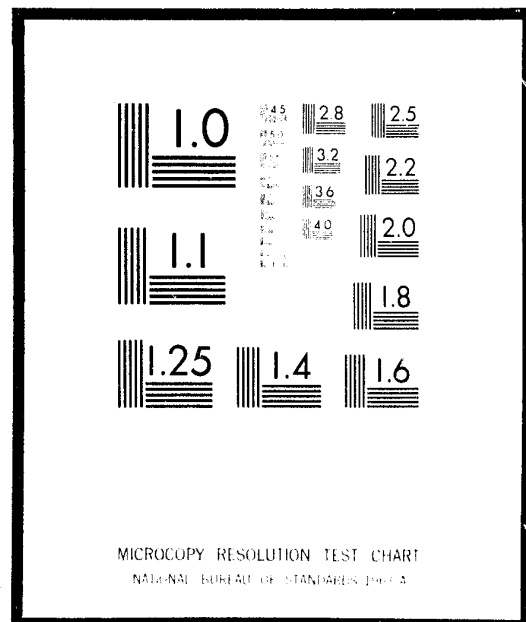


NCJRS

This microfiche was produced from documents received for inclusion in the NCJRS data base. Since NCJRS cannot exercise control over the physical condition of the documents submitted, the individual frame quality will vary. The resolution chart on this frame may be used to evaluate the document quality.



Microfilming procedures used to create this fiche comply with the standards set forth in 41CFR 101-11.504

Points of view or opinions stated in this document are those of the author(s) and do not represent the official position or policies of the U.S. Department of Justice.

U.S. DEPARTMENT OF JUSTICE
LAW ENFORCEMENT ASSISTANCE ADMINISTRATION
NATIONAL CRIMINAL JUSTICE REFERENCE SERVICE
WASHINGTON, D.C. 20531

1/4/77
Date filmed

LAW ENFORCEMENT ASSISTANCE ADMINISTRATION (LEAA)

POLICE TECHNICAL ASSISTANCE REPORT

SUBJECT: Communications: An Assessment of Grant Application From King County, ~~Washington~~ Department of Public Safety For Funds to Purchase 8 Channel Portable Radio Equipment.

PROJECT NUMBER: 76-097/063

FOR: ^{STATE} State of Washington, Law and Justice Planning Office

CONTRACTOR: Public Administration Service
1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036

CONSULTANT: Bernard H. Flood

CONTRACT NUMBER: J-LEAA-002-76

DATE: July 16, 1976

35843

DEPARTMENT OF JUSTICE

INTERNAL ROUTING/ACTION SLIP

TO	BLDG.	ROOM	NAME/TITLE/ORGANIZATION
			NCTRS :
			ATTENTION
			GUY BOSTON
			Police T.A. REPORT

- RECOMMENDATION/COMMENT
- SEE REMARKS ON REVERSE
- MAKE COPIES (NO.)
- RETURN(BY)
- LOG
- FILE
- SEE ME
- CALL ME
- NECESSARY ACTION
- COORDINATE
- PER INQUIRY
- INFORMATION

FROM	BLDG.	ROOM
R.O. Hall		1159
	PHONE	DATE
	6 3944	.

Table of Contents

	<u>Page</u>
I. INTRODUCTION	1
II. UNDERSTANDING THE PROBLEM	3
III. ANALYSIS OF THE PROBLEM	9
Data Channel	9
East Radio Channel	9
Tac-1	10
Southwest System	10
Southeast Precinct	11
North Precinct	11
County Radio Channel	11
IV. CONCLUSIONS	12
V. RECOMMENDATIONS	16

Exhibits

Appendix A -- King County Washington, Department of Public Safety Grant Application #75-C-0144	17
Appendix B -- Pacific Western Engineering Corporation Communications System Report	45
Appendix C -- King County Washington, Department of Public Safety Communications Master Plan	58

SECTION I. INTRODUCTION

The State of Washington Law and Justice Planning Office (LJPO) recently requested technical assistance from the U.S. Law Enforcement Assistance Administration (LEAA). The technical assistance requested was to help LJPO determine if the King County Department of Public Safety (DPS) was justified to make a "sole source" purchase of Motorola MX-300 series hand-held portable radios. These radios are capable of 8-frequency receive and 16-frequency transmit operation and no radio equipment manufacturer, other than Motorola C & F, markets such a product at this time.

DPS is seeking hand-held portable radios that will exactly duplicate the operating capabilities of UHF mobile radios that are installed in DPS vehicles. The mobile radios are capable of receiving on eight UHF frequencies and transmitting on 16 UHF frequencies. Eight of the transmit frequencies are approximately 5 MHz removed from the other eight transmit frequencies; thus, requiring "wide-spaced" transmitter capabilities.

LJPO personnel harbor a feeling that DPS is seeking greater operating capabilities in the portable radio equipment than is actually required. LJPO feels that sole source purchasing of the MX-300 series portable radios is an unnecessary "gold plating" of the system.

LJPO has retained the professional services of Pacific Western Engineering (PWE) to assist DPS in getting the entire DPS communications system operational. LJPO feels that, although technically competent, PWE does not have the expertise to adequately assess the DPS operational (Police) requirements to determine if a sole source procurement, of the portable radio equipment, is justified. Both LJPO and PWE representatives feel that PWE's effectiveness in assisting DPS install their entire radio communications system would be lessened if PWE became involved in the sole source procurement decision process.

As the first step in assessing the problem, the consultant met with the LJPO coordinator assigned to the King County DPS project -- Ms. M. Linda Chapman, and with PWE vice-president and consulting engineer -- Mr. James A. Goosman, P.E.

The LJPO and PWE representatives provided the consultant with copies of the DPS grant application (application no. 75-C-0144), DPS' communications master plan, correspondence seeking to justify the request for authorization to purchase the portable radio equipment on a sole source basis, the PWE prepared DPS system documentation, and a general verbal discussion about the DPS system operational requirements as understood by LJPO and PWE.

Meetings were then held with DPS personnel who are in command positions; who are involved with the LEAA funded project; and, who are responsible for the system design. The purpose of these meetings was to get a more detailed and accurate description of the King County DPS police operations, county geographic and topographic considerations, and the associated communications system requirements, plans and operations.

The DPS personnel met with included:

Lawrence G. Waldt, Sheriff --- Director
Donald R. Actor, Chief --- Patrol Division
Harold W. Booth, Chief --- Bureau of Staff Services
Lt. T. Allmen, Communications Officer
Lt. Nickle, Criminal Investigation Division
Sgt. C. Wilkie, Grant Project Director
Frank Porter, Jr., Communications Supervisor --- Engineer

The consultant also attempted to meet with representatives of the three major radio communications equipment manufacturers: General Electric Co., Motorola C & E, and Radio Corporation of America. He hoped that these people could give him further insight on the operational requirements of the King County DPS.

The industry representatives met with included:

Paul Bolerjack, General Electric Company
William Pratt, Motorola C & E, Inc.

The representative for Radio Corporation of America was not available to meet with the consultant.

SECTION II. UNDERSTANDING THE PROBLEM

The evaluation of DPS' alleged need for 16-channel transmit portable radios must be viewed in two parts: (a) within the constraints of the Patrol Manpower Utilization Study -- application no. 75-C-0144 (Appendix A), and; (b) within the broader constraints of the DPS operational requirements for the entire county.

Evaluation of parts (a) and (b) mentioned above is influenced by geographic and topographic characteristics of King County. Because of these influences, it is appropriate to briefly discuss the physical characteristics of the county, and the DPS communications system characteristics.

King County is approximately two thousand square miles in size. It is fairly heavily populated in the western portion of the county and becomes relatively sparsely populated as the county extends east of the Seattle metropolitan area.

Vashon Island is also located in King County. Although five DPS officers are assigned to Vashon Island, no further mention will be made of this portion of the county. This is because the officers on this island cannot readily respond to most DPS assignments on the mainland.

The county has a number of mountainous areas that are rather heavy in foliage; this tends to reduce the operating range of radio equipment operating in the UHF range. The mountainous nature of the area both helps and hinders radio communications -- particularly in the UHF frequency region that the DPS radio system is being developed in.

The UHF system design and features are adequately delineated in the reports titled: "An Introduction to the King County Department of Public Safety Radio System," prepared by Pacific Western Engineering Corporation (Appendix B), and "Communications Master Plan -- King County Department of Public Safety," prepared by Frank L. Porter, Jr., Communications Engineer (Appendix C). Both reports will often be referred to, but not repeated here.

Page 6 of Porter's DPS Communications Master Plan (Comm-Plan) lists the channels and frequencies that are being, or will be, used in the DPS system. Only the channels designated as County, East, Data, North, Southwest, Southeast, and Tac-1 will be discussed in the remainder of this report. All other channels are not capable of being operated, in conjunction with the above channels, with the type of portable radio equipment under discussion.

Page 15 of Porter's Comm-Plan shows how King County is divided into three precincts: North, Southeast, and Southwest. Each precinct has an operational communications system that is normally controlled through one of three dispatch consoles installed at the DPS communications center located at DPS' headquarters facilities.

In addition to the three operational systems mentioned above, an East radio system has been established for communications with DPS units operating in the Skykomish area -- at the East side of the North precinct.

The Tac-1 and County radio channels are to be capable of use throughout the county. Use of these channels -- particularly Tac-1 -- will be for special or localized communications needs. Use of these channels as intended will help keep communications on the primary operational channels from becoming disrupted when special communication needs arise.

The purpose of the Data channel is to provide a direct channel to a data terminal operator for information retrieval purposes. Use of this channel is restricted to data communications -- only voice now, voice and data later.

It is the contention of DPS officials that all portable radio equipment must be capable of operating on all of the seven two-frequency channels previously mentioned. The officials further contend that the portable radio equipment must be capable of transmitting on both of the frequencies associated with each channel; one frequency to be picked up at the fixed station receivers, located at mountaintop stations and other locations, and the other frequency to be picked up directly by the DPS vehicle or portable radios being operated in the area, as well as fixed-station receivers.

DPS officials justify this type of operation by citing several different types of instances that demonstrate why officers need to have all channel, 16-frequency transmit capability; mobile radio and portable radio.

Among the reasons cited by DPS officials are:

- (1) Units of the same precinct providing "back-up" to an officer out of his unit on an assignment.

DPS states that it is common for their units to begin to "drift" over into the general area of an officer who has been given an assignment. This is particularly true when the assignment is of a type where the probability that the officer on assignment may need assistance is quite high. Family fights, brawls, etc. are generally of this type.

As a rule, the back-up unit starts "drifting" over to the general area when he hears the radio dispatcher make the assignment. If he is in the general area, the back-up unit can probably communicate directly with the officer who is out of his unit, but is carrying a portable radio. In this instance, the ability to transmit from the portable radio on both precinct frequencies appears to be a valid requirement.

However, DPS personnel did not cite specific instances or numbers of times that an officer has been injured, or worse, because he did not have this communications capability. Nor did the DPS personnel provide information on how often the actual need to directly communicate from a portable to a back-up unit radio occurs.

- (2) Officers on assignment may be able to obtain back-up assistance from units in nearby precincts.

DPS officials indicate that an officer on an assignment will be able to obtain back-up assistance from officers working in adjacent precincts, when both officers are close to the precinct boundary.

It was explained that an officer working in an adjacent precinct will drift over towards the nearby area where an officer from the adjacent precinct has been assigned. In this manner, the officer on assignment is afforded back-up protection when units from his own precinct are not in the vicinity.

Presumably, the officer on assignment can switch his portable radio to operate on the adjacent precinct channel. Communications can then be achieved directly between the assignment and back-up officers.

Unexplained, however, is how the unit operating in the precinct adjacent to the assigned officer's area becomes aware that back-up assistance may be required. This type of awareness was possible when everyone operated on the same radio channel. With the precincts operating on separate radio channels, the "party line" type of operation, where everyone knows what is happening, is no longer possible.

When questioned about how often the inter-precinct type of back-up occurred, no one could provide an estimate or any data that would enable an estimate to be derived.

Also to be considered is the probability that a unit, operating in a precinct adjacent to the assignment area, would be within direct radio range of the limited transmit power of the portable radio. The limited range of the portable radio equipment would seem to preclude this type of communication -- even if the portable radio had the adjacent precinct frequencies installed.

- (3) Officer Training for using the radio system will be greatly simplified. Portable radios having control features similar to those of the vehicle radios will help the officer remember the equipments operational features and capabilities.

Portable radio equipment having similar operational capabilities as the vehicle radios will probably enhance the officer's ability to remember how to use the radio. This can be extremely important in times of urgency or emergency when the officer must act swiftly.

The degree of proficiency in the use of the portable radio would be a function of how often either radio -- the vehicle radio or the portable -- is used in the various modes. Intuitively, the radios will not normally be used in all of the many operating modes available. If this is true, the training advantage gained from uniformity might be more illusory than actual.

DPS's inability to demonstrate how often the officer would probably use the portable radio equipment, in the various modes available, makes it difficult to properly evaluate this statement.

- (4) With the 16-frequency transmit capability, the portable radios can be used at any location in the county. This will allow DPS to maintain a smaller number of spare portables.

The portable radios, equipped as described, could be used from any location in the county. DPS personnel did not supply any information indicating their policy regarding the ratio of spares to operating radio equipment they intend to maintain.

The total number of spare radios required would probably be about the same even if the portable radios had less than the 16-frequency transmit capability. This is because the portable radios will be checked-out from the precinct office at

the beginning of an officer's shift, and checked back in at the precinct office at the end of his shift. Presumably, spare portable radios would be maintained at the precinct office to replace malfunctioning equipment. It is hard to see where the total number of spare radios maintained at the precinct office would change much if 16-frequency transmit capability was available.

- (5) Manpower versatility will be enhanced because the officer can move from precinct to precinct without having to exchange portable radios.

As stated, the manpower versatility will be enhanced because the portable radio equipment can be used in all precincts. DPS representatives failed to give any information on how often the shifting of manpower, from one precinct to another, is likely to occur.

If officers are reassigned to other precincts quite regularly, this feature will be quite advantageous. On the other hand, if reassignment of the officers to other precincts is only done quite rarely, the advantage of having the 16-frequency transmit capability for this purpose will be relatively non-existent.

As explained by DPS representatives, the portable radios will be assigned to precincts. Equipment accountability will probably require that the portable radios be turned in at the precinct office where they were checked out. If this is so, the manpower versatility will probably not be affected too greatly if portable radios having less than 16-frequency transmit capability is used. The equipment accountability aspect was not discussed with DPS personnel, so this assumption is not verified.

DPS representatives could not provide any data that would give an indication on how often the movement of officers from one precinct to another takes place. This makes assessment of the manpower versatility feature extremely difficult. Proper assessment of this feature would require the development of data to give an indication of how often the shifting of manpower occurs.

In terms of manpower versatility, it is somewhat doubtful that more than a few officers will ever need to use their portable radios in the East radio system. Equipping all portable radios to be able to operate in the East radio system seems to be somewhat of an over-design.

Other suggestions were made, to justify the 16-frequency transmit portable radio, but the above mentioned points were the ones most often stressed. Unfortunately, DPS does not have information collected that supports the points mentioned above.

Quite often the statement was made, "The low transmit power output of the portable radios will prevent the officer from transmitting through a repeater station to the communications center. When this occurs, the patrol units only communication capability is to another patrol unit cruising in the area." This quite probably is valid in the western part of the county with the higher population and patrol densities, but appears to be less valid for those portions of the county that are somewhat sparsely populated, thus sparsely patrolled.

SECTION III. ANALYSIS OF THE PROBLEM

In analyzing the DPS request for the 16-frequency transmit capability in their portable radios, considerable emphasis is placed upon the fact that the county currently has seven 2-frequency UHF channels. This, DPS contends, means that a total of 14-frequency transmit capability is currently needed for the portable radio equipment. Expansion capability will then be available for one additional channel to be added at a later time. The seven channels have been identified in Sections I and II. In this section, each channel will be looked at with an attempt to determine the probability of need for the two-frequency transmit capability, and whether or not the channel should be installed in all portable radios.

Data Channel

This channel is designed to provide radio coverage in the western third of King County. The channel is used by DPS units to make data checks (i.e., vehicle registration, wanted persons, etc.) directly with an operator located in the DPS communications center data room. Communications on this channel is direct to the data terminal operator, thus bypassing the precinct dispatcher.

Because this channel is for the purpose of seeking and receiving data -- voice now, voice and digital later -- there is no apparent need for car-to-car, portable-to-portable, or portable-to-car communications on this channel. Only one-frequency transmit capability appears to be required for operation on this channel.

East Radio Channel

Use of the East radio channel is restricted to the Skykomish-Stevens Pass area of King County. DPS personnel indicate that, for the most part, no officers are on duty in this area.

Until recently, an officer would go into this area once a twice a week. Now, however, the incidence of patrol in this area has been increased; an officer now generally patrols this area on a daily basis. At times, more than one officer may routinely patrol the area at the same time.

DPS personnel indicated that portable-to-portable and portable-to-vehicle communications are required in the East radio system when officers are coordinating efforts to apprehend loggers illegally cutting timber.

At times, when the area is open to skiing, additional officers may routinely work in the area. The ability to communicate with each other by portable radio is desired. However, officer-to-officer communications through the portable or vehicle radios can generally be conducted through the repeater station for this type of communications.

The limited incidence of patrol in this area makes it somewhat dubious that all 40 of the portable radios being purchased in the LJPO grants must be equipped with this channel. Further, it is even questionable that all units operating in the North precinct must be equipped with portable radio equipment that is capable of operating on this channel.

Officers assigned to patrol in the East channel area could pick up portable equipment, capable of operating in the East system, prior to driving into the area on routine patrol duty.

Tac-1

This radio system is designed to provide radio coverage to most parts of King County. The channel is to be used mainly for tactical situations, i. e., responding to robbery alarms, crowd control situations, and similar events where communications between officers using portable and vehicle radio equipment is required, and where a dedicated (non-precinct) channel is desired.

It is probable that, outside of the precinct channels, this channel will be used more than any other channel, for operational purposes. There is a valid need for this channel to appear in both modes (transmit-direct and transmit-through-repeater) in all of the portable radio equipment. Outside of operations on the precinct channel, operations on the Tac-1 channel will probably occur more often than on any other channel.

Southwest System

The Southwest system is the primary operating system for that precinct. The requirement for portable radios with two-frequency transmit capability on this channel is a valid requirement.

The requirement to have the Southeast precinct and the North precinct radio channels available on portable radios operating on the Southwest precinct is somewhat questionable. Particularly, the validity of requiring North precinct channels in portable radio equipment operating in the Southwest precinct is questionable. The precinct map, shown on page 15 of Porter's Comm-Plan, indicates that there are no common boundaries between the

Southwest and the North precincts -- the City of Seattle is physically located between the two precincts.

Southeast Precinct

The availability of two-channel transmit capability in the Southeast precinct appears to be a valid requirement. It is questionable that portable radio equipment operating in this precinct must be capable of operating on the Southwest and North precinct (two-frequency transmit) channels. Inter-precinct communications can be handled on the County common or Tac-1 channels.

North Precinct

The two-frequency transmit capability is a valid requirement for portable radios operating in the North precinct. It is questionable that portable radios operating in the North precinct must also be capable of operating (two-frequency transmit) on the Southeast precinct. Even more questionable is the requirement that radio equipment operating in the North precinct also be capable of operating on the South precinct channels; this is because of the lack of a common boundary.

County Radio Channel

As described in Porter's Comm-Plan, the County common radio system is designed to provide radio coverage to the majority of King County. The channel is to be used mainly by detective units as well as other units that operate on a county-wide basis. It is also supposed to be used as a back-up or secondary channel for the three precinct operational channels. It appears that all portable radio equipment should be capable of operating on the County radio system on a two-frequency basis.

SECTION IV. CONCLUSIONS

In reviewing the DPS communications system plan, the consultant found it to be innovative and designed to meet existing as well as future DPS needs. In the consultant's opinion, however, the plan does not appear to support the need for portable radios capable of transmitting on sixteen frequencies. Subsequent discussions with DPS officials and representatives did not convince him that the 16-frequency transmit capability was required in the portable radio equipment.

When reviewing the portable radio channel requirements within the narrowly defined requirements of LJPO grant request no. 75-C-0144, the 16-frequency transmit requirement is not valid.

