator specifying the dispatcher status screens which he wants grouped on his single status screen. This results in the units, from each of the specified dispatcher's status screens, being displayed in the same order as originally established by each dispatcher. Only "IN SERVICE" and "OUT OF SERVICE" conditions are shown for each unit by high and low intensity respectively.

### Two CRTs Are Recommended

Certain characteristics of CAD systems are emerging as standard. For example, the use of two CRTs at each dispatch position has proven to be invaluable in eliminating the necessity for the dispatcher to manipulate frequently a single display in order to interchange incident, unit status, and message information.

A number of CAD systems are currently in operation and offer operational proof of their advantages over conventional methods. Although there are differences in the way that suppliers have implemented their systems, the basic functions described for this system are generally available. The primary differences between the various systems available today include the structure of the CRT displays, the functional capability at the complaint position, and the amount of information (location, for example) on display for each unit on the status CRT.

Although some CAD systems have been implemented using existing city computers, it is not the general trend. Due to the critical nature of the applications of CAD and the resulting need for high availability and fast response times, it is not advisable to operate in a shared environment on a city computer for which the Public Safety Department may not have direct control.

Considerable benefit can result from the incorporation of CAD in terms of resource allocation. Since all incident and unit activity is permanently recorded in magnetic tape, it is available for operational analysis.

There is great variability between public-safety departments' methods of performing operations analysis. As a result the trend is to encourage the public-safety department to do the programming required to process the data on a city computer or on a back-up CAD computer. It is not recommended that such analysis be performed on the on-line CAD system due to possible effects on response time of the primary function of dispatching. Consideration should be given to the configuration of the back-up CAD system to insure that it is designed to allow programs to be created and subsequent reports to be generated without affecting the on-line system.

Up to 10 man years of effort may be required for development of the software required to perform a comprehensive CAD system. Making use of this work can result in significant cost savings for the purchaser. These savings can best be realized by issuing functional specifications which allow suppliers to propose their standard system and equipment for which this programming effort has been accomplished.

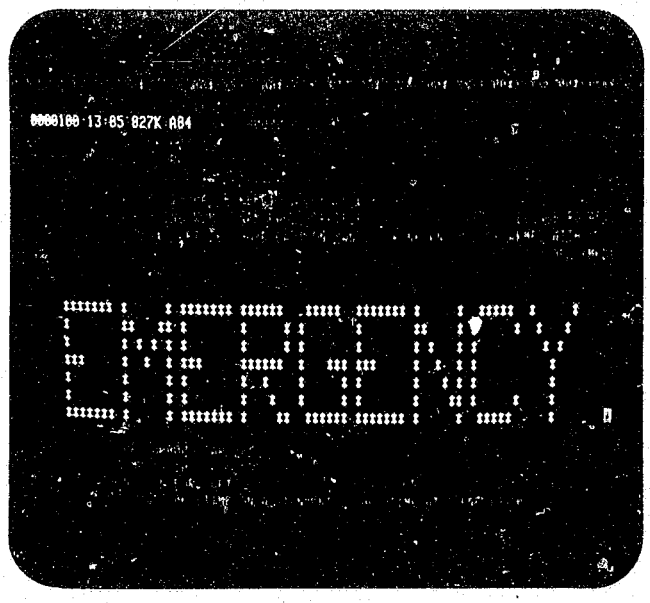



**Figure 9. Status display—emergency**

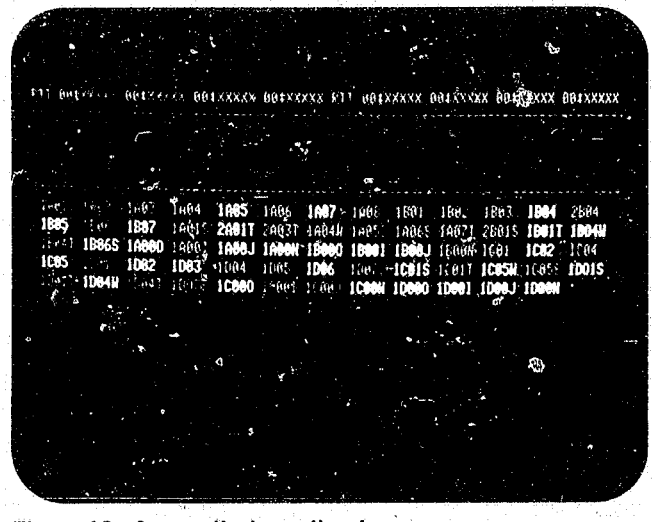
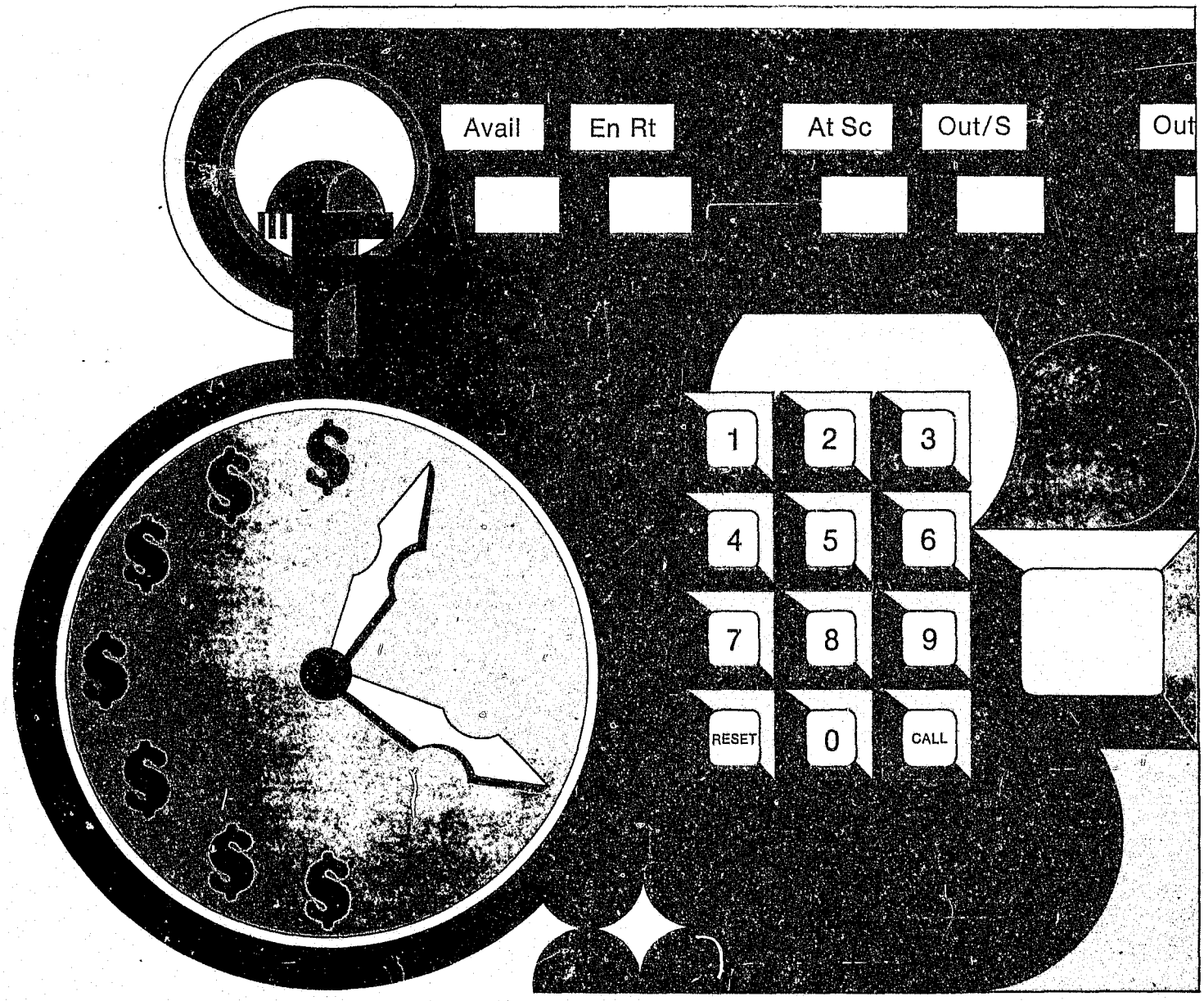
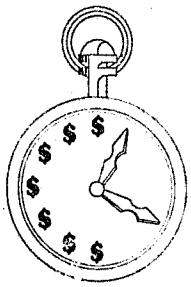


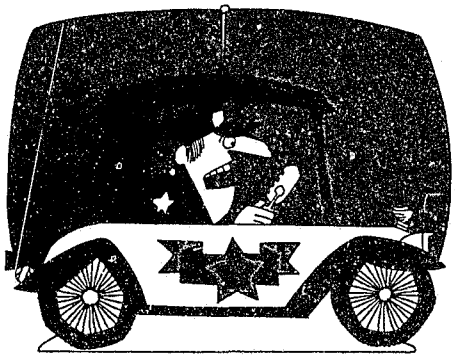
**Figure 10. Status display—all units**

MOTOROLA

# MODAT Status/Message Data Communications

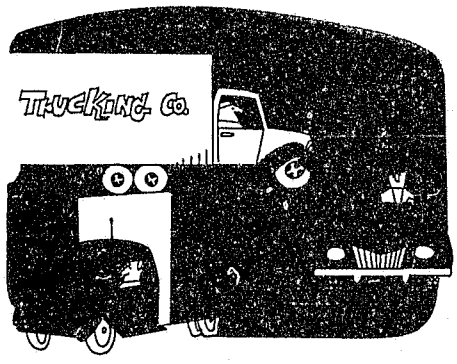






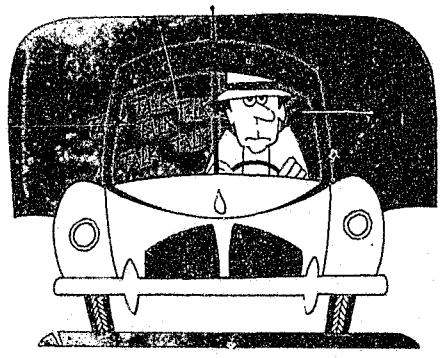
1

Public Safety agencies were the first to foresee the benefits of mobile two-way radios. As a result, citizens of the 1930's were provided with better police protection. Quick response to calls, more efficient use of the officer's time, and added services without additional personnel became the key words across the country.




2

The first business agency to turn to FM two-way radio was a public utility in 1940. After WW II, taxicabs, limousines, truck fleets, and other businesses increased the efficiency of their mobile fleets by equipping them with two-way radios. Vehicle drivers no longer had to look for a telephone to get in touch with the dispatcher. Dispatchers could instantly route their vehicles at any time. Customers of "Radio-Dispatched" fleets were provided with better and quicker service.

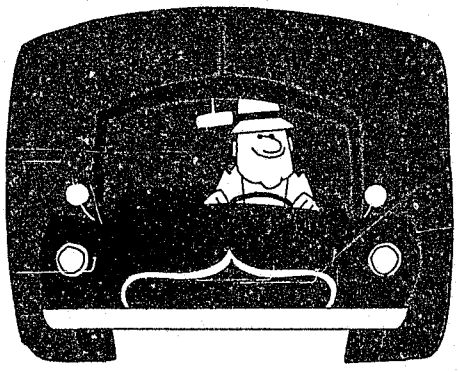


3

But as more and more businesses realized the benefits of radio, the available channels became more and more crowded. On a crowded channel, the mobile operator had to listen to almost constant chatter from his speaker, even though most of it did not concern him. In self-defense, the operator would mentally tune out all the talk coming in, missing many of the calls intended for him. Because of this "operator fatigue," messages often had to be repeated and sometimes were lost entirely.

4

And the situation was even worse for the dispatcher.