The grant application describes the area of operation to be four patrol districts in the shoreline area of unincorporated King County. More specifically, the project area is described as Adam-1, Adam-2, Adam-3, Adam-4, of precinct 2 -- the North precinct.

The project area is quite well-defined. The use of the portable radios in other parts of the county -- Eastern portion of the North precinct, Southeast precinct, or Southwest precinct -- are not within the scope of the grant application. However, the use of the County, Tac-1, and Data channels are within the geographic scope of the project. Two transmit frequencies are required for operation on the North precinct, County, and Tac-1 channels. A single-frequency transmit channel is required for operation in the Data radio system.

A total of seven transmit frequencies are required for portable radio operation consistent with the grant request. This can be accommodated with a portable radio that has an eight frequency and eight frequency transmit capability.

DPS officials point out that the life of the radio equipment will extend well past the life of the on-going project. The radio equipment will then be used in all parts of the county -- thus justifying the requirement for 16-frequency transmit capability.

DPS officials also point out that only 20 of the 40 radios are to be purchased in the Patrol Manpower Utilization Grant. They state that the remaining 20 radios do not have the same operational (geographical) constraints as the first 20 radios do. Thus, they state, the second 20 radios are well justified to be of the 16-frequency transmit type.

There is some merit to the DPS argument if it is determined that 16-frequency transmit capability is required on the portable radio equip-

ment not purchased in the Patrol Manpower Utilization Grant.

DPS officials also state that, in their opinion, they are being forced to purchase obsolete radio equipment if they must accept portable radio equipment that has less than the 16-frequency transmit capability. The obsolescence they describe will be one of an operational nature rather than of a technical nature.

Obsolescence, of the type described by the DPS officials, is a subjective matter based upon their belief of what they should have. Their belief on what they should have is based upon their knowledge of what type of communications equipment is presently available. Unfortunately, this type of equipment is only available from a single radio equipment manufacturer -- Motorola C & E.

There is little doubt that communications through-the-repeater and direct, is a desirable feature of any portable radio equipment purchased. An officer who is out of his vehicle, and requires help, is most likely to get the necessary assistance from another unit operating in the same precinct.

An officer assigned to an incident that would normally require a back-up will generally get that back-up from another unit working in the same precinct, who overhears the dispatcher make the assignment. The direct communications mode on the portable radio equipment is a valid requirement in this case.

Most of the incidences cited by DPS officials for the direct officer-to-officer, portable/portable or portable/vehicle communications requirements are of the type that can be accommodated on the precinct or on the Tac-1 channels.

DPS officials cite the need for all portable radios to have the capability of talking, through-the-repeater and direct, to another portable or vehicle radio on all precinct channels. They cite instances where a unit from one precinct can ease over into another precinct to back-up a unit that is on an assignment.

As previously discussed, what the DPS officials don't explain, is how the unit in one precinct knows when another unit in another precinct needs the back-up assistance. Presumably, in rare instances, the precinct radio dispatcher will assign a unit to go into an adjoining precinct to provide necessary assistance.

DPS officials were not able to provide any data on how often inter-precinct operations, of the type described are required. Intuitively, it is true that operations of this type can be beneficial, but no actual supporting

data was available to indicate how often events of this type are likely to happen. Consequently, the consultant is of the opinion that, although desirable, it is not necessary to have all precinct channels available on the portable radios.

The single largest appeal that would justify buying portable radio equipment with a 16-frequency transmit capability is that of uniformity. The officer would have a better knowledge of what channel to switch to in order to operate in any area of the county. Operation of all of the portable radio equipment would be the same as well as being quite similar to the operation of the mobile radio equipment installed in the DPS vehicles.

The logic of this appeal is well based. There is much to support this approach. However, the probability of the radios being operated (in the direct mode) on other than a few channels (Precinct, Tac-1, County common) appears to be relatively small. Because of this, there is not enough apparent benefit from the approach to justify the sole source procurement.

Another argument in favor of uniformity is the fact that DPS can maintain a minimum number of spare portable radios if all of their radios are capable of operation anywhere in the county. With the 16-frequency transmit capability, it will be possible to assign the portable radio equipment to any part of the county without having to worry about what channel the radios can operate on. This feature would presumably allow DPS to keep all of their officers supplied with portable radio equipment with a minimum number of spare radios.

From a logistics point of view, this argument has merit. However, the county does not have an adequate "down-time" or maintenance history, for this type of equipment, to justify a decision on this basis. The argument for uniformity, for this reason, does not justify the sole source procurement.

A review of criminal investigation division portable radio requirements show that they often have a need to communicate with regularly assigned precinct officers. The CID officers' portable radio requirements differ considerably from the somewhat orthodox requirements of the rest of the department. Other radio channels are generally used for the CID surveillance work. This means that different operating channels are required for the CID officers.

Each of the radio center dispatch consoles -- three precinct consoles and one master console -- has patching capabilities which permits officers operating on one radio channel to be patched through to communicate

with officers operating on other channels. This patching capability can enable the CID officers to communicate with precinct officers when it is necessary to do so. In addition, if direct communications is necessary for specific instances, the CID and precinct officers can use the Tac-1 or County common channel.

In conclusion, the consultant is of the opinion that DPS can adequately meet their portable radio needs with an 8-channel transmit portable radio that has wide-spaced transmit capability. Equipment with 16 channel transmit capability is certainly more desirable, but that is not sufficient justification for the sole source procurement.

DPS officials cited many instances that the 16-frequency transmit equipment would be required to protect life or dramatically increase effectiveness. However, the instances they cited were intuitive and not substantiated with back-up information.

In justifying a sole source procurement of 16 channel transmit equipment, more than intuition is required. It is necessary to note the probability that certain events will happen, i. e., how often must an officer move from one precinct into an adjoining precinct to provide back-up service; how often must an officer go into an adjacent precinct on other police business, and if so, could he equally as well operate on the County common channel. Even then, it is necessary to know how many of those times that the officer would have to use his portable radio equipment for communications in lieu of using his standard mobile radio. At the present time, DPS officials cannot provide this information or other similarly required documentation.

The consultant does not believe that a portable radio capable of 6 channel operation will meet the DPS requirements. He does, however, believe that the majority of the DPS requirements can be met with an 8-channel radio that has a transmitter capable of transmitting on frequencies that are separated by at least 5 MHz.

SECTION V. RECOMMENDATIONS

The consultant recommends that the King County Department of Public Safety be authorized to purchase portable radio equipment capable of operating on eight separate channels. He further recommends that they be authorized to purchase the eight channel portable radio equipment of the type that is capable of transmitting on UHF frequencies that can be separated by a minimum of 5 MHz.

APPENDICES

APPENDIX A

King County Washington, Department of Public Safety

Grant Application #75-C-0144

STATE OF WASHINGTON
 OFFICE OF COMMUNITY DEVELOPMENT
 INSURANCE BUILDING
 OLYMPIA, WA 98504
 (206) 753-2235

(FOR LJPO USE ONLY -- DO NOT FILL IN)

APPLICATION NUMBER 75-C-0144

PROGRAM AREA 75-SP-5

LJPO COORDINATOR CHAPMAN

APPLICATION IS HEREBY MADE FOR A GRANT
 AWARD IN THE AMOUNT AND FOR THE PURPOSES
 SET FORTH IN THIS APPLICATION.

1. PROJECT TITLE PATROL MANPOWER UTILIZATION STUDY 543

2. APPLICANT

KING COUNTY, WASHINGTON

3. PROJECT COORDINATOR FOR APPLICANT

N.A.

4. IMPLEMENTING AGENCY

King County Dept. of Public Safety
 Room 116 King County Courthouse
 Seattle, WA 98104

(206) 344-5262

5. PROJECT DIRECTOR FOR IMPLEMENTING AGENCY

Sergeant Richard C. Wilkie
 King County Dept. of Public Safety
 W-116 King County Courthouse
 Seattle, WA 98104

(206) 344-4275

6. FINANCIAL OFFICER

Hugh L. James, Comptroller
 653 County Administration Bldg.
 Seattle, WA 98104

(206) 344-7670

7. GRANT AMOUNT REQUESTED \$ 54,810

STATE BUY-IN \$ 3,047

APPROPRIATED FUNDS \$ 3,043

TOTAL PROJECT COST \$ 60,900

8. PROPOSED PROJECT PERIOD July 15, 1975 TO July 14, 1976

PROJECT WILL/WILL NOT REQUIRE LEAA SUPPORT FOR 0 ADDITIONAL YEARS.

NOTE: PLEASE READ INSTRUCTIONS CAREFULLY
 PRIOR TO PREPARING THIS APPLICATION.

The purpose of this grant application is to test the feasibility of programming noncommitted patrol time into more productive uses than traditional preventive patrol activity. Preventive patrol has historically been an operating principle of this and other police agencies; however, its value in reducing crime and apprehending criminals is not supported by recent analytical experiments. To improve management understanding of patrol time usage and activity, this project proposes to study the allocation of patrol time to various activities in a select area of unincorporated King County. Past estimates have suggested that as much as 50% of the Department's patrol time is noncommitted and thus potentially available for alternate, possibly more productive, uses.

An integral part of grant activity is the performance of time usage analyses to discern the relationship of committed to noncommitted patrol time. The purpose is to accurately reflect the potential for absorbing alternate patrol strategies into patrol unit work schedules. Also included are periodic analyses of the crime situation in the target area. The purpose is to appropriately assign patrol strategies which address particular crime problems and to establish realistic performance objectives for each strategy.

To properly implement alternative patrol strategies (crime scene investigation and followup case work, public education and saturation or strategic patrol) will require the purchase of portable radio units and various dictation equipment plus the contracting of limited clerical
 ...continued on Page 2(a) attached...

10. REGIONAL PLANNING COMMENTS This shall certify that the project has the approval of the King County Executive and King County Council. Three changes, two major and one minor, have been made since the initial preparation of the project plan and since the submission of a budget amendment to the State LJPO in November of 1974. The first relates to the "patrol manpower study" described on Page II-149 of the 1975 King County Law and Justice Plan. The Department has decided that the crime prioritization aspects of the study address certain patrol policy issues which could be more appropriately examined after completion of the patrol time expenditure analyses defined in this grant and certain sections of the study. We concur with the Department's decision to structure the project study in this manner.

...continued on Page 2(a) attached...

NAME AND ADDRESS OF AGENCY AND STAFF REPRESENTATIVE

Michael H. Wilkins
 Law and Justice Coordinator
 E-340 King County Courthouse
 Seattle, WA 98104

Michael H. Wilkins
 SIGNATURE _____

support. The target area consists of four patrol districts in the Shoreline area of unincorporated King County with a patrol force consisting of approximately 25 officers.

Any efficiencies realized in the use of the target area's patrol force ought to reflect an increasingly effective police service, both in terms of crime reduction and criminal apprehension. If this study sufficiently demonstrates that noncommitted patrol time can be rationally programmed for alternate uses, a significant redefinition of Departmental patrol concepts would be clearly mandated.

10. Regional Planning Comments (continued)

The second concerns the project's objectives and evaluation design as outlined on Page II-156 and pages II-158 through 163 of the King County Plan respectively. Because of the ongoing nature of the crime problem analyses element of the project, effectiveness and performance objectives will be set following the completion of the initial analysis (note element 13, Section D of the application) and modified according to future analyses and the patrol strategies used to address various crime problems. As stated in the plan, the original project evaluation was tentatively prepared in anticipation of changing project implementation conditions. The final evaluation methodology designed for the project study realistically models the methods to be used in the collection and evaluation of project data. We agree with the project director's conclusion that as study activities mature, the proposed evaluation model will assume major significance to sworn personnel in the target area.

A minor change in the grant budget as amended from the original project plan should be noted. Due to price increases in the cost of portable radio units, any budgeted expenditures for crime-scene kits or for training purposes have been deleted. The Department will assume responsibility for training sworn personnel in the target area and for providing any necessary crime-scene equipment.

The expenditure of LEAA funds will have occurred within the 12-month contract period; however, it should be noted that the project is designed for an 18-month period.

This office is highly supportive of the grant project and agrees that increased experimentation is needed in regard to present patrol practices.

- A. It is understood and agreed by the applicant that: (1) any allocation of grant made as a result of this application shall be subject to a Grant Award Contract; (2) funds allocated are to be expended only in accordance with the applicant's approved plan and budget; (3) appropriate records and accounts will be maintained and available for state and federal examination and audit; (4) funds awarded pursuant to this application will be used to supplement and not supplant local or state funds otherwise available for law enforcement programs (and, to the extent practical, will be used to increase such funds); and, (5) applicant will comply with all applicable provisions of the Omnibus Crime Control and Safe Streets Act, as amended, the rules and regulations of the Law Enforcement Assistance Administration of the United States Department of Justice and the Law and Justice Planning Office of the Washington Office of Community Development and the Law and Justice Planning Office Fiscal Manual. Applicant acknowledges having received a copy of the Law and Justice Planning Office Financial Guidelines.
- B. The applicant will comply with and will insure compliance with Title VI of the Civil Rights Act of 1964 and all requirements imposed by or pursuant to regulations of the Department of Justice (28 C.F.R. Part 42) issued pursuant to that title, to the end that no person shall, on the grounds of race, color, creed, sex or national origin, be excluded from participation in, be deprived of the benefits of, or be otherwise subjected to discrimination under any program or activity for which the applicant receives financial assistance from or through the Law Enforcement Assistance Administration or the State of Washington Law and Justice Planning Office.
- C. CERTIFICATION OF EQUAL EMPLOYMENT OPPORTUNITY PROGRAM.
- I, John D. Spellman (person signing the application) certify that the King County Department of Public Safety (implementing agency) has formulated an equal employment opportunity program in accordance with 28 C.F.R. 42.301, et seq., subpart E, and that it is on file in the office of James H. Shaw (name), W116, King County Courthouse, Seattle (address), 98104 Administrator, Personnel and Training Division (title), for review or audit by officials of the Office of Community Development or the Law Enforcement Assistance Administration, as required by relevant laws and regulations.
- D. NON-SUPPLANTING CERTIFICATION.
- I. The undersigned hereby certifies that the federal funds which are distributed under the grant will be used to supplement and not to supplant funds otherwise available for law enforcement activities in this jurisdiction.

For the annual period covered, are at least a percent as for the preceding year plus the average annual increase for the past 2, 3, 4 or 5 years. (Number of years is at the option of the grantee.) 21

The following must be completed FOR NON-FEDERAL FUND EXPENDITURES:*

a. Expenditure Certification

- | | | |
|-----|---|-------------------|
| (1) | Expenditures during immediately preceding calendar or fiscal year | \$ 19,178,029 (1) |
| (2) | Average annual increase for previous 2 3 4 5 years (circle number of years used) | \$1,990,882 (2) |
| (3) | Total of (1) and (2) | \$21,168,918 (3) |
| (4) | Total budget for present calendar or fiscal year (must be at least equal to the total on Line a(3)) | \$22,063,857 (4) |

3. Where the certification in paragraph 2 cannot be given and there is a reduced or unchanged investment in law enforcement, explain why the reduced or unchanged commitment would have been necessitated even if federal financial support under Title I had not been made available.

E. OFFICIAL AUTHORIZED TO SIGN:

NAME, TITLE AND ADDRESS

SIGNED

DATE SUBMITTED

Robert W. [Signature]
6/25/75

*General Revenue Sharing funds are characterized as non-federal funds for purposes of calculation to assure compliance with the non-supplanting provisions of the Crime Control Act.

12. BUDGET

A. SUMMARY (ENTER TOTALS FROM BUDGET PAGES 5A THRU 5F)

BUDGET CATEGORY

- (A) PERSONNEL COMPENSATION
- (B) CONSULTANTS
- (C) TRAVEL
- (D) EQUIPMENT
- (E) SUPPLIES AND OPERATING EXP
- (F) CONSTRUCTION
- TOTALS

APPROPRIATED FUNDS	STATE BUY-IN	TOTAL MATCH	GRANT REQUEST	TOTAL
918	919	1,837	16,525	18,362
2,110	2,112	4,222	38,006	42,228
15	16	31	279	310
3,043	3,047	6,090	54,810	60,900

12. BUDGET (CONTINUED)

B. BUDGET DETAILS

CATEGORY (A) PERSONNEL COMPENSATION					
EMPLOYEES (LIST EACH POSITION)	ANNUAL SALARY	APPROPRIATED FUNDS	STATE BUY-IN	GRANT REQUEST	TOTAL COST
Clerical Services		918	919	16,525	18,362
EMPLOYEE BENEFITS, FICA, ETC.					
TOTAL PERSONNEL COMPENSATION	X	918	919	16,525	18,362

JUSTIFICATION AND EXPLANATION:

The personnel compensation identified above reflects the amount of typing support necessary to effectively test alternate uses of patrol time. Because of the anticipated increase in the amount of case and miscellaneous report writing which patrol officers in the target area will generate by assuming other police-related responsibilities (follow-up case work; increased crime scene investigation); some provisions for relieving patrolmen from excess clerical work (and, in the process, possibly creating additional non-committed patrol time) are necessary.

Current estimates indicate that typing is required in three staggered, three-to-four hour periods a day or approximately 80 hours per week. Since it is more economical to budget the cost of typing services on an hourly basis, rather than budget the cost of full-time clerical positions, two options are being explored by project staff. The first would hire a complement of typists for part-time employment. The second would contract with a private secretarial firm for needed services. The State LJPO will be notified of the option selected.

The budget is calculated at \$4.17 per hour, with 5.85% of the total included as OASI.

CATEGORY (8) CONSULTANTS					
CONSULTANTS (LIST BY INDIVIDUAL OR TYPE)	RATE PER DAY	APPROPRIATED FUNDS	STATE BUY-IN	GRANT REQUEST	TOTAL COST
Not Applicable					
TOTAL CONSULTANTS	X				

JUSTIFICATION AND EXPLANATION:

B. BUDGET DETAILS

CATEGORY (C) TRAVEL AND SUBSISTENCE.				
TRAVEL (ITEMIZE TRANSPORTATION AND SUBSISTENCE BY MAJOR TRIPS OR TYPES OF TRAVEL)	APPROPRIATED FUNDS	STATE BUY-III	GRANT REQUEST	TOTAL COST
Not Applicable				
TOTAL TRAVEL				

JUSTIFICATION AND EXPLANATION:

N.A.

12. BUDGET (CONTINUED)

B. BUDGET DETAILS

26

CATEGORY (D) EQUIPMENT				
EQUIPMENT (ITEMIZE ANY MAJOR PURCHASE OR LEASE)	APPRO- PRIATED FUNDS	STATE BUY-IN	GRANT REQUEST	TOTAL COST
Dictation Equipment	132	133	2,388	2,653
Telephone Equipment	12	13	225	250
Electric Typewriter	26	26	473	525
Portable Radio Units	1,940	1,940	34,920	38,800
TOTAL EQUIPMENT	2,110	2,112	38,006	42,228

JUSTIFICATION AND EXPLANATION:

The justification for the first three items is defined in the comments contained on page 5a. The dollars budgeted are best estimates based on current market prices.

The dictation equipment is best explained in two parts. The first, a cassette dictation recorder, coupled to a telephone line, will be used to record incoming case report information of patrol officers operating in the target area. The second, a transcribing station, will be used for the purpose of "playing-back" recorded dictation for typing. Both the telephone line and the linking device to the dictation recorder will be leased. An electric typewriter will also be purchased for use by clerical staff in transcribing dictated reports. The experience of other police departments suggests that to record case report information on a phone recorder system for transcription by a typist is the most efficient method of eliminating time-consuming case report writing.

The bulk of the grant monies will be used to purchase a sufficient complement of portable radios to outfit patrol officers of the project's target area. The need for this equipment is defined in both section B and D of application narrative. Briefly, if patrolmen are to effectively perform police duties, an acceptable communication capability is of paramount concern to the management. Without the advantages of portable radio units, patrol officers are tied to radio-equipped patrol vehicles which limits flexibility in terms of any alternate task assignment. If patrolmen were to lose contact with Radio while performing police related duties, the risk to personal safety is increased as is response to emergency requests for service. Both are unacceptable, therefore the purchase of portable radio units is clearly mandatory. The radio frequency of the portables will be compatible with the Department's new radio system. The budget dollars for this item are anticipated to be sufficient to purchase approximately twenty units, depending on the results of the contract bidding process.