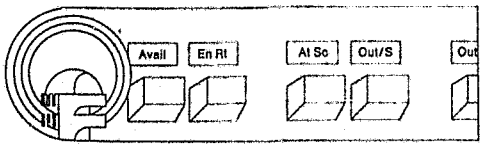


5

In 1955, Motorola introduced a secondary squelch system that allowed the operator's receiver to operate only when the message contained the correct tone code for his system. Thus, a mobile operator heard only the calls that were for him or for someone else in his own fleet. In effect, the new dual squelch restored the channel to a "single user" or "private" channel, hence the name "Private-Line" squelch.

6

However, the population continued to expand, businesses expanded in proportion, and more and more businessmen recognized the revenue-producing and cost-saving benefits of radio-dispatched mobile fleets. The result is that in today's urban areas, when the mobile operator monitors the channel, odds are that it will be busy. When he tries again a few moments later, it will likely still be busy. When he does finally get a clear channel and makes his call, someone else might break in before he can get a reply from the dispatcher. It's easy to understand why an operator gets frustrated—and might decide that he's *too busy* to call in.




7

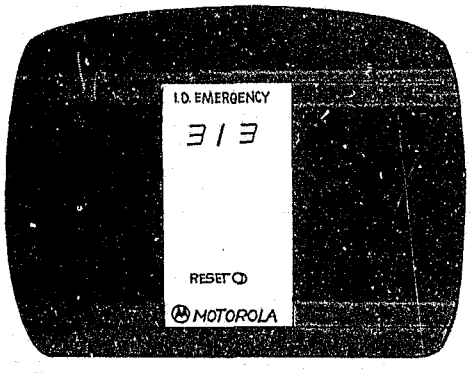
These time-wasting frustrations make it hard for the dispatcher to keep track of vehicle status. In some cases the dispatcher simply doesn't have enough time to obtain status information as often as he needs it. Not only does he have to contend with mobiles not calling in, he has to wait for air time to call the mobiles and ask their status. In a large fleet, one or more operators will probably be away from their vehicles and unavailable. Which means he has to go through the procedure once more to get status information from those mobile operators.

8

Public Safety agencies realized early in the game that two-way radio traffic during saturation periods could be further increased if the amount of air time needed for each transmission was shortened. They managed to accomplish just that by creating a code for the most-used phrases. This was the "10"—code which in one form or another has been adopted by two-way radio users all over the country.

9

Since the information sent over a two-way radio channel can be coded, and since technology has advanced to the point that data can be transmitted over a voice channel—the logical evolution was a voice communications system supplemented with data communications to further shorten the air time for each transmission. Motorola's MODAT Status/Message Data Communications System provides that extension for mobile two-way radio systems.

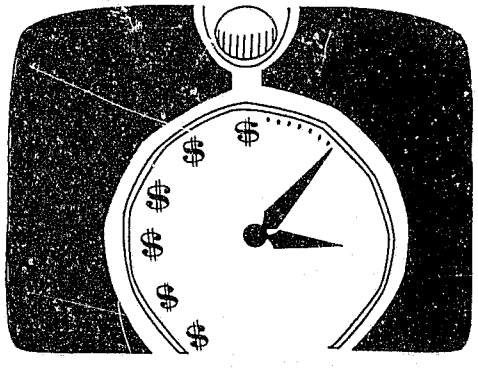



10

Air time for each voice transmission is shortened since each time the mobile operator keys his transmitter, the MODAT equipment in the mobile automatically sends vehicle identification (ID) data to the dispatcher. The vehicle ID is immediately displayed to the dispatcher and air time is reduced since the mobile operator doesn't have to make frequent voice identification. And the dispatcher *always* knows who is calling him.

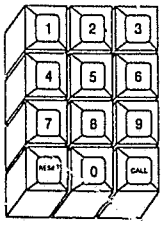
11

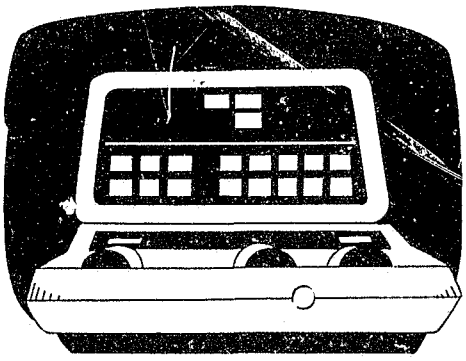
In addition, the mobile operator can send a pre-programmed message or status change to his dispatcher by just pressing a button. The information is displayed directly in front of the dispatcher along with the vehicle ID.



12

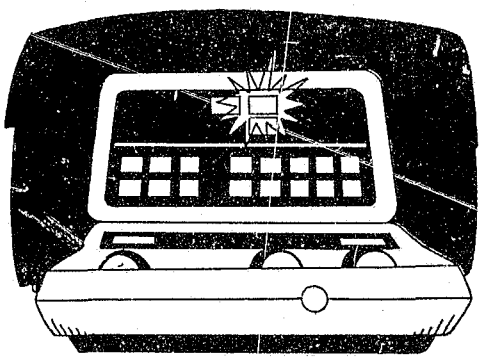
With Motorola's MODAT systems, the coded data transmission takes only about ¼ of a second—thus the total air time used is about the same as would be required to key the transmitter and utter a single syllable. That's the point of what MODAT Data Communications is all about—*time*. In any business *time* is money and MODAT Data Communications saves *time*. It'll add extra minutes to each hour; more work accomplished and services provided every day. Replacing many time-consuming voice transmissions with tone-coded data will save *time* and *money*.



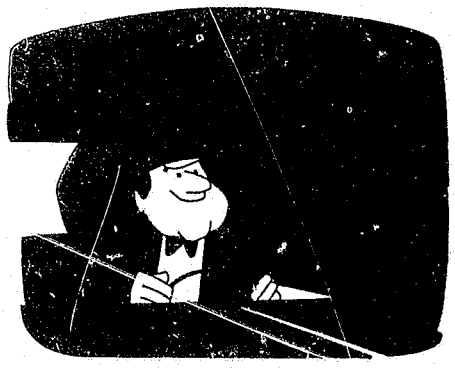
13

What's more, the mobile operator spends less time with his radio and more time at his job. He doesn't have to monitor the channel, the MODAT mobile data unit does that for him. That isn't all that a MODAT system does for the mobile operator. The MODAT equipment at the dispatcher's location automatically transmits a data message back to the mobile for positive acknowledgement. If, for any reason, the MODAT mobile unit doesn't receive an acknowledgement, the message will be sent again—automatically—up to four times or until an acknowledgement is received.



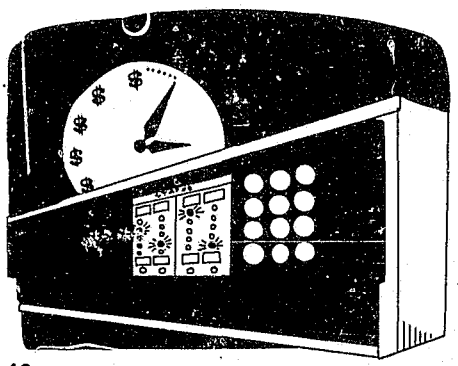
14

But what if the dispatcher needs to contact an operator and he is out of the vehicle? With the MODAT system, he calls the mobile with a data transmission. This turns "on" a light on the mobile MODAT control unit, so the operator is notified as soon as he returns to the vehicle.



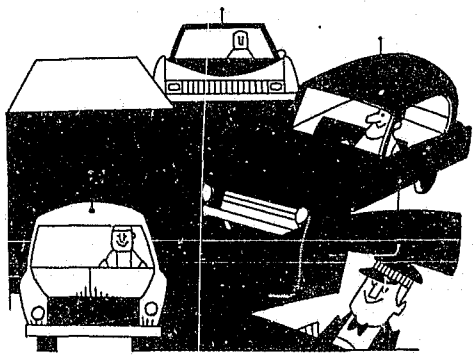
15

With the MODAT system, the vehicle operator requires only an insignificant amount of time to report status changes or send the most common messages. He doesn't have to monitor the channel and spend time waiting for a clear channel. Operator fatigue and frustration are eliminated. And, the messages and status changes sent by data are not going to be garbled or subject to misinterpretation.



16

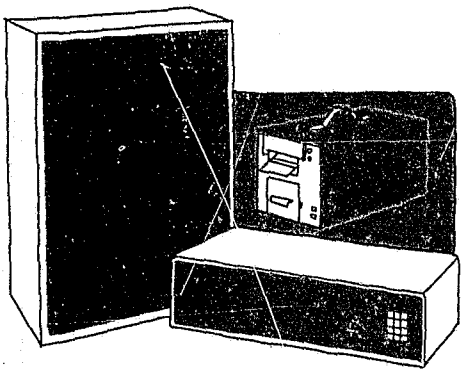
The dispatcher with a MODAT display has *simultaneous* up-to-the-minute *status* of *every* vehicle in his fleet—automatically. The display will retain data *messages* from several mobiles long enough for him to take any required action. The dispatcher has more information for decisions, more time for decisions, and more accurate and timely information on which to base his decisions. He is freed from time-consuming paperwork and manual status-keeping; his routine workload has been reduced and he has more *time* to spend on his real job—managing the vehicle fleet.



17

That's Motorola's MODAT Status/Message Data Communications System. In tune with today's need and answering the problems of tomorrow's greater congestion.

# Dispatcher's Equipment.

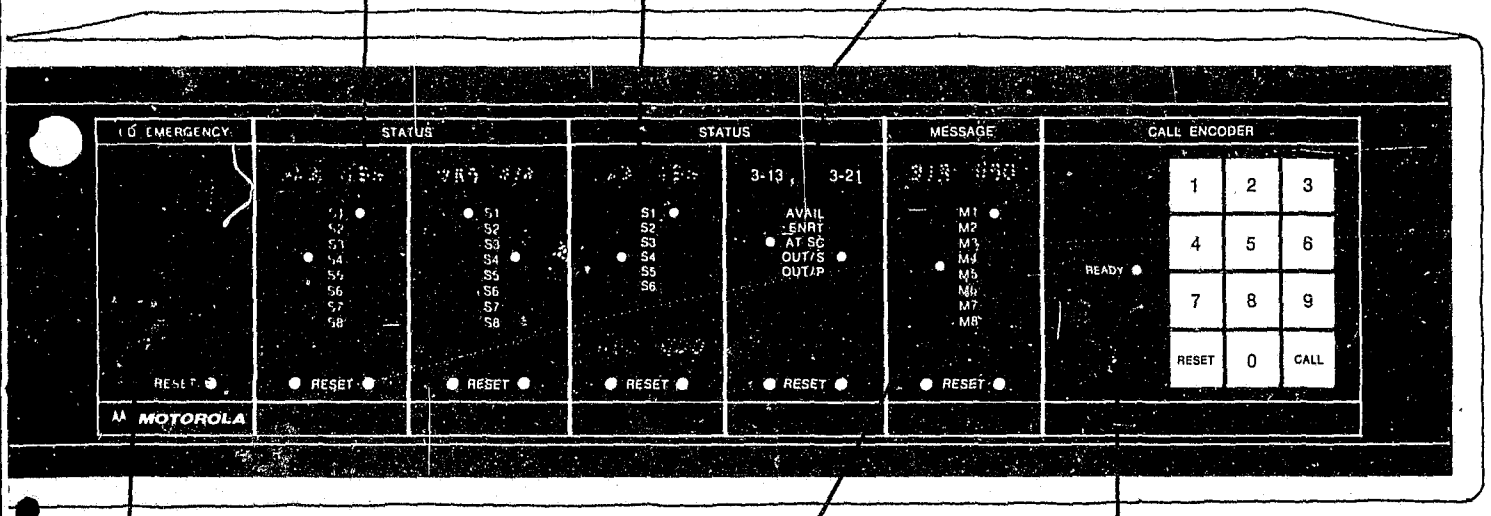


A single, stand-alone cabinet houses the MODAT Base Encoder/Decoder and its power supply and the power supply for the display. The display cabinet uses plug-in modules so that each system can be designed to suit individual customer requirements. An optional line printer will provide a complete log of all the data received by the dispatcher, adding the date and time to each entry.