B. BUDGET DETAILS

CATEGORY (E) SUPPLIES AND OPERATING EXPENSES				
SUPPLIES AND OPERATING EXPENSES (ITEMIZE BY CATEGORY)	APPRO- PRIATED FUNDS	STATE BUY-IN	GRANT REQUEST	TOTAL COST
Pay phone reimbursement	-15	-16	279	310
TOTAL SUPPLIES AND OPERATING EXPENSES	-15	16	279	310

JUSTIFICATION AND EXPLANATION:

Dollars budgeted in this category will reimburse patrol officers of the target area for expenses incurred in cases where a pay telephone is used to dictate report information.

CATEGORY (F) CONSTRUCTION				
CONSTRUCTION EXPENSES (ITEMIZE BY CATEGORY)	APPRO- PRIATED FUNDS	STATE BUY-IN	GRANT REQUEST	TOTAL COST
Not applicable				
TOTAL SUPPLIES AND OPERATING EXPENSES				

JUSTIFICATION AND EXPLANATION:

Construction expenses and costs of remodeling (when in excess of \$5,000 for the project) must be included in the appropriate budget categories and summarized on this page.

The uniformed patrol operation has the largest single budget in the King County Department of Public Safety, representing over 40% of the total departmental budget in 1974 and 45% in 1975. Historically this expenditure has been justified on the assumption that the existence of patrolmen on the streets serves three generally accepted public purposes: (1) the provision of a crime deterrence and criminal apprehension capability; (2) the provision of certain social and order-maintenance services traditionally delivered by the police; and (3) the maintenance of police officers in a reasonably small geographical area to respond to emergency requests for service. Determining which or what combination of these purposes justifies any particular level of commitment to patrol requires an independent examination of each in terms of patrol effectiveness and efficiency.

Until the completion of the Kansas City "proactive-reactive" patrol deployment experiment, there was a glaring lack of analytical or experimental research which measured the contribution of uniformed patrol to the reduction of crime and the arrest of criminals. Decisions concerning patrol manpower were not being sufficiently influenced by such factors as the impact of uniformed patrol upon crime or the point where additions to patrol result in diminishing marginal returns, but were instead dependent almost solely on the subjective opinions of police administrators. The King County Department of Public Safety currently plans the allocation of police manpower to uniformed patrol on the basis of input measures, i.e., numbers of patrolmen on the street, amount of reported crime in a specific patrol district, geographical and population characteristics of the County, etc. This method of planning, while necessary, is inadequate unless combined with an analysis of the effect of these inputs on the output measures (impact of patrol on crime rate, on-scene apprehensions, etc.) of patrol effectiveness.

The best analytical work to date on certain aspects of patrol effectiveness, the Kansas City study, has not supported traditional views about preventive patrol's crime deterrence and criminal apprehension capability. Until the total study is received, however, and analyzed by our Department as well as others, we will withhold final judgment on the merits of the study's conclusions. If the results of the study have been derived from a logically consistent experimental research design (as would appear from the summary report), there would be sufficient justification to reevaluate the concept of preventive uniformed patrol in King County.

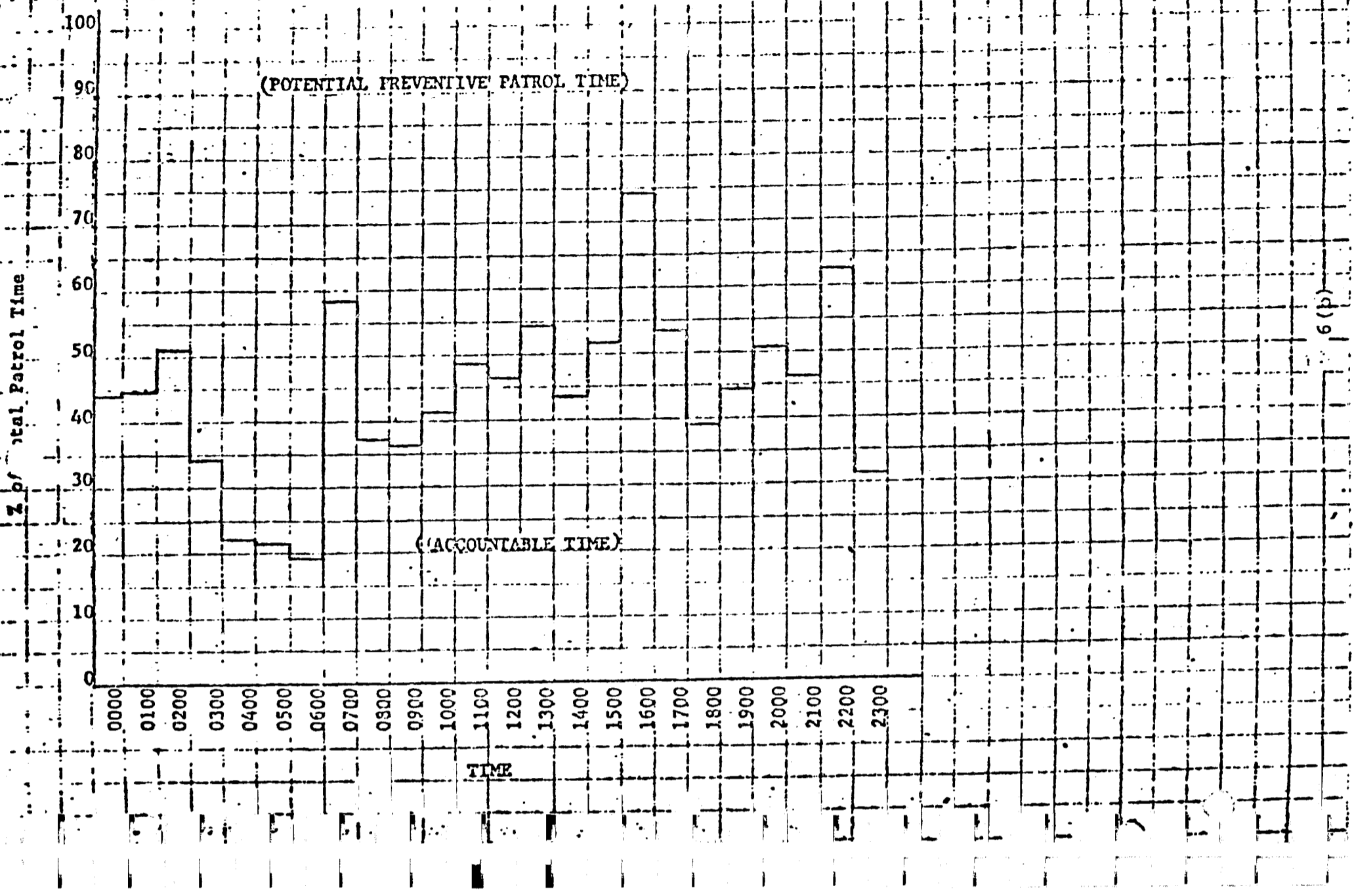
In the first quarter of 1974, the Department of Public Safety collected and analyzed response time data from October 1973 for the purpose of determining patrol manpower allocation and scheduling. After reviewing the conclusions of the Kansas City study summary, these data were also used, along with information on total patrol manhours gathered from precinct rosters, to estimate the amount of available preventive patrol time for this period. The Department was able to account for an average of approximately 47% of total available patrol time. This percentage includes time spent responding to calls, travel to and from patrol districts, lunch, coffee breaks, and roll-call. Case and miscellaneous report writing is not included, nor are routine

traffic violations or any nonreported on-view incidents. After making an allowance for these factors, the upper limit for nonaccountable (potential preventive patrol) time would be less than 53% and the lower limit for accountable patrol time would be in excess of 47%. The attached graphs identify accountable and nonaccountable patrol time as a percentage of total available patrol time including the number of requests for service and the number of police units available to respond to these requests. Since this analysis was conducted in the last quarter of 1973, it is possible that with increasing requests for police service the amount of noncommitted patrol time now available has been reduced from these estimates. The conclusion remains, however, that a certain amount of time is being expended on preventive patrol when better uses of this time probably exist.

6(a)

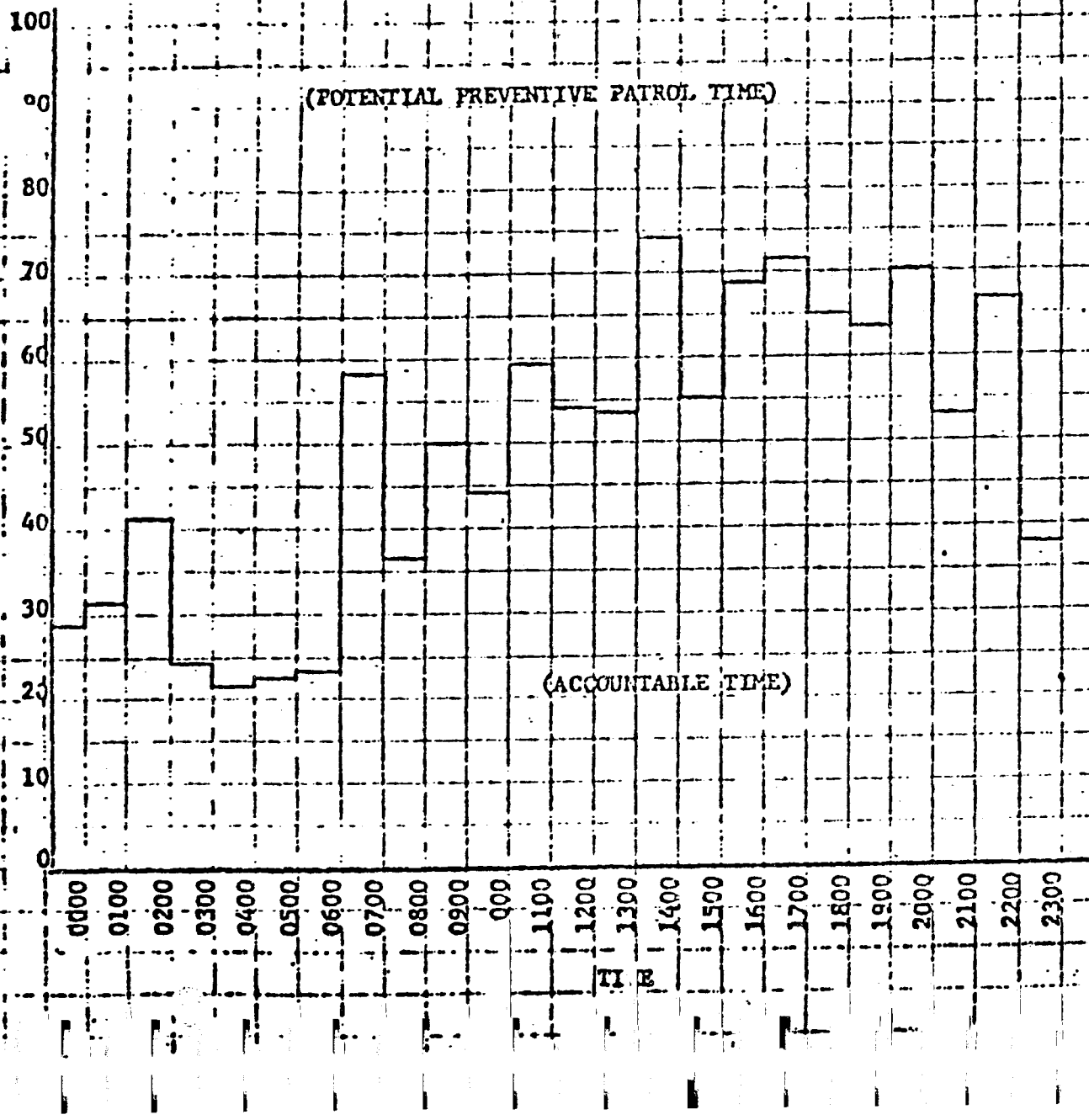
PRECINCT 2: Accountable Time as a Percentage
of Total Available Patrol Time
(October 1-28, 1973)

81

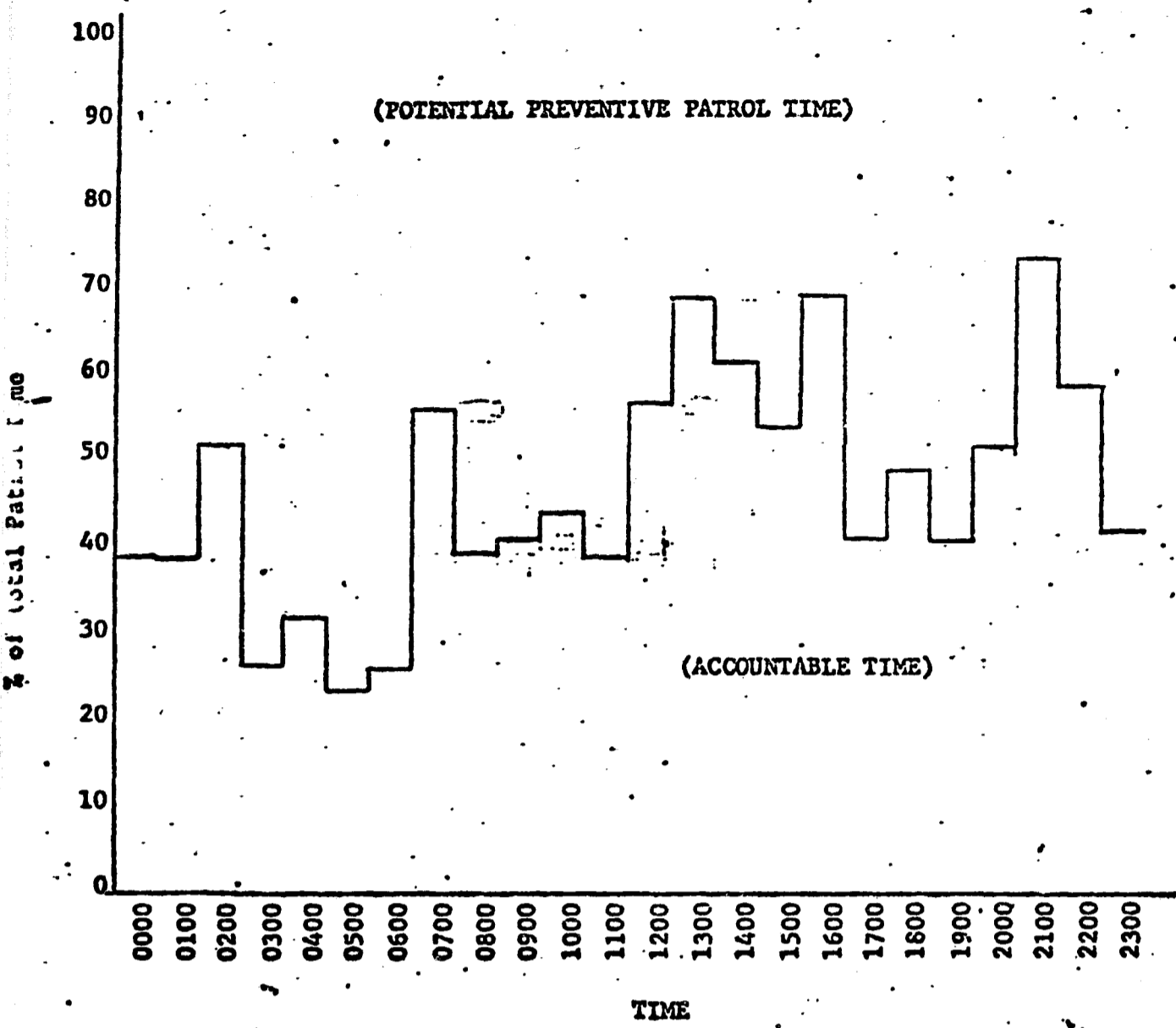


6 (b)

PRECINCT 3: Accountable Work as a Percentage
of Total Available Patrol Time
(October 1-28, 1973)



PRECINCT 4: Accountable Work as a Percentage
of Total Available Patrol Time
(October 1-28, 1973)



The most appropriate problem statement contained in the 1975 Washington State Plan for Law Enforcement and the Administration of Justice that would relate to the proposed project concerns Police Services Problem Statement I, "Current methods of dealing with specific crime problems are ineffective."

For the purpose of this particular project, however, certain qualifications to the statement are required. Police management in King County has always sought ways of improving the uses of patrol personnel. Implicit in these efforts is the notion that if better methods do exist then they should be tested and implemented, if proved successful. This does not imply, however, that existing uses of patrol personnel are totally ineffective and therefore unnecessary. As stated previously, police officers are maintained in a small geographic area in order to respond efficiently to emergency requests for police service. If the Kansas City experiment is universally applicable to all local police agencies, thus discounting the generally accepted value of preventive patrol, and if a patrolman's work schedule does not permit the assignment of added duties (as might be proven by the study), then perhaps the responsibility of government to provide this emergency police response capability is the sole reason for operating uniformed patrol units. If this is the case effectiveness would be a measure of whether patrol officers arrive at the scene of a police incident in sufficient time to effect a change in the outcome of a situation requiring emergency police response. This, however, is beyond the scope of the proposed study. To be tested is not the effectiveness of patrol response to emergencies but rather the feasibility of translating patrol time formerly spent engaged in preventive patrol activities into more productive police functions. Since no study exists on the effectiveness of patrol response to emergencies in King County, for our purposes the problem statement would best read, "some methods used by patrol are ineffective in dealing with specific crime problems." Whether better methods exist is problematical, until the conclusion of the project study.

Under the Washington State Plan, this project falls into Program Area SP-5, "Studies, Action Research and Evaluation." With respect to Goal 3-a of this program area ("To assist officials in making rational decisions based on empirical information") elected officials and police administrators of King County have indicated a desire to test various methods of improving the utilization of uniform patrol personnel. In a period of increased costs to operate local government and competing demands for a limited amount of local resources, these officials are committed to a search for better methods of providing local governmental services. (See attached memorandum.) For these reasons, this study is but one of a series of projects being conducted in the Department of Public Safety to increase efficiency and improve the quality of police service being provided by King County. By gathering empirical data on the time expended by patrol officers on various police activities, police management of King County should be furnished with sufficient information on which to base decisions on the feasibility of increasing the assignment of responsibilities previously held by other units of the Department.

The objective of this project is consistent with Objective 4-E of Program Area SP-5, "To evaluate the effectiveness of existing criminal justice system and techniques in reducing crime and recidivism." By analyzing the work programs of uniformed patrol personnel, identifying areas in their work programs which might be used more productively and by developing alternative programs of more utility for the uniform patrol operation (such as increasing the investigation of crime scenes, assigning more responsibility for case investigation, creating more opportunity for uniform patrol activity in the area of community crime prevention) some impact is anticipated on the reduction of crime and the apprehension of criminals. This study proposes to measure that impact, provided that the work programs of uniformed patrolmen have the capacity to absorb added responsibilities.

B. Crime/System Impact:

Raw data collected and analyzed as justification for the project suggests that something less than 53% of a typical patrolman's work schedule is being expended randomly patrolling for purposes of crime prevention or deterrence. What the data fails to indicate is the frequency, scope, and time of random patrol occurring during various shift periods when patrolmen are not responding to emergency requests for service. To eliminate these unknowns the project first proposes to examine these factors and derive some conclusions on which alternative "manpower utilization" strategy might be most feasibly implemented. The current strategies under consideration include increased crime scene investigation, responsibility for case followup investigations, and added duties in the area of community crime prevention. Upon completion of the time expenditure analysis, anticipated to occupy about three months of project time, some or all of the above strategies are expected to congeal into specific program activities, developed by project staff and project area sworn officers and implemented in the target area. Each of the program strategies will have varying impacts on crime and the apprehension of criminals.

The success or failure of the project may be reflected in changes in the crime and arrest rates for the project, in community satisfaction with police service provided, quality of offense reporting, and crime-scene investigation. Because of the difficulties in measuring these factors, project impact on crime and arrest rates will be the primary criteria for evaluation. As discussed later in the application, to suggest the degree of impact would be premature at this time.

Systems improvements generated by the project are more easily definable. The patrol force of the King County Department of Public Safety cannot be effectively utilized while tied to patrol vehicles. An officer loses contact with Communications once he leaves his radio-equipped vehicle, and, as a result, is not available to respond to details of a higher priority. Consequently, an officer leaves his vehicle only when necessary, which experience has shown to be quite frequently. While management is reluctant to instruct officers to separate themselves from radio communications during patrol activities to perform police-related duties, management believes that many times situations require that this be done. The practice has many risks,

however, including endangering the personal safety of the officer and diminishing opportunities for quicker response to emergency calls. To eliminate these negative features about King County's patrol operation, this, as well as a proposed 1976 grant, will furnish a sufficient complement of portable radios for equipping on-duty patrol officers with adequate communications capability.