A status display module is provided for each vehicle. Most models are programmed for a particular vehicle from the call encoder keyboard. The ID number is shown at the top of the module on a light-emitting diode (LED) readout. One of several LED's below the ID readout illuminates to show the vehicle status. Up to eight different status conditions can be displayed.

Some status models also show the elapsed time that a vehicle has been in a particular status condition. This is displayed by an LED readout at the bottom of the module.

Fixed-ID status modules are also available.

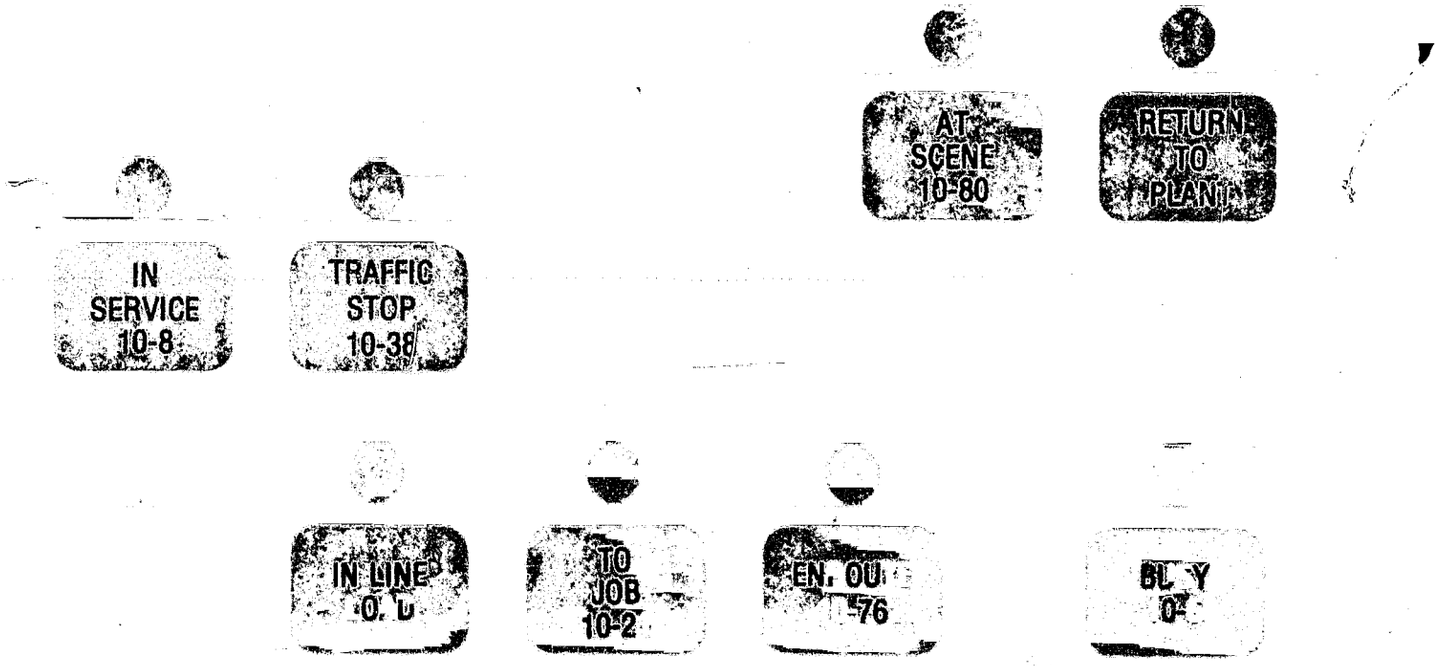



When a mobile calls in, his vehicle ID is displayed on the ID-Emergency module. If an emergency message is received, this module flashes the vehicle's ID number and sounds an alarm.

Message display modules show the most recent messages. They are similar in appearance to the status modules with the vehicle ID displayed on an LED readout at the top of the module and the message indicated with an illuminated LED below the readout. Up to eight different messages are displayed by standard models.

The first message appears on the far right module: subsequent messages are displayed on the modules to the left. One configuration of message display requires that the dispatcher manually clear each message. A second configuration is self-clearing. On the latter, when a message is received and all message modules are displaying a message, the oldest message (the one on the right-hand module) is rolled off the display and the rest of the messages are shifted one module to the right.

The call encoder module is used to selectively call the mobiles and to program the variable-ID status display modules.


IN SERVICE 10-8
TRAFFIC STOP 10-38
AT SCENE 10-80
RETURN TO PLANT
TO JOB 10-2
76

# How To Make Fleet Management More Effective? reporter II

**REPORTER II replaces routine voice messages with reliable digitally coded messages requiring only a fraction of a second to transmit and acknowledge.** Vehicle status changes and selected operational messages are immediately communicated to the dispatch center at the touch of the appropriate function control. Elimination of voice-reported status changes and reduction of operational voice messages enhances present radio communications while not changing other two-way procedures in any way. Efficient radio channel utilization is best realized by digitizing the status conditions and routine messages most frequently used in your operation. **REPORTER II provides for detailed vehicular information** by offering a selection of eight status conditions together with five operational messages (two of which may be either front panel or external switch activated). One of these messages may be used as an emergency message by public safety personnel or as a mechanical failure by commercial users. Since all data messages are quickly and automatically acknowledged by the base station logic controller, acknowledgment response delays are minimized, saving time and reducing driver frustration.

All transmissions from mobiles to base, whether voice or data, contain vehicle identification for display to the dispatcher. A voice transmission identifier message is activated by depression of the radio microphone push-to-talk switch. This feature deletes the necessity for voice identification thereby speeding voice exchanges while discouraging unauthorized transmissions and aiding radio discipline. An important benefit for computer-aided dispatch systems is the ability to perform periodic status validation with each received mobile message. This is possible since current status information is included in all operational and voice identity messages. In addition, **REPORTER II will respond with current status to a dispatcher initiated query, or interrogation command.** This feature enables automated status updates at any time without disturbing the vehicle operator and "transpond" checks to confirm radio contact with a mobile unit. REPORTER II also offers the convenience of selective calling. A mobile call alert indicator blinks upon command by the dispatcher. If the driver is out of his vehicle, an output signal can be used to activate an audio sounder. Upon receipt of a selective call command, the unit automatically responds with its current status as an acknowledgment to the dispatcher that the call message was received. When the driver returns, the call light extinguishes automatically by the initiation of either a data or voice transmission.