C. Supporting Resources

(1) Qualifications and facilities of applicant. King County, the applicant for this grant, is the largest county in terms of population in the State of Washington. County government employs nearly 4,000 persons in a wide variety of occupations and with a wide variety of skills. The County has facilities adequate to meet its needs and possesses considerable specialized equipment. King County government has served residents within its boundaries for well over 100 years.

(2) Staff and organization.

(a) This project will operate in the Shoreline precinct of the Division of Patrol, which is a major division of the King County Department of Public Safety. Staff for the project are dispersed in divergent areas of County government; all, however, have special interest in the project and particular expertise to lend to its operation.

Sergeant Richard C. Wilkie, Project Director, has served seven years in the Department of Public Safety and has broad experience in Departmental operations with duty assignments in patrol, jail, communications, and most recently Research and Development. Holder of a Master's Degree in Public Administration from the University of Washington, Sergeant Wilkie is exceptionally well-qualified to administer the day-to-day operation of project activities.

Dennis B. Applegate, Budget Analyst for the Department of Public Safety and a member of the King County Law and Justice Planning Office, will continue to provide staff support to the project director in a variety of key program areas including conceptual design, data analysis, and evaluation of project results. Mr. Applegate has been employed two years in the King County Department of Budget and Program Planning and possesses a Master's Degree in Public Administration from the University of Washington.

Mary Ann McLaughlin, Planner/Analyst in the Research and Development Division of the King County Department of Public Safety, will provide technical assistance, as required, in project design, implementation and evaluation. Ms. McLaughlin has been employed two years in the Department and is a holder of a Master's Degree in Business Administration from the University of Washington.

(b) Lines of reporting authority for staff are bifurcated according to Department. Sergeant Wilkie and Ms. McLaughlin will report to D. R. Actor, Chief, Bureau of Patrol and Enforcement, and H. W. Booth, Chief, Bureau of Staff Services respectively, who, in turn, report to Lawrence G. Waldt, Sheriff-Director, King County Department of Public Safety. Mr. Applegate will report to M. H. Wilkins, Coordinator, King County Law and Justice Planning Office, and W. P. Moyer, Manager, Program Budgets Division, King County Department of Budget and Program Planning, who, in turn, report to John P. Lynch, Director, King County Department of Budget and Program Planning. Both Sheriff Waldt and Mr. Lynch report to King County Executive, John D. Spellman.

Ultimate responsibility for decisions about project conclusions rest with the Executive.

(3) Cooperating and Participating Agencies. While this project most directly involves the Patrol Division of the Department of Public Safety, other divisions within the Department will closely relate to project activities, including Communications, Research and Development, and Criminal Investigation. The Program Budgets Division of the King County Department of Budget and Program Planning and the King County Law and Justice Planning Office will also be directly concerned with project operations. The Washington State Law and Justice Planning Office is a cooperating agency.

D. Project Operation - Phasing of Tasks/Objectives/Goals

(1) Tasks:

The following outlines project tasks and an expected time frame for their operation and completion:

Tasks	Month																	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A. Gather time expenditure data in target area	_____																	
B. Order portable radios & dictation equipment; contract for typing services	_____																	
C. Analyze time expenditure data	_____																	
D. Crime research in target area; identification of specific crime problems to be addressed by alternative patrol strategies	_____																	
E. Program non-committed patrol time into the following strategies: 1) Intensified crime scene investigation; 2) Assignments of follow-up case work; 3) Public education assignments; 4) Saturation or strategic patrol duty.	_____																	
F. Collection and evaluation of project data.	_____																	
G. Write-up of evaluation report.	_____																	

Task A

Four contiguous patrol districts in the Shoreline area (an unincorporated area of King County, located north of Seattle) have been selected to serve as the project's target area. While it is a fairly safe assumption, as indicated by the data presented in the "Rationale" section of this application, that a certain amount of patrol time is being expended on preventive patrol in the target area, the scope, frequency, and time of occurrence during various patrol shifts is unclear. In order for the assignment of additional police responsibilities to easily dovetail into patrol time formerly spent randomly patrolling, a more detailed analysis of how patrol time is being utilized in the proposed target area is required.

During the first two months of the project, data on the use of patrol time in the target area will be collected and analyzed in two different ways.

In the first, a sampling procedure will be employed which may be described as taking a snapshot of patrol activity at random times. This technique has been applied to a variety of work measurement situations, and is particularly useful where job activities are widely varied and random in nature. The percentage of time that officers engage in a particular type of activity will correspond to the frequency with which they are observed in that activity, provided, of course, that a sufficiently large number of observations is made. The "observations" will rely on self-reporting in order to obtain the necessary volume of data at reasonable cost and in a timely manner. Data will be collected by hour of the day and by category of activity, with the categories to be defined by the project director and representatives of the patrol officers involved in the project.

The distribution of lengths of time for certain categories of activity is also of interest. For example, development of alternative strategies for use of preventive patrol time will depend not only on the amount of time available, but also on the manner in which it is likely to occur. The lengths of the time intervals could be determined by measuring a sample of intervals from start to finish, or, because of their random nature, they can be determined by beginning at any random point after they have started and measuring the time to completion. Both methods will give the same average length for a large number of samples. We will make use of the randomness property in this part of the study, by having the officer indicate not only what activity he is engaged in, but also the length of time to complete the activity (or if it is preventive patrol time, the length of time until the next call).

The second method is more detailed but probably less accurate than the first. Patrol officers are now required to maintain a log of major activities during the course of a duty shift. For project purposes, this practice will be refined to encompass all patrol time expenditures, including tasks which often go unreported such as case

report writing, traffic stops, and certain on-view incidents. A random sample of logs from the target area will be selected for a one-month period and analyzed according to patrol activity.

As currently designed, this method will place heavy reliance on the ability of patrol officers to precisely record time spent on a wide variety of patrol functions. In this respect the first technique is thought to be more sound, since patrolmen will be responsible for reporting only a fraction of their work program rather than their entire schedule of activities. To the extent that patrolmen are able to accurately document time spent on various activities throughout a complete shift, this technique ought to confirm the validity of the "snapshot" method and so establish its reliability for future studies. If disagreements are found in the conclusions drawn from each of the two methods, the method of implementation designed for the two techniques will be refined and a second study conducted. It is also possible that a flaw might be discovered in one of the methods and that method discarded and the results of the other accepted. In any event it is essential to the success of the experiment that confidence in conclusions about the extent of usable patrol time available for other police activities be established prior to the assignment of any alternative tasks.

Task B

This task will involve the purchase of equipment and services necessary to successfully conduct the study.

To permit patrol officers in the target area the ability to perform police duties away from their radio-equipped vehicles and still provide emergency response to service requests, requires equipping the patrol force in the target area with portable radio units. Therefore, a sufficient amount of project funds have been budgeted to purchase a complement of portable radio units that will provide this capability.

A limited amount of dictation equipment has also been proposed for purchase in order to further experiment with patrol time usage and activity. This equipment will be used to test the practicality of transferring responsibility for preparing a primary case report in final form from patrol officers to clerical staff. If it is feasible operationally to conduct patrol case report-writing in this manner and sufficient patrol time is released for alternative police tasks, then the activity of dictating case reports would have implications for the uniformed patrol operation countywide. Typing services will either be contracted with a private vendor or clerk/typists hired on a parttime basis. Current estimates call for approximately 80 hours of required typing capacity per week.

Task C

This task will consist of a detailed analysis of the patrol time usage data collected at the outset of the project period (Task A).

The purpose is to develop a better understanding of the relationship of committed to noncommitted patrol time. The tentative conclusions reached from previous analyses indicate that there may be some capacity in the existing work schedules of patrolmen to absorb certain alternative assignments. The results of this study element should more accurately reflect the extent of time available for other police-related task assignments.

Task D

Any alternate patrol concept considered for implementation will be predicated on two factors. The first will be the conclusions derived from the time usage and patrol activity analysis described in Tasks "A and C." The second factor is dependent on the first and will involve defining and analyzing crime problems in the target area during hours where noncommitted patrol time exists. Problem analyses, to be conducted by project staff and sworn supervisory personnel assigned to the project, should result in an identification of specific police problems requiring particular types of patrol attention. The Department's crime reporting system, officer patrol logs and the judgments of uniformed patrol officers, will all serve as contributing factors to the problem analyses. Periodic reviews of the relationship of noncommitted patrol time to the crime problems of the target area will be conducted by project staff. The purpose is to adjust alternate patrol strategies to changing crime conditions in the target area.

Task E

The purpose of this task is to qualitatively set certain patrol objectives in the target area based on the patrol time allocation and crime problem studies discussed previously. The consideration of patrol time usage relative to the crime situation in the target area coupled with an articulation of what patrol management wishes to achieve in the delivery of patrol services which address definitive crime problems ought to suggest a need to implement certain patrol strategies. If, for example, analysis indicates that a substantial number of residential burglaries are occurring during the early morning hours in a particular section of a district in the target area, varying patrol strategies will likely be assigned to different duty shifts in order to accomplish different sets of service objectives. Saturation patrol might be employed by the morning shift between the hours of 6:00 a.m. and 8:00 a.m. for the dual purpose of providing a sense of security to the community and of attempting to apprehend suspects in the process of crime commission. If the afternoon shift is taking the primary case reports on burglary offenses which occur during the early morning time periods, then responsibility for crime case investigation and other followup details might be assigned to appropriate patrol units. The objective would be to investigate cases to the point where either a suspect(s) is apprehended or a method of criminal operation is discovered that is consistent with other burglary offenses in the target area. Some investigations might also be carried to a point where further

investigation would be inconsequential; where neither a mode of operation is identified nor a suspect arrested. These cases would then be transferred to the Criminal Investigation Division for further work, if any is required. The night shift in turn might be assigned responsibility for conducting public education meetings with burglary victims and concerned citizens in problem sections of the target area. The objective would be to reduce the opportunities for a burglary commission through some combination of block watch, home security inspections, or property identification activity.

In this example, the use of the three strategies of saturation patrol crime scene and followup case work, and public education is predicated on the existence of available, noncommitted patrol time. If the duty schedules of patrolmen in the target area are able to absorb the programming of added patrol strategies, increases in patrol output ought to be achieved through improvements in the allocation of patrol time.

Task F

The content of the project's evaluation is contained in Section E.

Task G

The content of the project's evaluation is contained in Section E.

(2) Objectives: The objectives for this project are best delineated in two major areas.

The first relates to efficiency or output objectives which define the improvements realized in the use of patrol time in the target area. These improvements would reflect the extent to which non-committed patrol time has been allocated to specific program strategies. Since raw data on patrol usage accumulated prior to the study suggests that about 50% of patrol time is unaccountable, a programming of a like amount of patrol time in the target area would be the ideal.

A commitment to this figure is unrealistic, however, since some patrol time considered unaccountable is probably unusable for alternate patrol purposes. Because of this problem, the study's primary objective will not be to indiscriminately assign added duties to patrol units but rather to examine the feasibility of using alternate patrol strategies during periods of patrol activity in the target area reduced, through analysis, to noncommitted status.

Indicative of improvements in the allocation of patrol time is the number of patrol hours programmed for alternate patrol duties, the additional types of patrol responsibilities performed, and the results of this performance. Basic indicators of output for the strategies now under consideration include numbers of cases investigated and cleared by patrol personnel in the target area during the project period, numbers of community meetings conducted and numbers of specialized patrols performed. To attach specific objectives, other than qualitative, to project output indicators at this time is

meaningless for the following reason. Crime and patrol time analyses are integral parts of grant activity and will be conducted periodically through the duration of the project to assure a proper match of noncommitted patrol time vis-a-vis crime problems in the target area. To set quantitative objectives in the absence of this part of the study, particularly because of its continuing nature, is premature. Due to changes in crime conditions and patrol time allocation, this project will probably never be amenable to the establishment of output objectives, which are other than qualitative, without first coupling crime analysis to noncommitted patrol time experience.

The second objective relates to effectiveness and is generally defined for project purposes as reductions in specific crimes and increases in the apprehension of criminals committing these crimes. As was stated above, crime problem analyses have not been conducted because of their inclusion in the study as a continuing effort, thus specific crimes have not been identified as requiring special patrol attention and will not be until the project is initiated. Thereafter, crimes being addressed by various patrol strategies will be changed periodically as different crime patterns develop and different patrol time allocations occur.

An objective for reducing the occurrence of a crime(s) will be set after the identification of a crime problem and prior to the use of a particular patrol strategy(ies). In addition, specific output expected from the implementation of a patrol strategy(ies) will be set by sworn supervisory personnel assigned to the target area. This will serve as a performance objective for patrol officers in the target area until that problem is abated and another is identified. Careful records will be maintained on which objectives are established during specific periods of the project; the strategies employed to suppress specific crimes and the results of this effort. Section E (Evaluation) contains additional information on recordkeeping as well as other matters.

GOALS

The goal of this project is to demonstrate to the police administration of King County the feasibility of programming relatively noncommitted patrol time into alternate uses. This should be achieved by project termination.

The long-term goal of the project is to translate any improvements realized in the allocation of patrol time into reductions in the incidence of crime and increases in the apprehension of criminals throughout unincorporated King County.

E: Evaluation

1. Data Base: As has been indicated throughout this writeup, the reason for experimenting with unaccountable patrol time is to determine if improved uses are feasible. For evaluation purposes, any

CONTINUED

1 OF 2

reasonable structuring of noncommitted patrol activity should, by definition, produce certain improvements in patrol output. To determine what productivity increases are occurring, careful records will be maintained on the use of the following alternate patrol strategies:

a. Public Education Program:

- number of citizens contacted during the operation of the program, delineated by program activity: neighborhood block watches, property security inspections, property identification.
- number of property crime victims contacted and advised about measures to prevent crimes against home or property.
- number of neighborhood block watches formed and number of citizens participating in each for the purpose of increasing the likelihood of a witness to a property crime.
- number of citizens using property marking tools and decals in order to deter a crime or to make the recovery of stolen property less difficult.

All of the above are output indicators of police activity directed at the property crimes of residential burglary and larceny. If, for example, the crimes of rape or assault are selected for a strategy of public education, similar types of detailed information will be maintained.

b. Crime Scene Investigation and Followup Case Work:

- number of crime scenes in which latent fingerprints are lifted and extensive analysis of the scenes are conducted, including a development by patrol of information about other areas of investigation for use by detectives (if case is not assigned to patrol force of target area).
- number and type of cases assigned to patrol personnel in the target area for investigative followup work.

c. Saturation or Strategic Patrol:

- number of specific types of patrols conducted in the target area for the purpose of suppressing a particular crime through deterrence or criminal apprehension.

Included as a part of data collection will be a process designed to record: (1) the results of periodic patrol time expenditure analyses and (2) the specific patrol activities assigned during patrol time periods identified as relatively noncommitted.

2. Purpose/Use:

A sample form to be used in assuring accurate and continuous reports of all noncommitted patrol time converted into alternate patrol strategy usage is displayed below:

APPENDIX B

Pacific Western Engineering Corporation

Communications System Report

AN INTRODUCTION
TO THE
KING COUNTY DEPARTMENT OF PUBLIC SAFETY
RADIO SYSTEM

PACIFIC WESTERN ENGINEERING CORPORATION

13240 Northrup Way
Bellevue, Washington 98005

Telephone: (206) 746-3110

April 20, 1976

It was in the 1920's that police departments first recognized the value of radio communications. Early systems consisted of a transmitter at headquarters and a radio receiver in each police car. This method was a "one-way" radio system since the cars were unable to acknowledge a message.

Later systems incorporated transmitters in the cars and receivers at headquarters to allow officers to call headquarters. This method is called "two way" radio and is illustrated in Figure 1a. "Two way" radio systems, which allow one car to communicate with another, are illustrated in Figure 1b. The "headquarters" radio is called a "base station" and the cars are "mobiles".

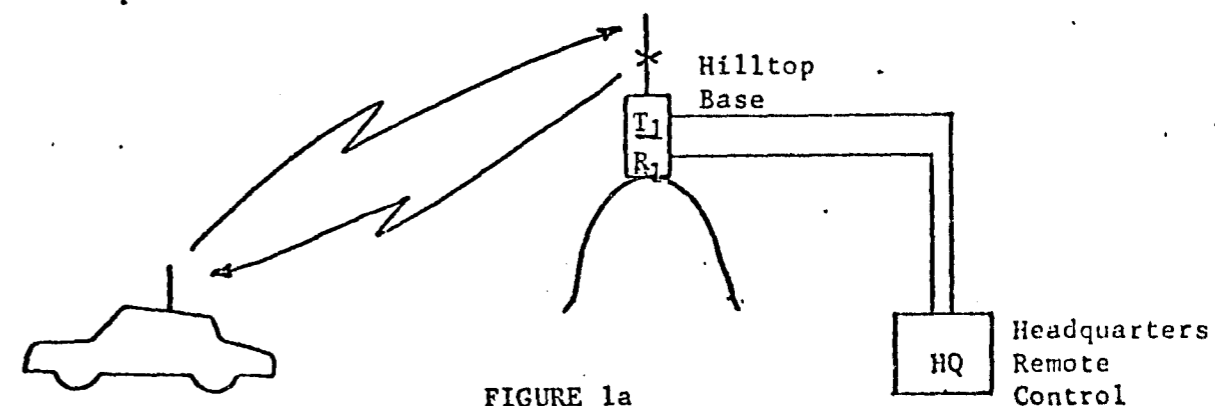


FIGURE 1a

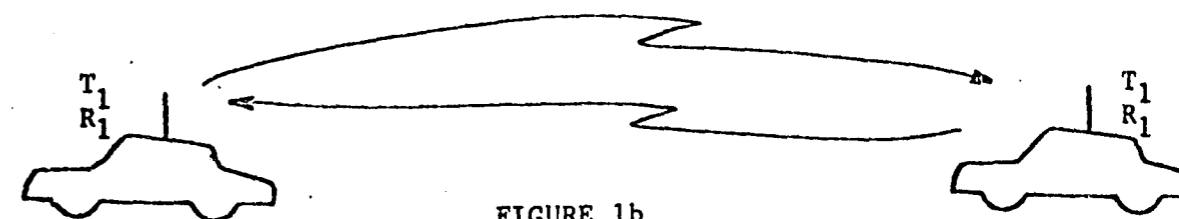


FIGURE 1b

The office of the King County Sheriff used just such a system for many years. The base station was located on Squak Mountain, with a remote control at headquarters, because the elevation permitted good base to mobile communications throughout 90% of the county.

Note that a radio system which uses the same radio frequency for both

transmit and receive is said to operate "simplex".

The sheriff's office utilized a very high frequency (VHF) lo-band frequency of 37.26 MegaHertz (MHz) for simplex operation until 1959, when the frequency was changed to 155.19 MHz (VHF hi-band). There were several objections to lo-band at the time.

The chief advantage of lo-band is also its main disadvantage. Lo-band signals are not attenuated by great distances as severely as higher frequencies. This makes the lo-band ideal for county-wide communications. Unfortunately, lo-band signals are prone to "skip interference" which sometimes results in reception of radio signals from radio users, as far as 3,000 miles away, who operate on the same channel.

Although not crowded today, the lo-band was filled nearly to capacity in the late 1950's. This assured many possible sources of interference, including ignition noise.

Once the conversion to hi-band simplex was made, however, an entirely new set of problems developed.

Hi-band signals are attenuated by terrain such as hills and trees, and by distance, sufficiently seriously to prevent two mobiles from receiving one another if any obstructions, or sizeable distances, exist between them. Under these conditions, two mobiles can transmit simultaneously, unaware of one another, and cause destructive interference at the base station receiver which prevents reception of either. This situation is illustrated in Figure 2.

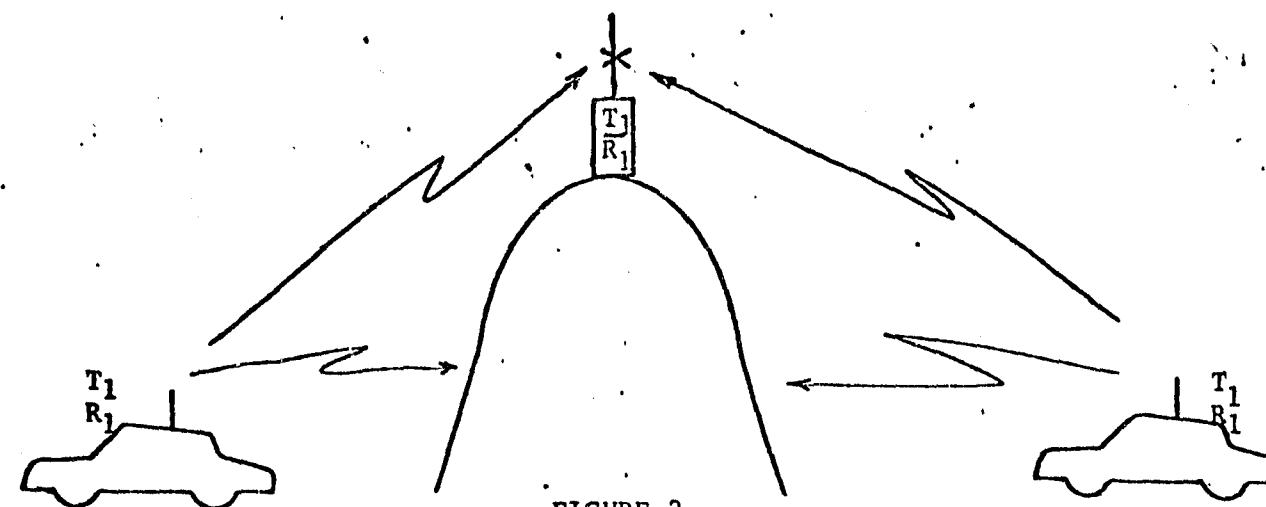


FIGURE 2

Fortunately, a method exists which circumvents this problem. It involves the use of a device known as a "mobile relay" (or sometimes incorrectly called a "repeater"), which receives radio signals on one frequency and rebroadcasts them on a second frequency. It is necessary to digress at this point to explain the details.

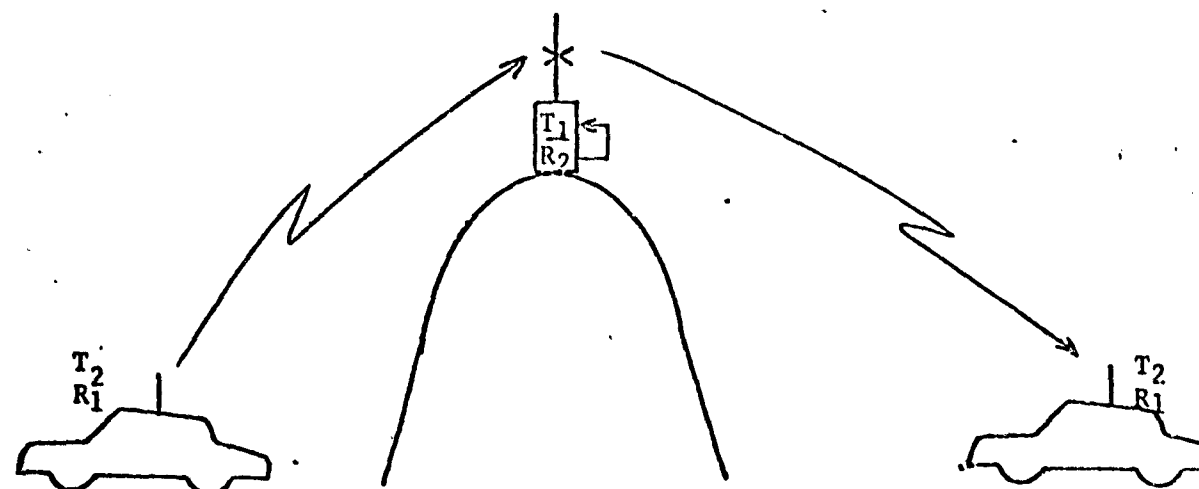


FIGURE 3

Figure 3 illustrates the operation of a mobile relay. It should be noted that a mobile relay consists of a receiver and a transmitter which are tuned to different frequencies, and which operate simultaneously.

This type of operation is termed "duplex". In order to utilize a mobile relay, every mobile must transmit on the frequency of the relay's receiver, and receive the frequency of the relay's transmitter. Such mobile operation is termed "half-duplex" because the mobile transmitter and receiver operate alternately rather than simultaneously.

Mobiles which operate half-duplex cannot communicate directly. All radio traffic passes through the mobile relay. A failure of the relay, therefore, stops all system operation.

To preclude a total loss of communication, some radio users purchase mobile radios with an extra transmit channel. The frequency of this channel is chosen to allow simplex operation on the mobile relay transmit frequency. Upon failure of the mobile relay, the mobiles revert to simplex operation and continue to communicate with reduced range.

Since the mobile relay is usually located on a mountaintop, it serves as an intermediate agent to give mobiles the same elevation advantage that a base station has. The basic mobile relay configuration of Figure 3 is usable as shown. Some municipalities, however, choose to enhance their mobile relays with extra cost accessories. Some of these additions extend the capabilities of the mobile relay considerably.

One such useful addition is known as a "satellite receiver voting system". The operation of this system is illustrated in Figure 4. Note that this system is an extension of the basic mobile relay in Figure 3.

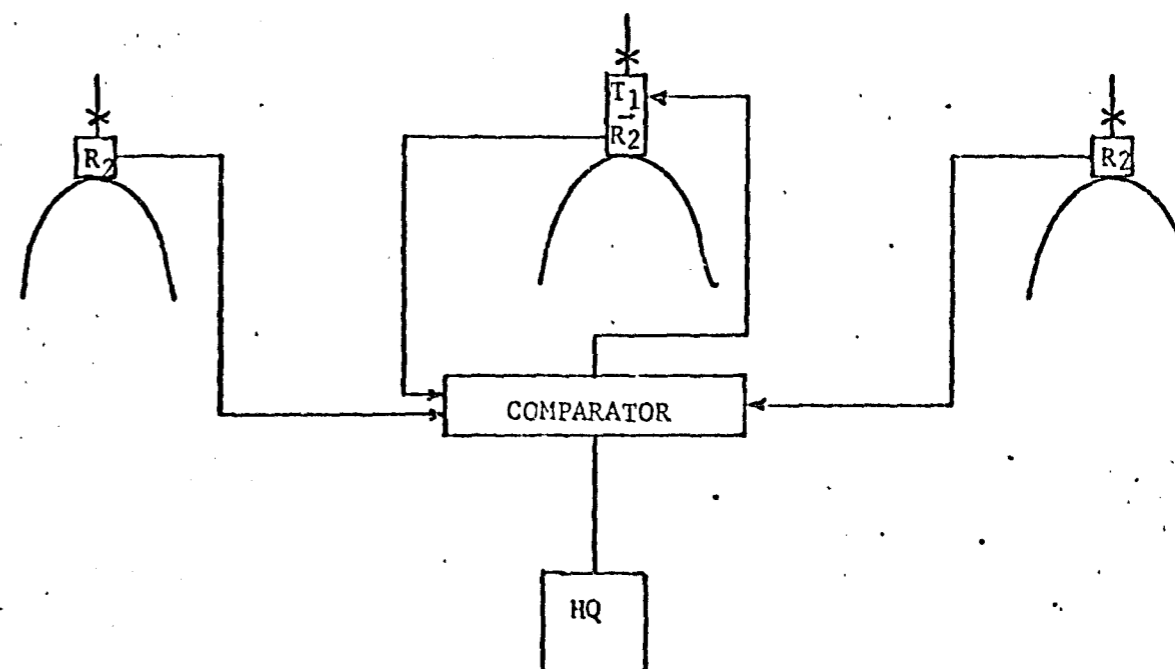


FIGURE 4

A satellite receiver voting system consists of one transmitter, up to 8 receivers, and a device known as a "comparator". All of the receivers are tuned to the same frequency.

The receivers are strategically located at various locations throughout the repeater coverage area. The audio output of each receiver is connected to the comparator by wires, or other means. It is the function of the comparator to determine which receiver is receiving the best signal, and to allow only the best signal to be re-broadcast by the mobile relay's transmitter.

It was towards the end of the 1960's when the Office of the Sheriff was changed to the Department of Public Safety. The radio system, however, was still the same hi-band simplex operation installed in 1959. Increased radio traffic prompted several studies to determine what course of action King County should take to relieve the congestion.

The results of two studies indicated that multiple channels with multiple base stations on each channel were required. The UHF radio system to be installed in 1976 for the King County Department of Public Safety will utilize many of the suggestions cited in the above reports.

Since continuity of communications is mandatory during the transition from old system to new, the King County Department of Public Safety installed VHF mobile relays at several locations to provide four channels of interim communications. These temporary frequencies have been giving such outstanding service that a decision was made to retain them permanently.

It is the plan of the King County Department of Public Safety to utilize UHF frequencies for its new system. Just as hi-band has more limited range than lo-band, UHF has more limited range than hi-band.

There are ways to overcome the limited range disadvantage of UHF. Two popular schemes both utilize multiple transmitters strategically located throughout the county. Figure 5 illustrates them both. The first scheme includes circuitry to identify the location of a mobile, then automatically activate the closest transmitter. The second is similar to the first, except that manual activation by the dispatcher is required.

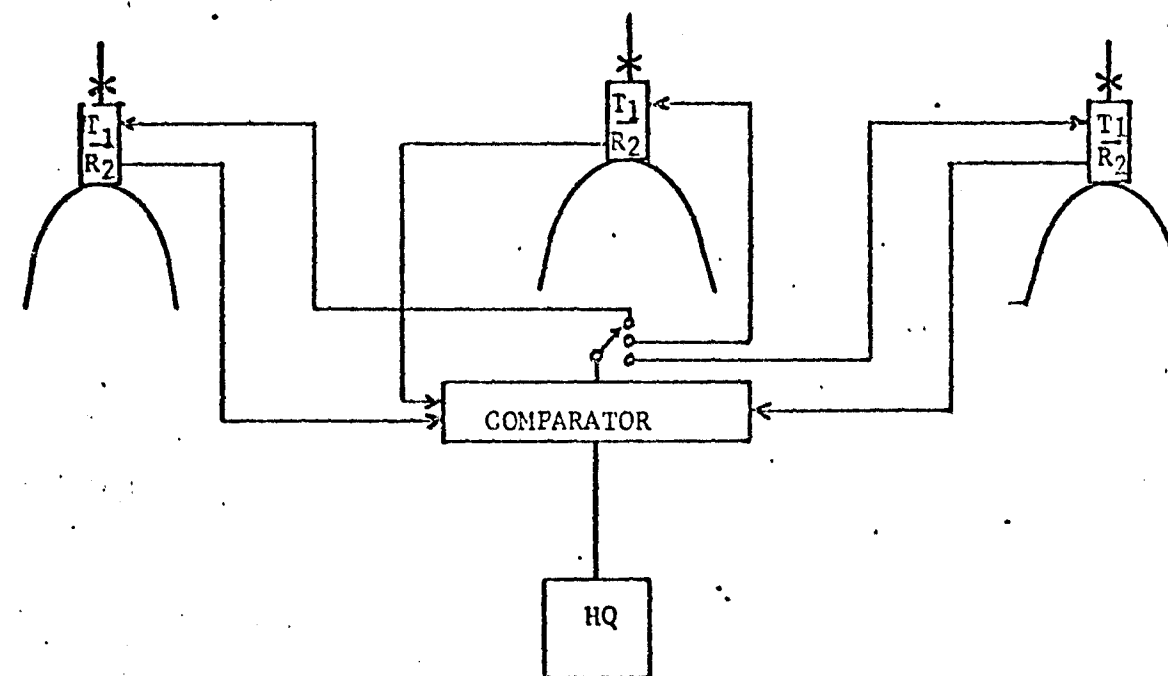


FIGURE 5

The King County Department of Public Safety, however, has decided to employ an unconventional system involving simultaneous activation of all transmitters. (See Figure 6). Since these transmitters will have overlapping coverage, steps must be taken to prevent destructive interference among them.

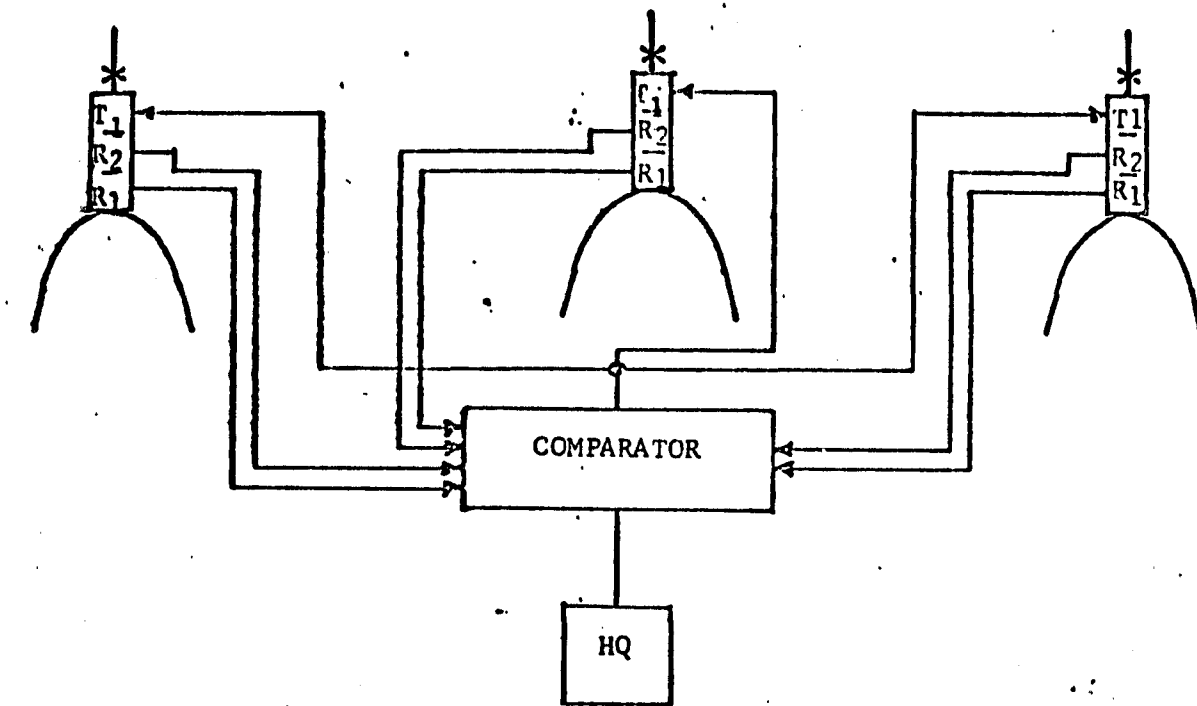


FIGURE 6

High stability oscillators will be used, along with audio delay lines, to minimize the effects of destructive interference. Considerable effort must be expended to optimize such a system. This effort is expected to be required frequently, because the state of the art in high stability oscillators is still such that noticeable drift is to be expected at 460 MHz.

One of the several noteworthy features of the King County Department of Public Safety radio system is included in Figure 6. Each mobile relay site will be equipped with an auxiliary receiver tuned to the transmitter frequency. Although this receiver will be overloaded during activation of the mobile relay, it will have some utility when the mobile relay is unused. The purpose of the auxiliary receiver is to allow the dispatcher to monitor mobile to mobile simplex transmissions.

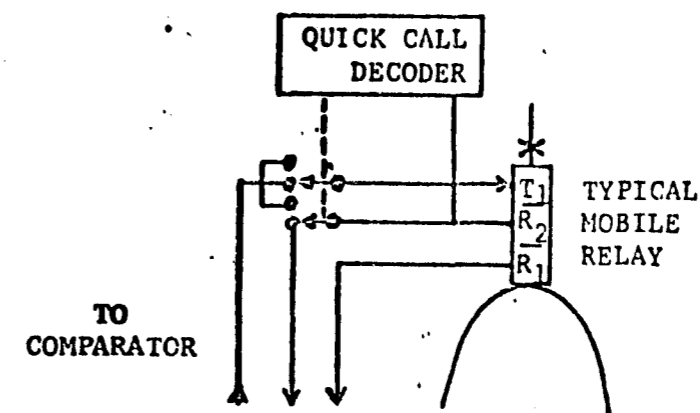


FIGURE 7

A very necessary feature planned for the King County Department of Public Safety radio system is illustrated in Figure 7. This feature, the key elements of which have not yet been purchased, serves as the only emergency backup in the event of control and audio (microwave) link failure.

The County plans to equip each mobile relay in the system with a "quick call decoder" which is unused during normal operation. Each decoder responds only to two unique pairs of tones received by the mobile relay.

Should the link to the courthouse fail, the chief dispatcher will be expected to transmit the appropriate tones to "activate" the quick call decoders. Each decoder then transforms its mobile relay into the mobile relay configuration of Figure 3. When the link is repaired, the original system is restored by transmitting "de-activate" tones.

The King County Department of Public Safety radio system, however, lacks the key elements to make this backup functional.

Since all the comparators are located at the courthouse, a failure of

the control and audio (microwave) link to the courthouse can halt operation of the entire radio system. A backup is highly desirable.

At this time, it is necessary to consider the magnitude of the King County Department of Public Safety Radio System. Refer to Figure 8.

King County Department of Public Safety

Radio Channels

<u>Designations</u>	<u>Number of Transmitters</u>	<u>Use</u>
<u>450 MHz</u>		
North K, S, R	4 Simulcast	North precinct
S W GK, S, KP	2 Simulcast	Southwest precinct
S E S, R, G	3 Simulcast	Southeast precinct
East M, 42	2	Vicinity of Skykomish
County GK, H, S, R, G	5 Simulcast	County wide
Tac 1 GK, H, S, R, G	5 Simulcast	County wide Tactical
Tac 3 H, S,	2 Simulcast	Mutual Aid
Data G, S,	2 Simulcast	County wide Data
<u>150 MHz</u>		
F 1 H, S, R,	3 Simulcast	Detective, Warrants, Civil
F 2 S, R	2 Simulcast	Admin., Special Operations
F 3 H, S	2 Simulcast	Paging

FIGURE 8

There are eight channels on the UHF band and four on VHF hi-band. To support the UHF channels, there are 24 base stations. All but one are configured as mobile relays. To support the VHF hi-band channels, there are 6 base stations. Four of these are mobile relays.

Of the UHF channels, the most prolific are County and Tac 1. Both of these channels employ 5 transmitters each.

Recall that it is planned to activate all transmitters of each channel simultaneously.

The price of the new King County Department of Public Safety radio system should be considered next. Total equipment cost is approximately \$1,200,000.00. Included are 79 option equipped mobile radios at approximately \$1900.00 each.

The cost of base equipment is therefore approximately \$1,050,000.00. This leads to the observation that King County purchased approximately \$13,290.00 worth of base equipment per mobile unit. If the number of mobiles were increased to 250 (total capacity), the cost per mobile would drop to \$4200.00.

SUMMARY

Recognizing the importance of law enforcement communications, the King County Department of Public Safety designed a deluxe radio system to meet present and anticipated future needs. The system is somewhat unconventional, in that multiple transmitters, activated simultaneously, are used to achieve county-wide radio coverage. Particularly noteworthy is the fact that a failure of the courthouse microwave control and audio link will cause the entire radio system to stop functioning. Installation of backup equipment is planned, but not immediately forthcoming. Another noteworthy item is the particularly expensive system cost of \$13,290.00 worth of base equipment per mobile unit.

APPENDIX C

King County Washington, Department of Public Safety

Communications Master Plan

COMMUNICATIONS MASTER PLAN

KING COUNTY DEPARTMENT OF PUBLIC SAFETY

Frank L. Porter, Jr.
Communications Engineer
4-1-75

COMMUNICATIONS MASTER PLANKING COUNTY DEPARTMENT OF PUBLIC SAFETYFOREWORD

The King County Department of Public Safety communications expansion project formally originated with the Pacific Western Engineering Report which was submitted on January 16, 1970. This report was funded by Law and Justice in order to determine the Department's communications requirements. As a result of this report, a communications engineer was hired in October, 1970 to design and implement a new system and to secure the necessary funds through Law and Justice grants. The following communications project is the result of that work. The several phases of this plan have been reviewed and approved by the Law and Justice Technical Radio Subcommittee, the Law and Justice Communications Consultant, and the I.B.M. Staff Communications Consultant. In addition, Law and Justice also contracted with Public Systems, Inc. (P.S.I.) to review this communications project. This report was published September 15, 1974 and the major recommendations of this report have been incorporated into the design of the communications system. As an example, these include:

1. Shift the Department's operational communications system to the UHF radio band.
2. Further increase the mobile radio channel capacity from equipment having four channel capacity to those having six channel capacity with expansion capabilities to eight channels.
3. Increase the number of remote base stations to improve radio coverage of King County.