**REPORTER II may be programmed for any one of over 2000 unique vehicle identifications.** This programming is accomplished on an internal, plug-in module which is easily changed in the unit without unsoldering or strapping on the main circuit boards. This feature guards against possible damage to the unit in field readdressing and allows the plug-in module to be programmed in a service shop prior to identification change or installation.

**The REPORTER II has been human engineered for ease of operation.** Status and Message pad spacing prohibits two functions from being activated simultaneously, even when wearing gloves, while generous pad areas allow for clear, easily understood legends or symbols. Legends and symbols are applied to the rear of a front panel mylar shield which protects against wear due to normal usage. If the mylar shield should be marred it may be removed and replaced without chassis disassembly. Solid state circuitry electronically interlocks the controls so that only one condition can be reported at a time. The last status control depressed determines the status sent. Individual acknowledgment indicators are associated with each function control. The interaction of the control pads and indicator lights is such that the vehicle operator has no doubt as to his selected status, the transmitting mode of the unit, and reception of a positive acknowledgment.

The operator selects his status by touching the appropriate control pad. This action extinguishes the previous status indicator and causes the selected indicator to blink, indicating the unit has gone into a transmit mode. In this mode, the **REPORTER II first checks for a clear radio channel then keys the transmitter and sends the pre-selected digital data burst.** The entire digital burst requires only 240 milliseconds to complete, including repeating the data and identity information within the burst to insure reliable reception. An adjustable delay allows the radio transmitter to attain full power prior to sending a data burst while a randomizing feature prevents several mobiles from attempting to transmit simultaneously on a single channel. After transmission, the radio transmitter is un-keyed and the status indicator continues to blink while the unit waits approximately two seconds for an acknowledgment. If the message is accepted by the base logic decoder it is retransmitted as an acknowledgment to the mobile. The mobile unit then performs additional validity checks on the acknowledge message. If the message matches the data which was sent, the activated status indicator is continuously illuminated. This serves as an indication of acknowledgment and is a continual reminder of current status. Should an acknowledgment not be received, **REPORTER II will automatically repeat the transmission sequence.** If the unit is not acknowledged after a total of five transmissions, the status indicator is extinguished, indicating to the mobile operator that he should try again. Manual retries are simple, as the mobile operator does not have to manually release a switch, as is the case with mechanically interlocked pushbuttons, but merely presses the control pad once again. Message controls and indicators operate in a similar manner, except the indicator is continuously illuminated if the message is not acknowledged and is extinguished upon acknowledgment so successive operational messages may be sent.

Compact and rugged, the **REPORTER II is designed for superior reliability.** Vehicular electronic equipment is exposed to severe operational environments including dust, grit, moisture, temperature extremes, vibration and shock. One of the most unreliable components in mobile equipment is a mechanical switch. This is particularly true with unprotected mechanically interlocked switches which require front panel openings. Switches of this type tend to wear excessively and occasionally jam or not make contact due to accumulation of dirt and corrosive deposits which enter through panel openings and contaminate the switch mechanism. The REPORTER II design with its unique pressure activated switch eliminates this common cause of equipment failure. The front panel is composed of a rigid Lexan® backing to which is bonded the pressure actuated switch assembly. This assembly is then covered by a mylar sheet to provide a tough protective shield. Far superior to conventional pushbutton switches the switch control pad is widely used in the aerospace and tactical defense industries due to its environmental integrity and inherent reliability. The **REPORTER II panel offers this same protection against severe environmental extremes and operator abuse.** The protective front panel shield has a clean, professional appearance while functionally providing protection against dust, moisture, and corrosive contaminants. Additional environmental protection is provided by one-unit chassis construction utilizing vinyl clad aluminum covers, slot-mated to extruded aluminum sides and molded front and rear panels. Vibration and shock protection is accomplished by dimensionally supported circuit boards incorporating dependable solid state integrated circuitry. Motion resonance is further dampened by internal mid-area support construction.

The latest in information transfer techniques combined with advanced solid state circuitry has produced unexcelled signaling reliability.

Multipath fading, impulsive and wide-band noise are common disturbances present in conventional land mobile communications systems. Effects of this nature are the primary cause of induced digital transmission errors. **REPORTER II's sophisticated message encoding format, redundant information transmission technique, and optimized data detection method combine to offer the most reliable digital communications system available.** Redundant ID and data segments are transmitted within a data burst providing successive opportunities to recognize a valid message, thereby improving reception under burst noise and signal fading conditions. Systems' performance in high ambient noise environments can be further improved by extending REPORTER II's burst length from 240 to 320 milliseconds. Message validation at both the base station and mobile unit include ambiguity resolution, bit period signature check, and cyclic error detection code check. These validity checks prohibit false information from being accepted and displayed at the dispatch facility. Coherent PSK demodulation, employing dynamic phase lock loop referencing, provides optimized data acquisition and minimizes bit errors produced in high noise/weak signal situations that render voice messages unintelligible.

**REPORTER II's compact, single unit construction facilitates installation.** Connection of a single cable to the radio control head is all that is required for most installations. A flexible plug-in module provides for proper electrical interface to mobile radios of various manufacture. Equipment reliability is assured by the use of dependable circuitry, reliable solid state components and rugged chassis design. Should service be required, the unit's modular design provides for simplified maintenance and quick return to operation.

# AUTOMATED STATUS – MESSAGE – IDENTIFICATION

**FINGER TOUCH COMMUNICATIONS:** Press a status control on REPORTER II and your present status is automatically posted for your dispatcher. Press an operations message control and your identity and message appear. In trouble? Press the emergency control and let your dispatcher know immediately. Depress your microphone switch and you are instantly identified. Save time and increase productivity.