HISTORY

The Department of Public Safety (originally the Sheriff's Office) initial radio system was comprised of a low band base station on Squak Mountain and mobile units which operated on 37.26 MHz. In 1959 the entire radio system was replaced with a high band system which operated on 155.190 MHz. While this change eliminated the interference inherent with low band systems, the radio coverage was actually decreased since high band radio systems have less range than low band systems. In addition, the radio system capacity was not increased since the network still only utilized one mobile radio channel; also direct car to car radio transmissions were limited to a very short distance. As a result, a mobile unit in one part of a precinct could not hear another transmitting to the office from a different part of the precinct. Thus mobile units frequently covered each other, causing much delay and confusion. It was this severe radio channel congestion and lack of coverage that led to the Pacific Western Engineering Report in 1970.

PROJECT GOALS

The goals of the communications project are to establish a new communications center on the first floor of the Courthouse, to establish a new microwave and base station network utilizing more remote repeater sites in order to improve radio coverage, changing the primary radio networks to UHF, improve car-to-car radio range, obtain additional UHF frequencies, incorporate portable radio units into the system, and establishing an effective county wide mutual aid communications system. While some of these goals are still in the planning stages, others have been implemented. Most important of all, however, was the criteria that the new communications system has sufficient growth capacity to handle the Department's communications requirements for at least the next 20 years. In addition, it must have the flexibility to accommodate the many types of new devices and subsystems which will become available for Law Enforcement in the future.

SYSTEM DESIGN FEATURES

General

The base station radio network was designed to provide county-wide communications, improve car-to-car radio coverage, and to simplify the control center dispatcher's job. In order to achieve this, all the base station receivers on the same frequency (but at different locations) are voted at the communications center. This gives the dispatcher the advantage of monitoring only the receiver with the best signal. In addition, all the base station transmitters on each frequency (but at different locations) are keyed simultaneously. This allows all cars on that channel irregardless of their location to hear all broadcasts. Also

General (Continued)

this feature simplifies the dispatcher's job since he does not have to select transmitters with regard to location or areas of coverage. Another benefit of this feature is that it allows car-to-car radio transmissions on a county-wide basis.

The communications system was also designed around the philosophy that an officer should never have to wait for a radio channel to clear before he can make an emergency call. This is accomplished by having additional radio channels for emergency and secondary type useage. Each Bureau of Police Operations vehicle will be equipped with all of the operational UHF radio channels in order to accomplish this.

Communications Center

The number of dispatch consoles in the new system was increased to three operational consoles (one for each precinct) and one master or supervisory console. Thus for the first time, each precinct has basically its own dispatcher. Also, the master console is manned by a patrolman who takes charge of dispatching any emergencies or special details.

The three operational and one master dispatch consoles all have the ability to broadcast simultaneously on any one or more operational channel. In addition, the master console has an override feature which permits that dispatcher's broadcast to have priority over the other dispatcher on that channel. All consoles are used with a headset which improves the transmitted voice quality as well as reducing the noise in the center.

Two thirty channel dual transport audio logging tape recorder units have been installed in the Communications Center. These units provide a recording of all Communications Center radio and telephone messages.

A radio equipment room has been constructed adjacent to the Communications Center. All of the microwave R.F. and multiplex equipment for the Communications Center is installed there. In addition, this room contains the receiver voting comparitor units and the remote transmitter audio phasing units for the Communications System. A complete base station test panel is also installed to facilitate equipment adjustment and repair.

Microwave R.F. Equipment

Microwave is used in this system to provide a reliable means of controlling the base stations at the remote sites. 6 GHz. microwave equipment was chosen for its future system expansion capability and to be compatible with the Washington State Patrol microwave system which utilizes 6 GHz equipment at their Squak Mountain and Gold Mountain sites. Since it is planned to tie the two systems together at these locations, the interconnect is simpler when the equipment uses the same bandwidth. Inter-tics are planned with the following Puget Sound area systems:

1. Washington State Patrol - an inter-tie with the Washington State Patrol could provide this Department and the Seattle Police Department with a direct microwave channel to the State of Washington Access Computer in Olympia. In addition, it could also provide the means for both departments to have a direct intercom with the Washington State Patrol Bellevue Communications Center. Also, the King County Sea-King Computer System could be tied directly to the State of Washington Access Computer using a microwave multiplex high speed line. In addition, the State could use the King County portion of the system to gain microwave access to downtown Seattle in order to serve the State offices located there.
2. City of Bellevue - The City of Bellevue is presently planning a 2 GHz. microwave system linking Bellevue with their base station site at Newport Hills which would also be linked with the Norway Hill (one mile south of Bothell) base station site. Bellevue also plans to interconnect their 2 GHz. microwave system with the King County system in order to provide an interconnect between the two agencies' communications centers. Also, this would allow Bellevue to have a direct microwave channel to the State of Washington Access Computer in Olympia.
3. Kitsap County - Kitsap County is in the process of installing a 2 GHz. microwave system which features a terminal on Gold Mountain. An inter-tie with the King County system on Gold Mountain would provide an economical means of furnishing the Kitsap County Sheriff's Office and the City of Bremerton with access to the SeaKing computer system.

This Department also plans to install remote computer terminals at its precinct offices and will use the microwave system to interconnect them with the SeaKing computer at the Courthouse.

Microwave Multiplex Equipment

The microwave multiplex used in the microwave system was chosen in order to meet the following requirements:

1. The multiplex must be both frequency and phase synchronized since the audio sent to each of the base station transmitters must be both frequency and phase synchronized. This requirement is necessary in simultaneous base station transmitter systems.
2. The multiplex must be CCITT frequency compatible in order to provide a maximum number of multiplex channels.
3. Each multiplex modem must be equipped for four wire operation and a jack field for testing. In addition, it must also be equipped with the V-10 base station control option so that it can be used to directly control a base station without an interface relay or further field modifications.

Base Station Equipment

All of the base stations in this system are equipped with a high stability transmitter oscillator which allows several transmitters on the same frequency to be keyed simultaneously without a heterodyne in equal signal strength areas. Each station is also equipped with two receivers so that the office can monitor the direct car-to-car transmissions and thus not broadcasting at the same time. See the attached maps for the number and location of the base stations on each channel.

Mobile Units

All new UHF mobile units will be equipped with widespread transmitters so that the vehicles out of range of a repeater can still communicate directly with another car by using this feature. It is also useful in that it allows a vehicle to communicate directly to a portable radio unit. This is especially important during searches of large buildings, etc., when the officer inside with a portable unit is frequently unable to reach a repeater station. All of the UHF mobile units have an eight channel capacity so that they can operate on any of the Department's 460/465 MHz. UHF radio channels. Each unit also has push-button frequency selection in order to facilitate operating the radio while driving at high speed.

Equipment Locations

The Department is installing radio equipment at many sites in order to provide radio coverage for the majority of King County. The location and elevation of each of these sites is listed below:

Gold Mountain - approximately 6 miles west of Bremerton, Washington with an elevation of 1761'. (This site is presently being made operational.)

Grass Mountain - approximately 15 miles east of Enumclaw, Washington, with an elevation of 4380'. (This site is operational on a limited basis.)

Kent Precinct - 25426 - 97th Place South, Kent, Washington, with an elevation of 315'.

King County Courthouse - Third and James Streets, Seattle, Washington, with an elevation of 68'.

Maloney Ridge - approximately 2 miles southeast of Skykomish, Washington, with an elevation of 4410'. (This site is presently operational.)

North City - 18020 - 15th Avenue N.E., Seattle, Washington, with an elevation of 490'. (This site is presently operational.)

Equipment Locations (Continued)

Norway Hill - approximately 1 mile south of Bothell, Washington at 16216 - 104th N. E., with an elevation of 480'.
(This site is presently operational.)

Rattlesnake Mountain - approximately 2½ miles southwest of North Bend, Washington, with an elevation of 3228'.
(This site will be operational in the fall of 1975.)

Squak Mountain - approximately 3 miles south of Issaquah, Washington, with an elevation of 1980'. (This site is presently operational.)

Channel Definition

The King County Department of Public Safety designates its UHF radio channels by an operational designation instead of by frequency. The new UHF mobile units have these designations on their frequency control switches in order to simplify selections. These correlations are listed below.

<u>Channel Designation</u>	<u>Transmit</u>	<u>Receive #1</u>	<u>Receive #2</u>
County	460.200 MHz.	465.200 MHz.	460.200 MHz.
East	460.225	465.225	
Data	460.275	465.275	460.275
North	460.325	465.325	460.325
Southwest	460.400	465.400	460.400
Southeast	460.450	465.450	460.450
TAC-1	460.500	465.500	460.500
TAC-2	Future Addition		
TAC-3*	453.350	458.350	453.350

These channels are used in the following manner:

County - This radio system was designed to provide radio coverage of the majority of King County. This channel will be used mainly by detective units as well as other units that operate on a county-wide basis. It will also be used as a back up or secondary channel for the three precinct operational channels.

North - This radio system was designed to provide radio coverage of the North Precinct area however does not cover the Skykomish-Stevens Pass area of this Precinct because of the high terrain. It is presently the primary operating channel for the North Precinct patrol units.

Southeast - This radio system was designed to provide radio coverage of the Southeast Precinct area. It is presently the primary operating channel for the Southeast Precinct patrol units.

*Note: The new UHF mobile units will not be equipped with this channel.

Channel Definition (Continued)

Southwest - This radio system was designed to provide radio coverage of the Southwest Precinct area. It will be the primary channel for the Southwest Precinct patrol units when they are changed over to UHF.

East - This is a radio channel which will be shared with Mason County, Washington in the future. As a result, its use is restricted to the Skykomish-Stevens Pass area of King County. Thus it was designed to provide radio coverage of only that area and is presently used by all of the Department's units operating in that area.

Data - This radio system was designed to provide radio coverage of the western third of King County. This channel will be used by all of the Department's units in this area to make detailed data checks directly with the Communications Center data room. Thus it will provide the majority of the field units with a better data service and free the operational dispatchers of this workload.

TAC-1. This radio system was designed to provide radio coverage of the majority of King County. This channel will be used mainly for tactical situations. As an example, in the case of a bank alarm, all the units responding to this detail would switch to this channel which would be dispatched from the master console in the Communications Center by a commissioned officer. This will not only give the responding units a clear channel, but will allow that precinct's regular operational channel to be kept open for dispatching routine details. This channel would also be used by any unit making an emergency call if that unit's normal operating channel was busy with other radio traffic.

Also note that the same channel is used in the Central Washington Law Enforcement Administrative Radio system (C.W. LEARN). Using this channel and the proper transmitter tone, any of this Department's UHF equipped vehicles traveling in Central Washington would have communications with the Benton County, Chelan County, Douglas County, Grant County, Kittitas County, Okanogan County and Yakima County Sheriffs' offices. This feature would be important to have when making prisoner transport trips to eastern Washington.

TAC-2 - This radio channel designation was set aside for a future addition. While no frequency has been licensed or equipment purchased for it, all of the Department's new mobile units have the provisions for this channel's crystal(s). It is anticipated that it would be used for either a channel shared with the Seattle Police Department for coordination and mutual aid or a future State-wide mutual aid channel.

Channel Definitions (Continued)

TAC-3 - This mutual aid radio system was designed to provide radio coverage of the Lake Washington-Seattle area of King County. This channel will be made available to those police agencies in the King County area that operate in the low 450 MHz. radio band which can use it as an alternate to their own channel. Thus it can provide the Renton, Bellevue, Mercer Island, Clyde Hill, Kirkland, Redmond, and Bothell police departments with a common radio channel for intercommunications between mobile units as well as communications with this Department. In addition, since most of these agencies contract with King County for jail service, this channel will provide them with needed radio service in the downtown Seattle area when transporting prisoners to the Court-house.

The King County Department of Public Safety also operates its original two VHF radio channels. These are as follows:

<u>Channel Designation</u>	<u>Transmit</u>	<u>Receive #1</u>	<u>Receive #2</u>
F-1	155.190 MHz.	154.650 MHz.	155.190 MHz.
*F-2	154.965	153.995	154.965

* Note that F-2 is a Local Government Radio Service Channel.

These two VHF radio channels are used in the following manner:

F-1 - This radio system was designed to provide radio coverage of the majority of King County. It is presently used by this Department's detectives, warrants, civil, and administrative units as well as by the police patrol marine detachment. When the detective radios are changed to UHF, the remaining units will continue to use the channel.

This radio channel will also be used as a common/mutual aid channel for those police agencies in King County which operate in the 155 MHz. band. Thus it can provide the Des Moines, Auburn, *Kent, *Enumclaw, *Tukwila, Issaquah, and Lake Forest Park police departments with a common channel for intercommunications between mobile units as well as communications with this Department. (*Note: These department's common 159.090 MHz. operational radio channel would have to be changed to one in the 155 MHz. range.)

F-2 - This radio system was originally designed to provide radio coverage of the western one half of King County. It is presently used as this Department's Southwest Precinct operational channel. When this precinct is changed over to UHF, it will be used jointly as an administrative/special operations radio channel. It is expected that this channel will be equipped with an automatic telephone interconnect in the future so that field supervisors can originate telephone calls from their vehicle. Also this channel will be used for the Department's new paging/voice message radio system.

Several outline maps of King County showing the various base station and microwave terminal locations have been attached to this report.

PROGRESS

This project has been divided into phases, each phase generally corresponding with a Law and Justice grant or grants. These are as follows together with the related progress:

Interim Phase - Due to the necessary length of time required to implement the first phase of the project, it was necessary to install a second 150 MHz radio channel (F-2) to reduce the channel loading on the then single 150 MHz radio channel (F-1). This was done in 1972 utilizing existing Department and borrowed radio equipment and parts. This channel was assigned to the Southwest Precinct.

In the summer of 1973 an existing UHF base station network was borrowed and implemented to provide an interim radio channel for the North Precinct. Two channel UHF mobile units were also borrowed from other county agencies and installed in the North Precinct's patrol vehicles to make the system operational.

These changes left the original 155 MHz. (F-1) radio frequency for the use of the Southeast Precinct and the remainder of the Department.

Phase I - Law and Justice Grants 402 and 724

Since the equipment provided by these two grants were purchased at the same time, they are covered by the same phase. The major accomplishments of this phase are as follows:

1. New Communications Center

A new communications center was constructed on the first floor of the Courthouse in the old Assessor's vault area during the remodeling of the Courthouse. Law and Justice funds from this phase of the project provided three operational dispatch consoles, one supervisory master console, and an audio logging tape recorder system.

2. Base Station Network

Base stations from the North, County-Wide and Data UHF radio systems were purchased and these systems implemented. In addition, VHF base stations for the F-1 150 MHz radio system were purchased and installed on Squak Mountain and at Harbor-view Hospital.

3. Microwave System

Six GHz. microwave equipment for the Courthouse to Squak Mountain link and the Courthouse to Gold Mountain link

was purchased. The Squak Mountain link has been installed and is operational. The Gold Mountain link will be installed as soon as the tower at that location is completed.

4. Mobile Radio Units

Eight channel 100 watt UHF mobile radio units were purchased under this phase of the project as well as additional units which were purchased with County funds. These units were installed in Precinct #3 patrol vehicles and that precinct changed over to the new UHF frequencies.

Phase I - King County Non-Grant Contributions

Additional equipment was purchased with King County capital outlay funds (non-grant associated monies) during this phase and installed. These are as follows:

1. Two Southeast UHF base stations were purchased and one installed on Squak Mountain. The other unit will be installed on Rattlesnake Mountain.
2. Two F-2 VHF base stations were purchased and one installed on Squak Mountain. The other unit will be installed on Rattlesnake Mountain.
3. The new King County Communications Center was completed on the first floor of the Courthouse. This modern center has approximately 15,000 square feet of floor space and was built to support the Communications Project. This center provides separate radio equipment telephone equipment, battery, battery charger, and emergency power generator rooms. Two 350 Kw diesel emergency power plants have been installed in the generator room. The radio equipment room has been equipped with overhead cable trays, work benches, a desk and file cabinet. Two 1000 AH 24 volt battery power supplies are on order and will soon be installed in the battery room. A closed circuit television system was installed to improve the communications center security.

Phase II - Law and Justice Grants 1297 and 1406

This phase of the project will convert the Southwest Precinct radio system to UHF, provide the North Precinct with 8 channel UHF mobile units, and expand the systems' radio coverage by adding repeater sites on Gold Mountain, Rattlesnake Mountain, Grass Mountain, and in the Skykomish area.

With the exception of the microwave multiplex and the mobile radio units, all of the equipment provided in this phase has been purchased. The mobile units are in the process of being purchased and will be installed in the fourth quarter of 1975. The bid specifications for the microwave multiplex are being prepared and it is anticipated that this equipment will be purchased and installed in the third quarter of 1975.

The status of the Phase II repeater sites are as follows:

1. Gold Mountain - A State of Washington Division of Natural Resources radio site building has been leased for this site. While the majority of the radio equipment for this site is on hand, it cannot be made fully operational until the Division of Natural Resources provided tower is installed.
2. Rattlesnake Mountain - A State of Washington Division of Natural Resources radio site building has been leased for this site. It is anticipated that this site will become operational on a very limited basis when its radio equipment is received. However the radio tower which is needed to complete this site was struck from this Department's 1975 Capital Outlay Budget. Thus, this site can be only partially implemented using a wooden pole as a temporary antenna support.
3. Grass Mountain - A State of Washington Division of Natural Resources radio site building has been leased for this site. This site is physically complete and will be fully operational when it's radio equipment is installed. At the present time, a TAC-1 UHF base/repeater station is installed and operating at this site (in the in-band repeater mode).
4. Skykomish Area - Since this radio system is being funded with King County 1974 Capital Outlay non-grant affiliated funds, this item of the project is covered in the next section of this plan.

Phase II - King County Non-Grant Contributions

Several systems purchased with King County Capital Outlay funds (non-grant associated monies) have been implemented during this phase. These are as follows:

1. A satellite receiver for the "North" UHF radio channel has been purchased with county funds and installed on Norway Hill just south of Bothell. This receiver makes it possible for portable

radio units operating on the North channel to be received when they are operating in the Bothell-Kenmore areas of the North Precinct.

2. A F-2 VHF satellite receiver unit was purchased with county funds during this period. This station will be installed on Gold Mountain (A F-2 base station cannot be installed at this location since the City of Bremerton operates on a channel 15KHz away, and a F-2 transmitter would cause harmful interference). These receivers will be used to receive units operating on the F-2 channel on the west side of Vashon Island and the east side of Puget Sound (Redondo Beach, Three Tree Point, etc.).
3. Twenty-two UHF portable radio units were purchased and assigned to the North Precinct.
4. Twelve UHF portable radio units were purchased and assigned to the Southeast Precinct.
5. In order to provide radio reception in the Skykomish area, a county purchased UHF repeater operating on the new East UHF channel has been installed at the U.S. Forest Service radio site on Maloney Ridge. This system utilizes a county purchased control station located in the North City area of King County which is operated from the communications center using leased telephone lines. This new East channel UHF repeater provides radio coverage of the northeastern corner of King County. Radio tests indicate that this includes U.S. Highway Number 2 from Gold Bar, Washington to 3 miles east of Stevens Pass.
6. Two TAC-3 453/458 MHz base stations were purchased with county funds during this period. These stations will be installed at Squak Mountain and Harborview Hospital (a further description of this system is outlined in the CHANNEL DEFINITION section of this report).
7. Ten microwave multiplex channels were purchased with county funds during this period. These multiplex channels will be used to control the county purchased F-2 VHF base stations, the F-2 satellite receivers, and the TAC-3 UHF base stations.

PROJECT EXPENDITURES

The following amounts of funds have been spent on equipment and equipment installation for this project. (These include those Grant 1297 funds held for equipment and installation contracts which are presently going out to bid).