**HIGHLIGHTS** — PROTECTED PRESSURE ACTIVATED FUNCTION CONTROLS . . . 8 STATUS CONDITIONS . . . 5 OPERATIONAL MESSAGES . . . VOICE TRANSMISSION IDENTIFIER . . . MOBILE CALL ALERT . . . DISPATCHER INTERROGATION FOR STATUS . . . UNACKNOWLEDGED TRANSMISSION REPEAT . . . INTEGRATED ACKNOWLEDGMENT AND STATUS INDICATORS . . . VARIABLE OR FIXED ID . . . ATTACK TIME DELAY . . . CLEAR CHANNEL SENSE . . . SINGLE UNIT CONSTRUCTION . . . COHERENT PSK MODULATION.

### PROTECTIVE FRONT PANEL
No more dust, grit, and humidity entering mechanical push switch openings to contaminate switch contacts. Front panel pressure pads are covered by a protective Mylar shield. When you need contact — you get contact, reliably and with a solid visual indication.

### POSITIVE ACKNOWLEDGMENT
Individual indicators are associated with each status and message control pad providing positive acknowledgment and continuous current status indication.

### MOBILE CALL ALERT
Nothing attracts attention more than a blinking light . . . you know it when you receive a mobile call alert with REPORTER II.

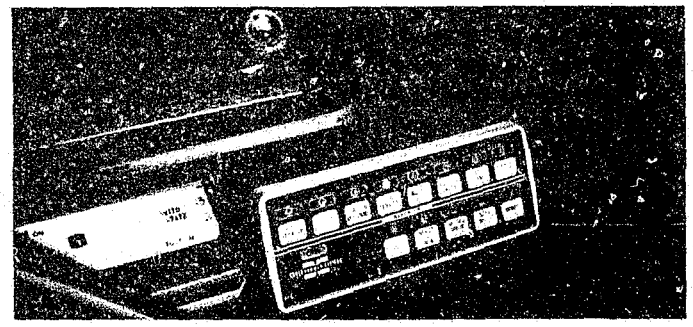
### SINGLE UNIT CONSTRUCTION
Since REPORTER II contains all circuitry within one logic control head, it requires only minimal under-the-dash or other out-of-way location space. Single chassis installation saves money and simplifies maintenance.

### DISPATCHER INTERROGATION
The dispatcher can interrogate any vehicle for its status at any time without bothering the vehicle personnel. Current status is reported back automatically.

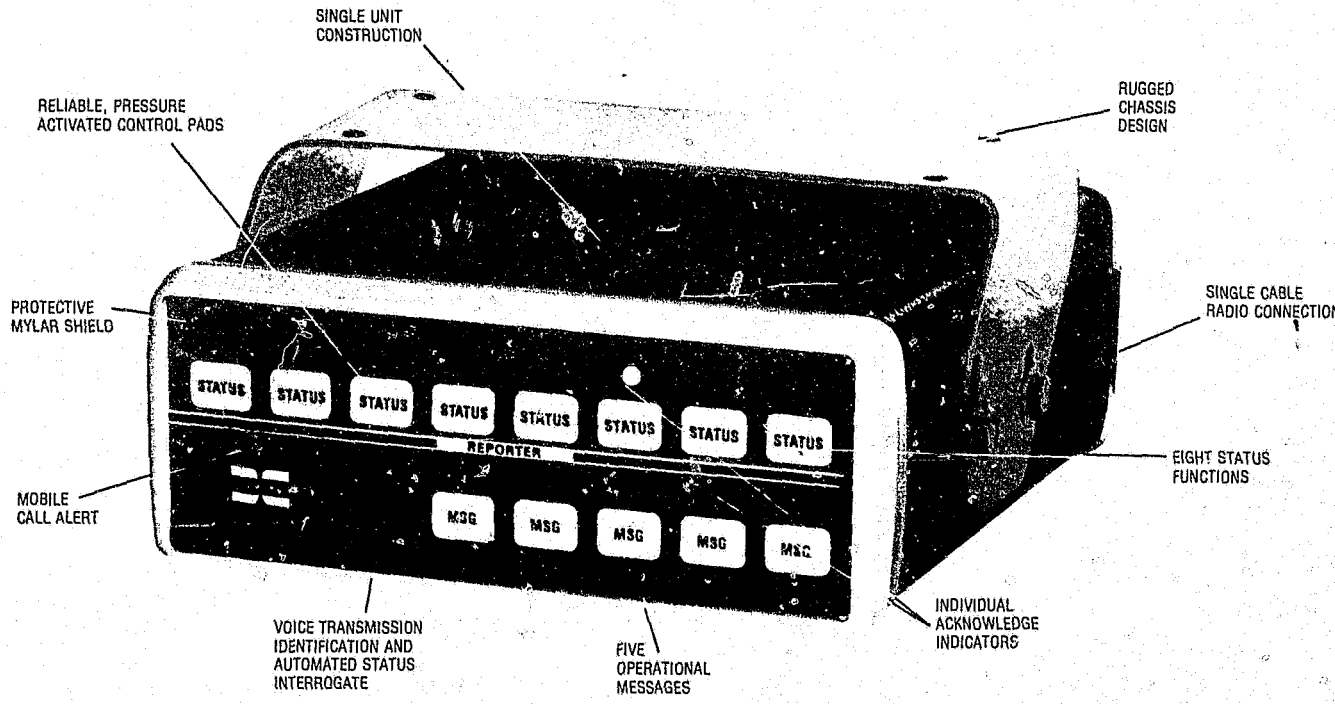
### TWO-WAY DATA CHECK
Every digital message is processed by the base logic controller and checked for possible errors. It is then returned as an acknowledgment to the mobile unit for a second validity check. **Only** if the return message passes all checks does the appropriate indicator light.

### CLEAR CHANNEL SENSING
With REPORTER II the vehicle driver doesn't have to monitor for a clear channel. Transmission is automatic when the channel becomes clear. A randomizing feature prevents several mobiles from attempting to transmit simultaneously.

### SUPERIOR RELIABILITY
REPORTER II utilizes a coherent phase-shift-keyed (PSK) signaling technique and coherent data detection. High reliability in noise and fades is strengthened by the presence of redundant information in the short digital burst, providing multiple opportunities to recognize a valid message.



*TYPICAL UNDER THE DASH INSTALLATION – Connections are made to the mobile radio control head including key line, microphone, volume control and battery power.*



# Performance Specifications

| | |
|---|---|
| Status Functions | 8 Vehicle Status Functions. |
| Message Functions | 5 Operational Message Functions. |
| Emergency Fault Message | 2 of 5 Operational Messages can be front panel or external switch activated. |
| Voice Transmission Identification | Unique identifier message initiated upon depression of microphone push-to-talk switch. |
| Selective Call | Front panel CALL indicator blinks upon command by dispatcher. Output available to activate audio sounder (200 mA max.). |
| Interrogate | Transmits current status upon command by dispatcher. |
| Acknowledgment | Separate indicator for each Status/ Message Function. Data validity check at both base station and mobile. |
| Retransmission | Until acknowledged to a maximum of 4 repeats. |
| Data Transmit Delay | Pause (25 ms to 500 ms) prior to data transmission allows for system attack delay. |
| Channel Sense | When this feature is utilized, the unit waits for a clear channel prior to data transmission. Operates from radio squelch circuit. 3.0 VDC min. deviation. 10.00 VDC max. DC offset. |
| Compatibility | Flexible, plug-in radio interface module supplied. Consult factory for individual radio interface requirements. |
| Random Que | Random pause (0 to 5 seconds) following clear channel sense prevents simultaneous queing transmission in contention mode of operation. |
| Unit Identification | 2045 unique ID's available. ID changed by means of plug-in module. |
| Common Identification | One common ID to which all units respond. |
| Data Burst Duration | 240 milliseconds. |
| Data Modulation | Synchronous phase shift key. (PSK) |
| Redundancy | Redundant digital messages are transmitted within a data burst providing through put reliability in the presence of impulse noise and signal fades. |
| Encoding Factors | Hamming sync. code. Bi-directional ID. Cyclic error detection code. |
| Signaling Reliability | 99.9% at 12db audio quieting. |
| Message Falsing | Less than one in $10^6$ transmitted messages. |
| Input Voltage | 13.8 vdc ± 20%. |
| Input Current | 0.8 amps nom. at 13.8 VDC. |
| Size | 3" H x 8" W x 9" D. |
| Weight | Less than 4 pounds. |
| Temperature | −30°C to +60°C. |

*SPECIFICATIONS Subject to Change Without Notice*

## STATUS DISPLAY SYSTEMS

Expandable base station logic systems are available with a full range of capabilities; from economical single line data displays and compatible base encoder/decoders, to flexible processor/video terminal information systems. Dispatch facility display systems have been designed to provide current information on fleet activity in clear, easily understood format.



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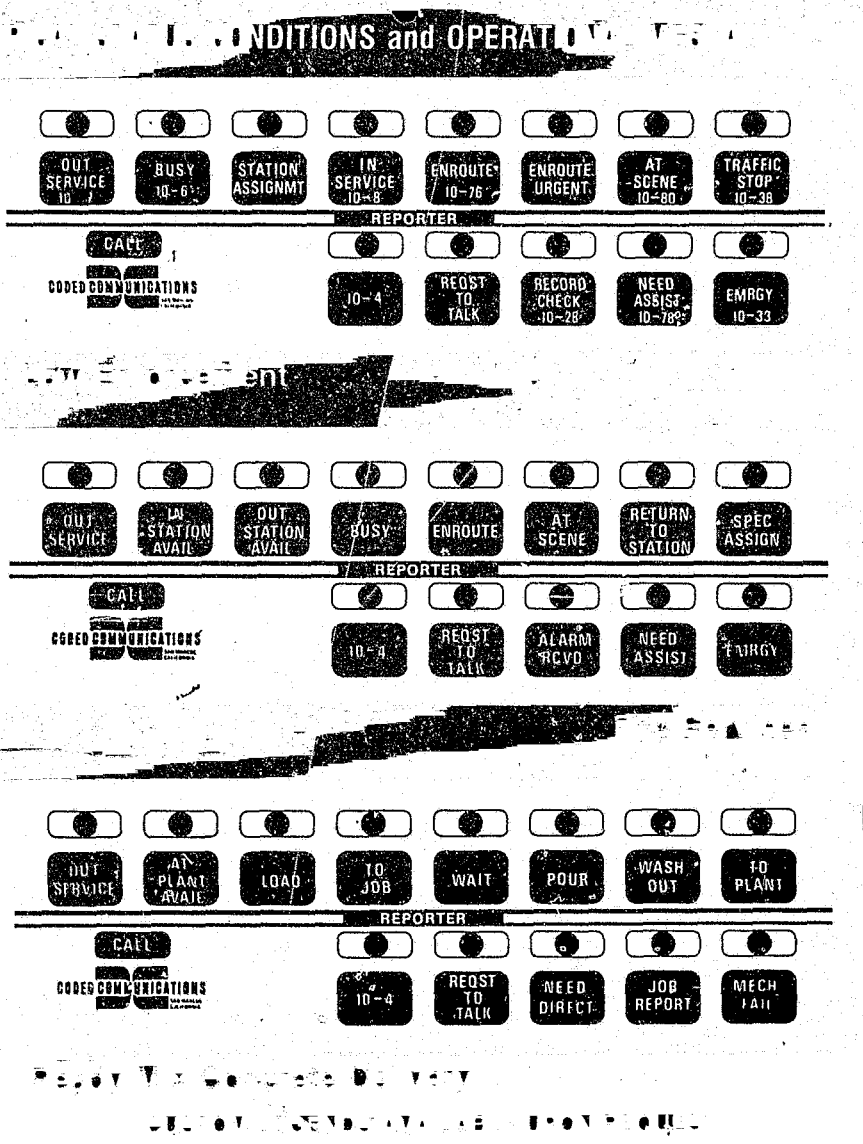


INDUSTRY LEADERSHIP through DIGITAL DIVERSIFICATION

*For Further Information and Assistance, CONTACT –*

**CODED COMMUNICATIONS CORP.**

**1620 LINDA VISTA DRIVE**
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