	<u>County Funds</u>	<u>Grant Funds</u>
L.J.P.O. Grant No. 402		\$ 295,000.00
L.J.P.O. Grant No. 724		103,120.00
L.J.P.O. Grant No. 1297	\$ 23,056.00	395,000.00
State share of match:		21,944.00

	<u>County Funds</u>	<u>Grant Funds</u>
L.J.P.O. Grant No. 1406	\$ 3,324.00	\$ 29,919.00
King County 1973 Capital Outlay Budget	33,321.26	
King County 1974 Capital Outlay Budget	137,159.59	
King County 1975 Capital Outlay Budget	15,455.98	
	<hr/>	<hr/>
Total County Funds Expended for Equipment	\$212,316.83	
Total Grant Funds Received for Equipment		\$844,983.00
		<hr/>
TOTAL FUNDS EXPENDED ON PROJECT		\$1,057,299.83

TOTAL PROJECT COMPLETION

The two phases of this project will just about complete this present project. However, the most severe problem affecting the project is and has been inflation. As a result the following items will have to be considered at another time when funds are available.

1. Rattlesnake Mountain Tower - Rattlesnake Mountain is the only repeater site which does not have a radio tower. This item was requested in the 1975 King County budget, however was deleted because of a lack of funds. It is estimated that the cost of purchasing and installing a tower at this location would be approximately \$35,000.00. At the present time, this site is being implemented on a temporary basis using a wooden telephone pole as an antenna structure.
2. North City Radio Equipment Building - A concrete block type, radio equipment building is needed at this site in order to house the East channel (Skykomish) control equipment which is presently located there in an outdoor cabinet. A building is needed in order to protect this equipment from vandalism and to provide housing for an emergency power generator. It would also be used to house microwave control equipment and satellite receivers which will be added in the near future.
3. Sattelite Receivers - The Department's UHF mobile radio system was designed with the premise that 100 watt UHF mobile units would be used throughout the system. In the interest of economy, however, 40 watt mobile units are being purchased for the North and Southwest Precinct patrol vehicles. Thus additional multi-channel UHF sattelite voting receiver units together with microwave multiplex equipment will be needed at each of these two

Precincts. It is anticipated that two of these units will be needed for the North Precinct and one for the Southwest Precinct areas.

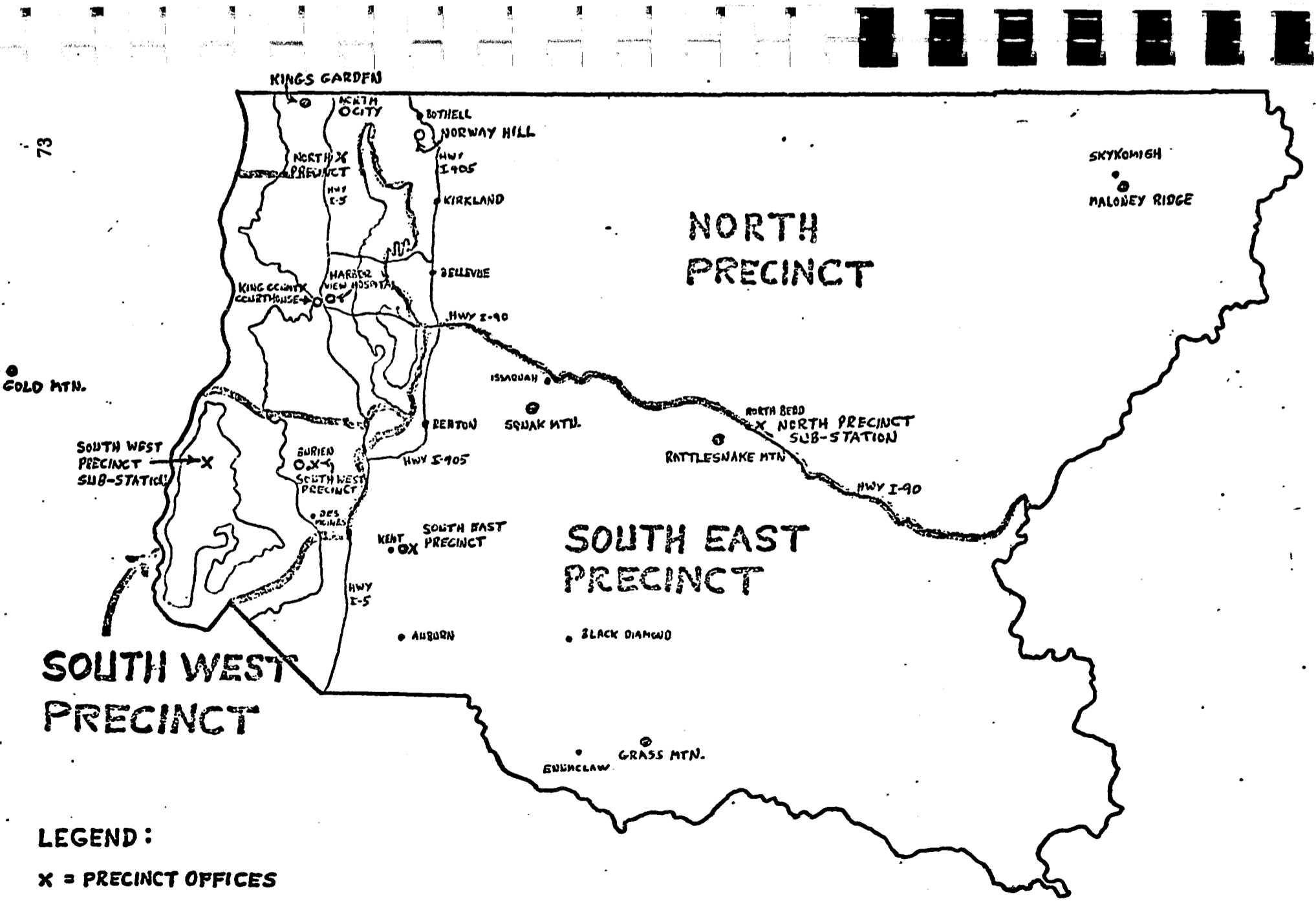
FUTURE PROJECTS

1975 Law and Justice Grant Application

The purpose of this new project is to provide eight channel UHF mobile radio units for the Department's detective vehicles together with the associated base station, microwave multiplex, receiver voting equipment, dispatch console, and satellite receiver units.

1976 Law and Justice Grant Application

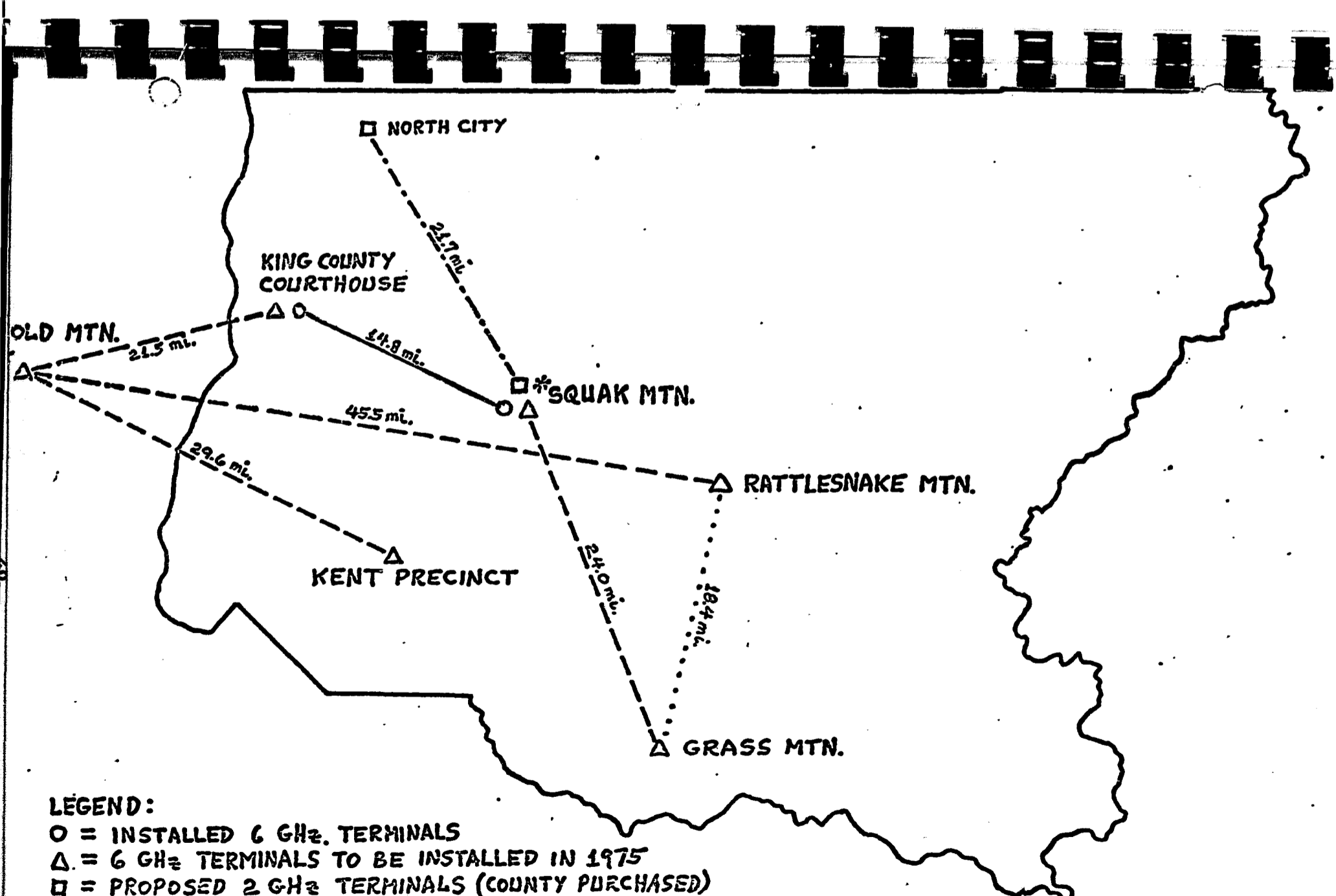
The purpose of this new project is to provide the additional portable radio units, satellite receivers, receiver voting equipment, and microwave equipment in order to establish an effective portable radio network in the heavily populated areas of King County. This project's goal would provide each on-duty patrolman with a portable radio unit.



LEGEND :

- X = PRECINCT OFFICES
- ⊗ = REPEATER STATION SITES
- = OTHER RADIO STATION SITES

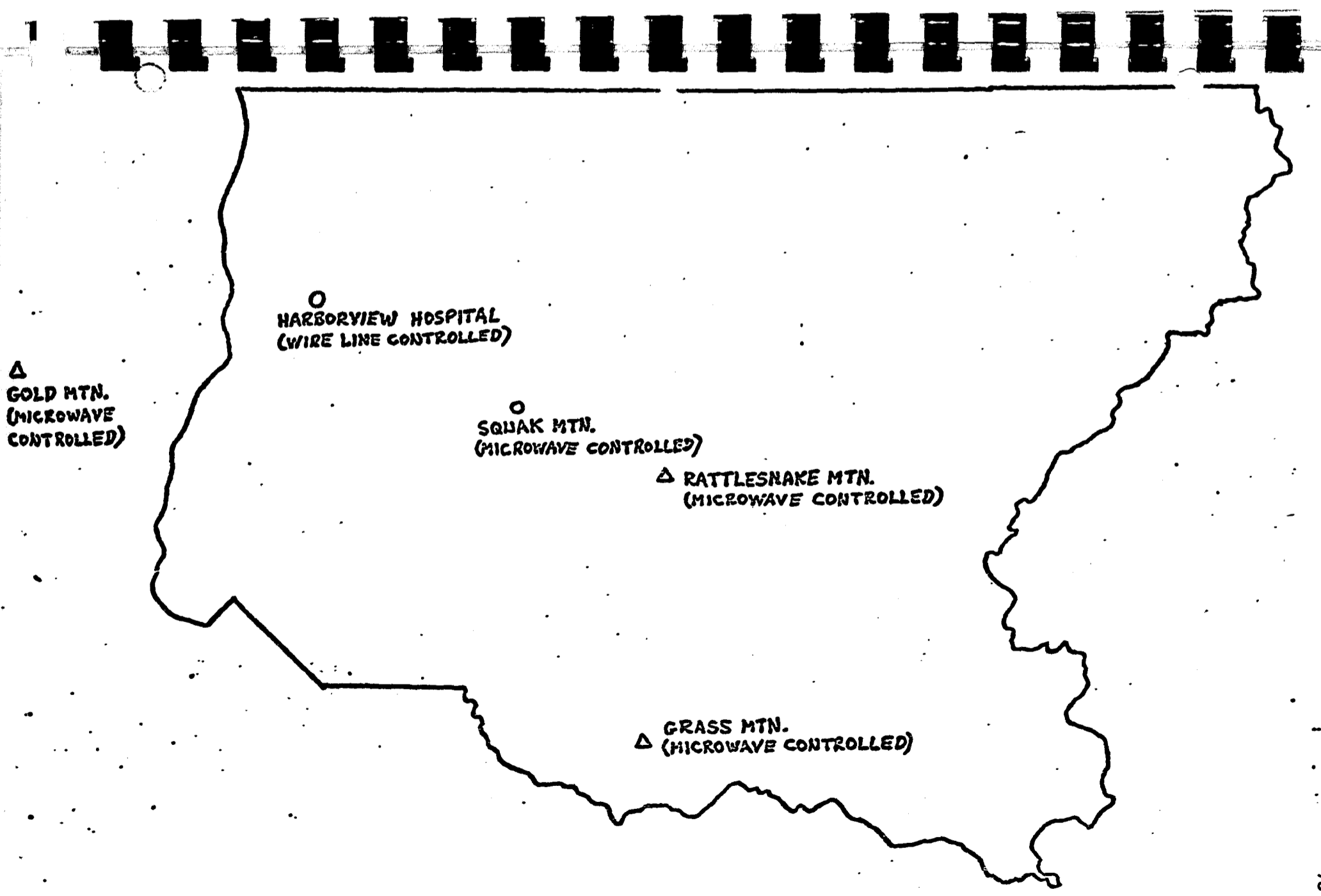
**KING COUNTY DEPT. OF PUBLIC SAFETY
 PRECINCT BOUNDARY MAP
 4-2-75 *J. H. Perkins, Jr.***

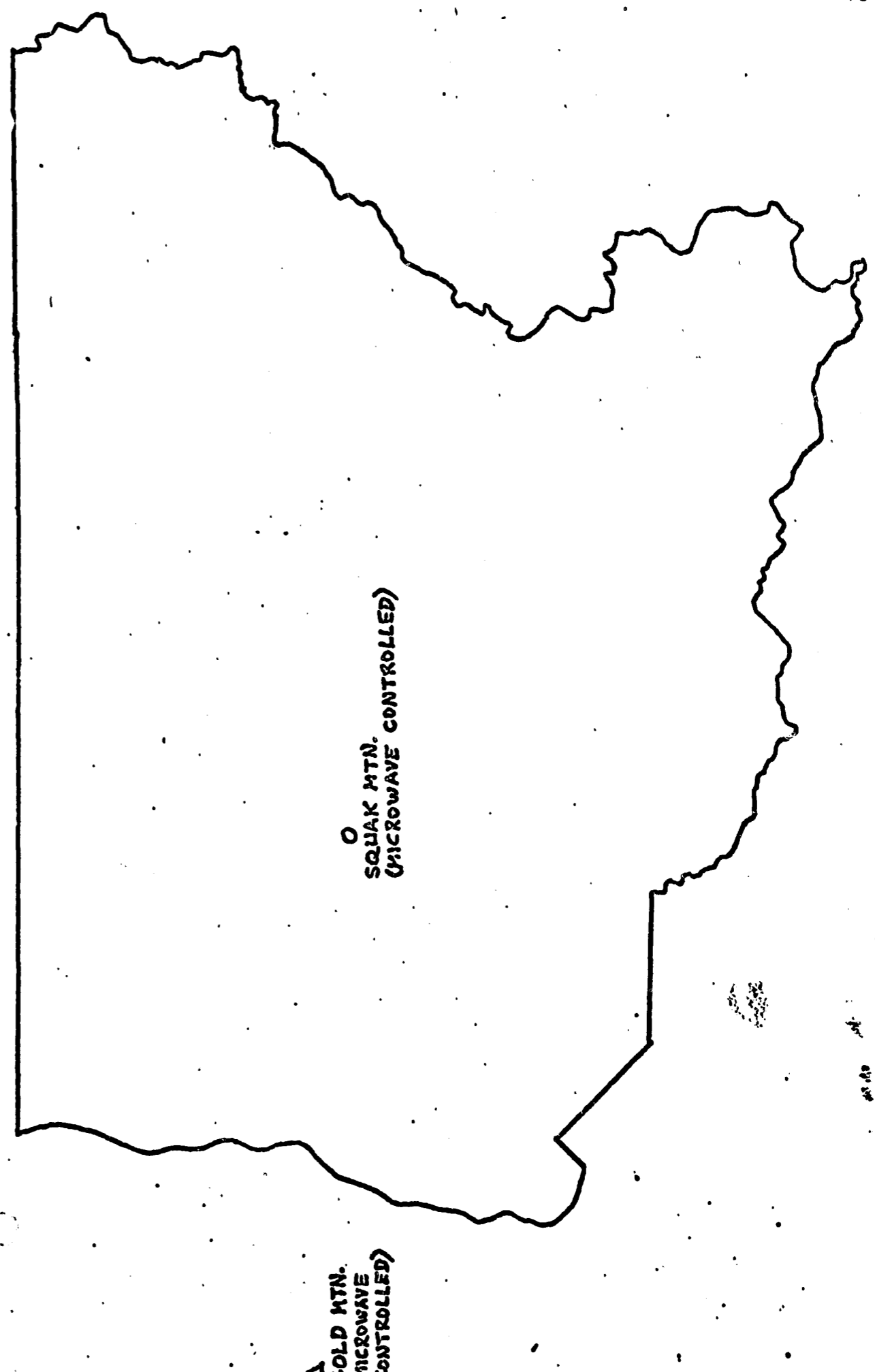


LEGEND:
 O = INSTALLED 6 GHz. TERMINALS
 Δ = 6 GHz TERMINALS TO BE INSTALLED IN 1975
 □ = PROPOSED 2 GHz TERMINALS (COUNTY PURCHASED)
 * = 6 GHz SYSTEM INTERTIE WITH WASHINGTON

STATE PATROL 6 GHz SYSTEM
 ————— = 6 GHz MICROWAVE PATHS (EXISTING)
 - - - - - = 6 GHz MICROWAVE PATHS (INSTALLED IN 1975)
 = 6 GHz MICROWAVE PATHS (PROPOSED)
 - · - · - = 2 GHz MICROWAVE PATHS (PROPOSED)

**KING COUNTY DEPT. OF PUBLIC SAFETY
 MICROWAVE SYSTEM DIAGRAM
 4-1-75 *J. J. Porter, Jr.***



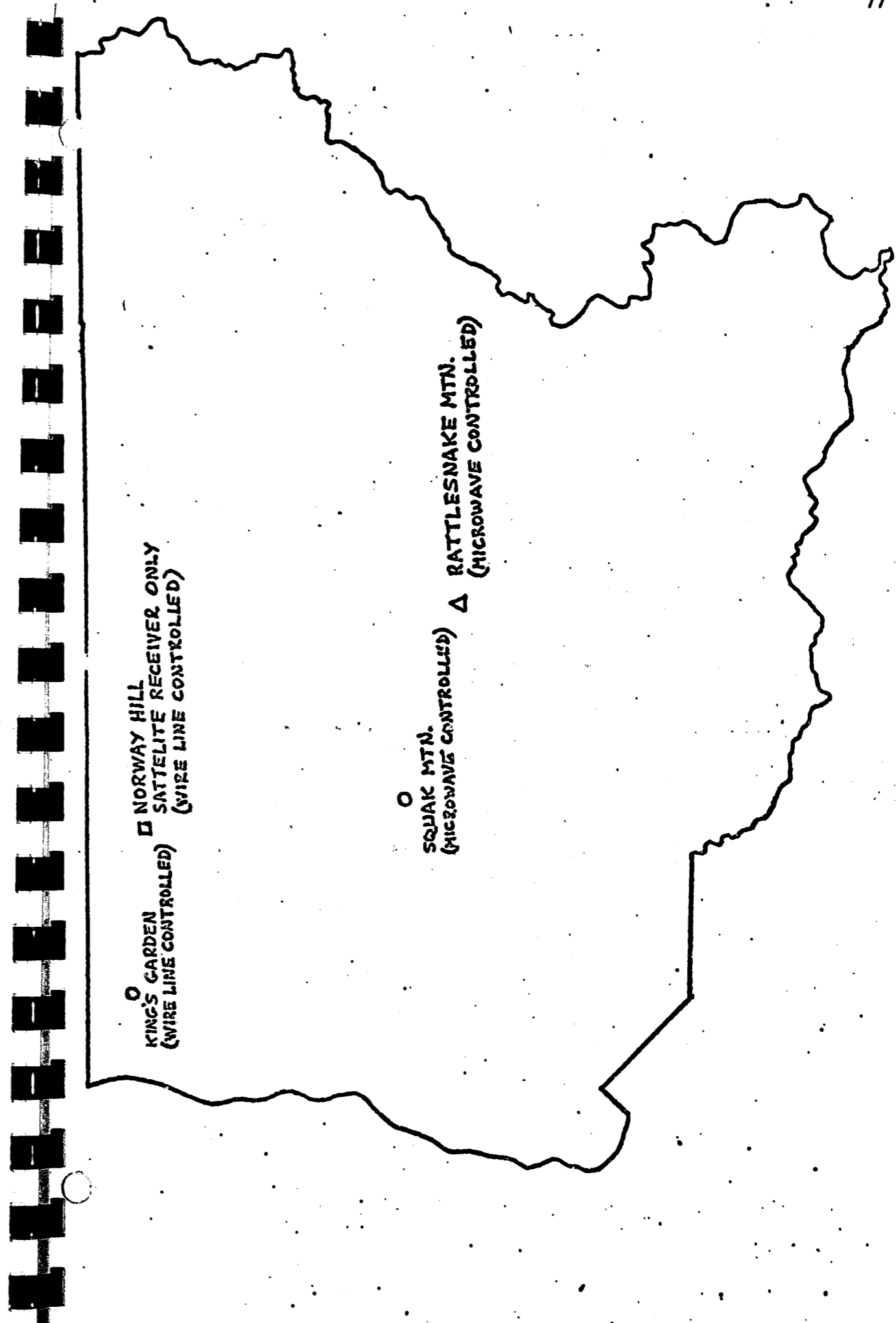


△ GOLD MTN.
(MICROWAVE
CONTROLLED)

○ SQUAK MTN.
(MICROWAVE CONTROLLED)

LEGEND:
○ = INSTALLED STATION
△ = STATIONS TO BE INSTALLED IN 1975

KING COUNTY DEPT. OF PUBLIC SAFETY
DATA RADIO CHANNEL REPEATER SITES.
TRANSMIT FREQUENCY 460.275 MHz.
RECEIVE #1 FREQUENCY 465.275 MHz.
RECEIVE #2 FREQUENCY 460.275 MHz.



LEGEND:

- O = INSTALLED STATIONS
- Δ = STATIONS TO BE INSTALLED IN 1975
- = INSTALLED SATELLITE RECEIVERS

KING COUNTY DEPT. OF PUBLIC SAFETY
NORTH RADIO CHANNEL REPEATER SITES
 TRANSMIT FREQUENCY 460.325 MHz.
 RECEIVE FREQUENCY 465.325 MHz.
 RECEPTION FREQUENCY 460.325 MHz.

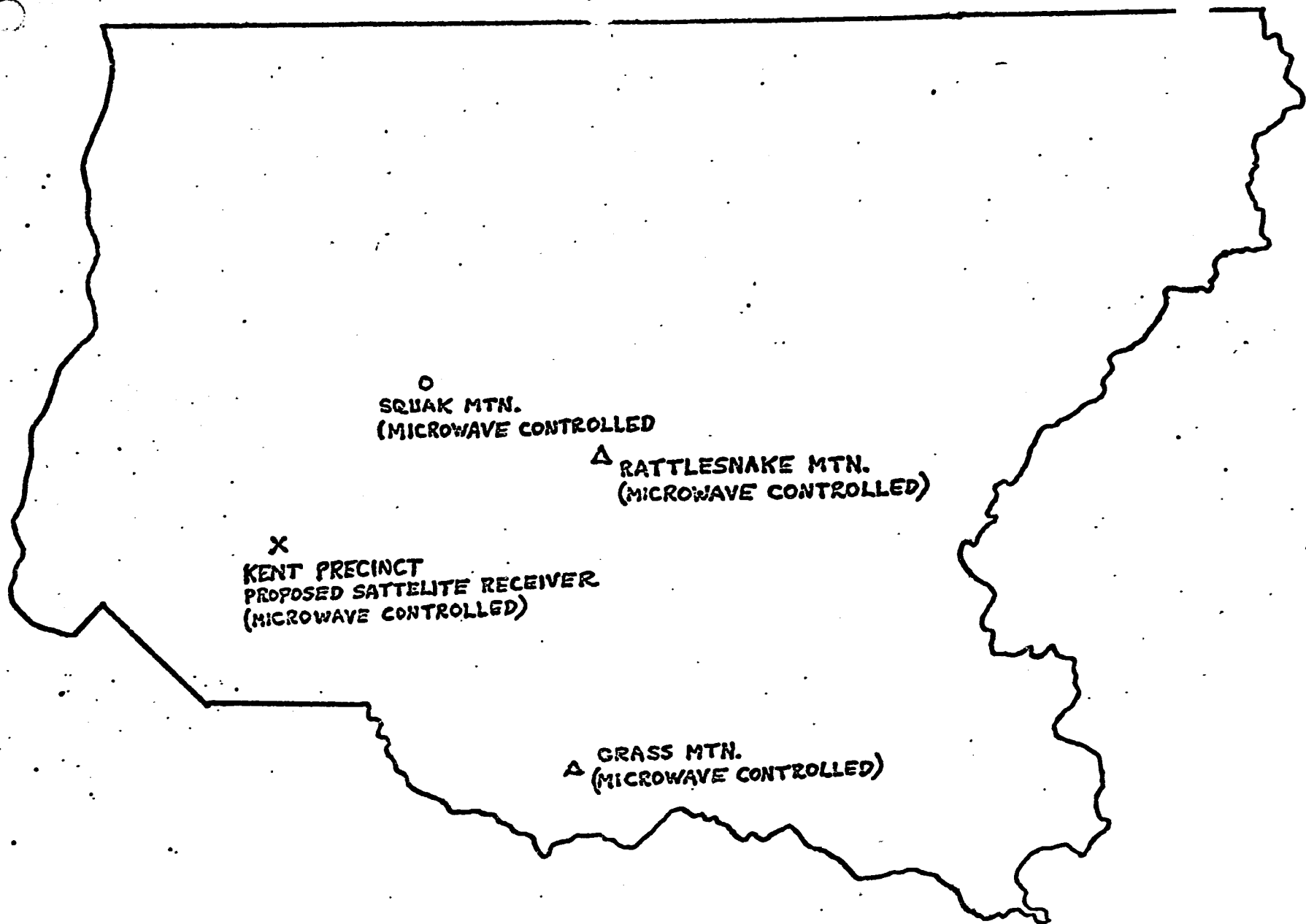
NORTH CITY
CONTROL STATION ONLY
(WIRE LINE CONTROLLED)

MALONEY RIDGE
(IN-BAND REPEATER)

LEGEND:

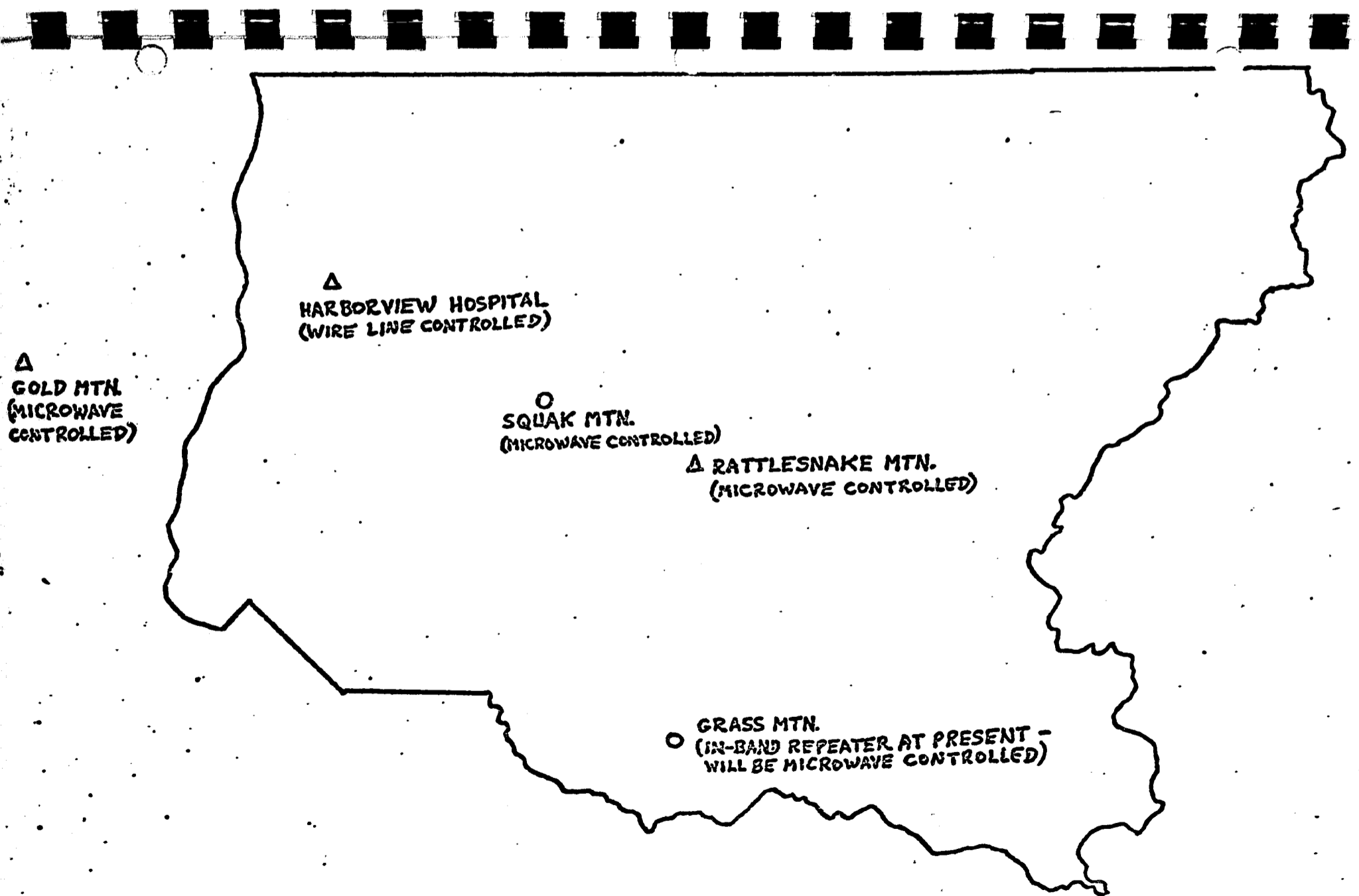
- = INSTALLED STATIONS
- △ = STATIONS TO BE INSTALLED IN 1975

**KING COUNTY DEPT. OF PUBLIC SAFETY
EAST RADIO CHANNEL REPEATER SITE**
TRANSMIT FREQUENCY 460.225 MHz.
RECEIVE FREQUENCY 465.225 MHz.



LEGEND:
 O = INSTALLED STATIONS
 Δ = STATIONS TO BE INSTALLED IN 1975
 X = PROPOSED SATELLITE RECEIVER

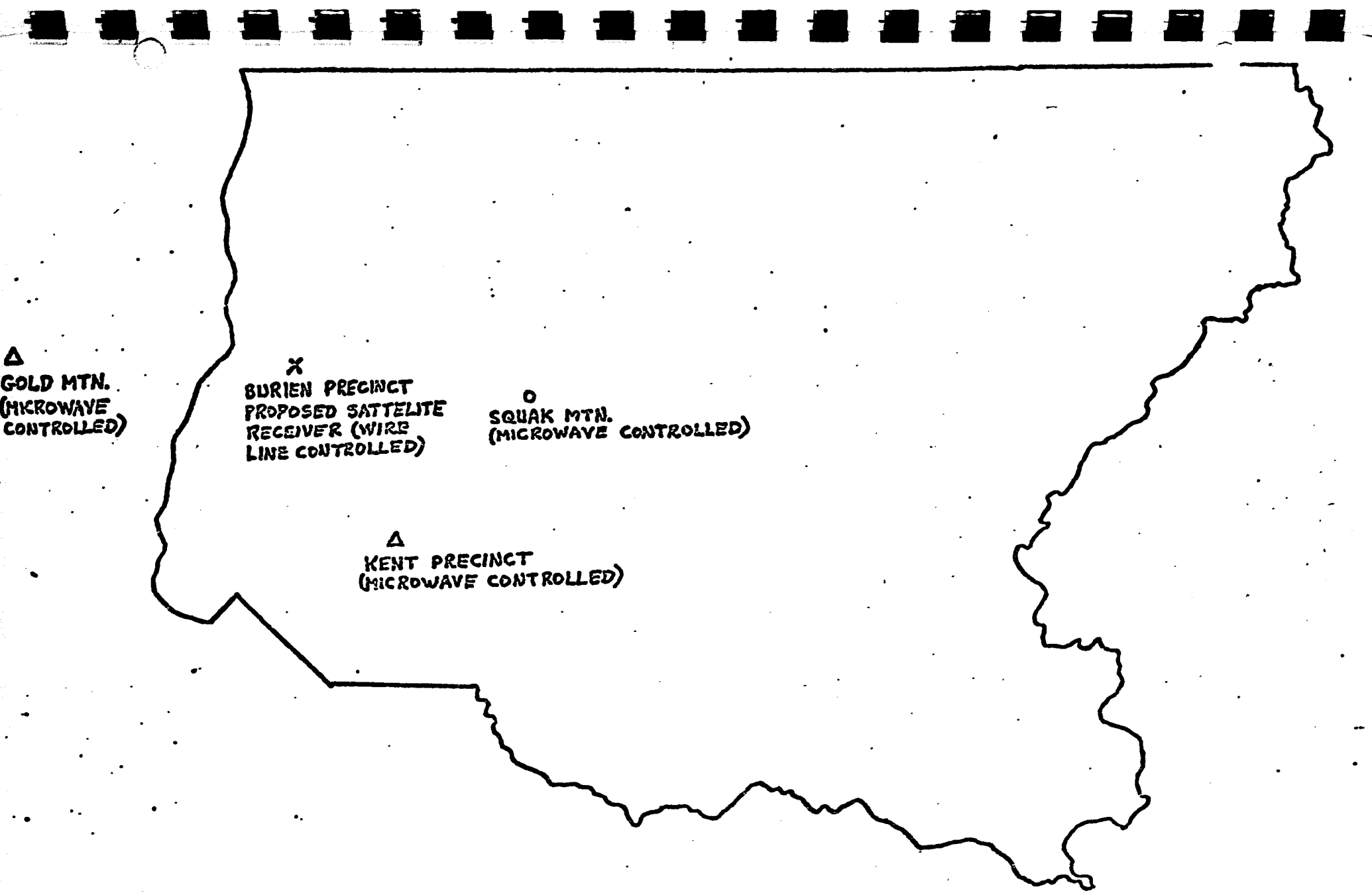
KING COUNTY DEPT OF PUBLIC SAFETY
SOUTH EAST RADIO CHANNEL REPEATER SITES
 TRANSMIT FREQUENCY 460.450 MHz.
 RECEIVE #1 FREQUENCY 465.450 MHz.
 RECEIVE #2 FREQUENCY 460.450 MHz.
 4-2-75 J.L.P.



LEGEND:

- = INSTALLED STATIONS
- △ = STATIONS TO BE INSTALLED IN 1975

KING COUNTY DEPT. OF PUBLIC SAFETY
TAC-1 RADIO CHANNEL REPEATER SITES
 TRANSMIT FREQUENCY 460.500 MHz.
 RECEIVE #1 FREQUENCY 465.500 MHz.
 RECEIVE #2 FREQUENCY 460.500 MHz.



Δ GOLD MTN.
(MICROWAVE
CONTROLLED)

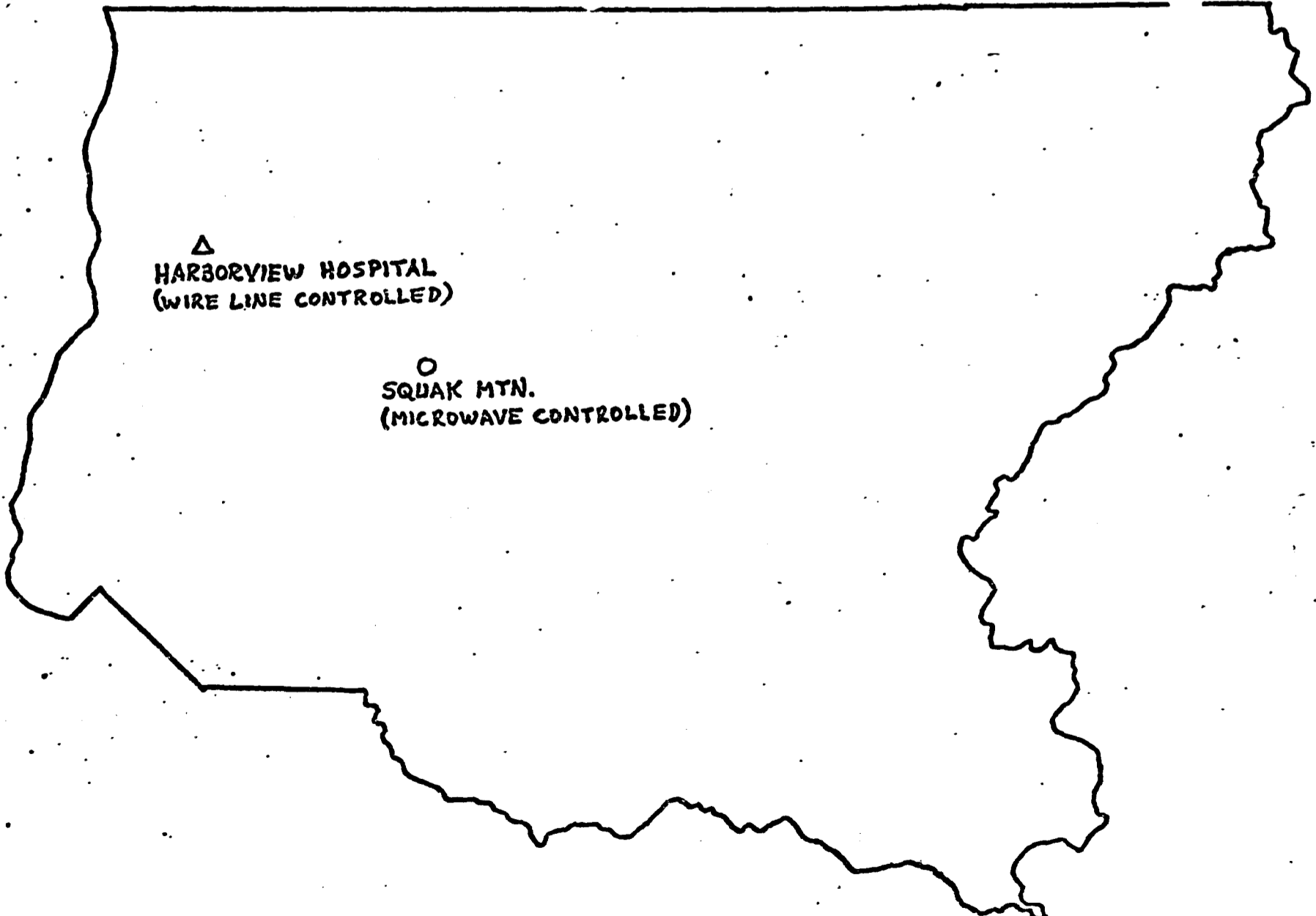
X BURIEN PRECINCT
PROPOSED SATELLITE
RECEIVER (WIRE
LINE CONTROLLED)

○ SQUAK MTN.
(MICROWAVE CONTROLLED)

Δ KENT PRECINCT
(MICROWAVE CONTROLLED)

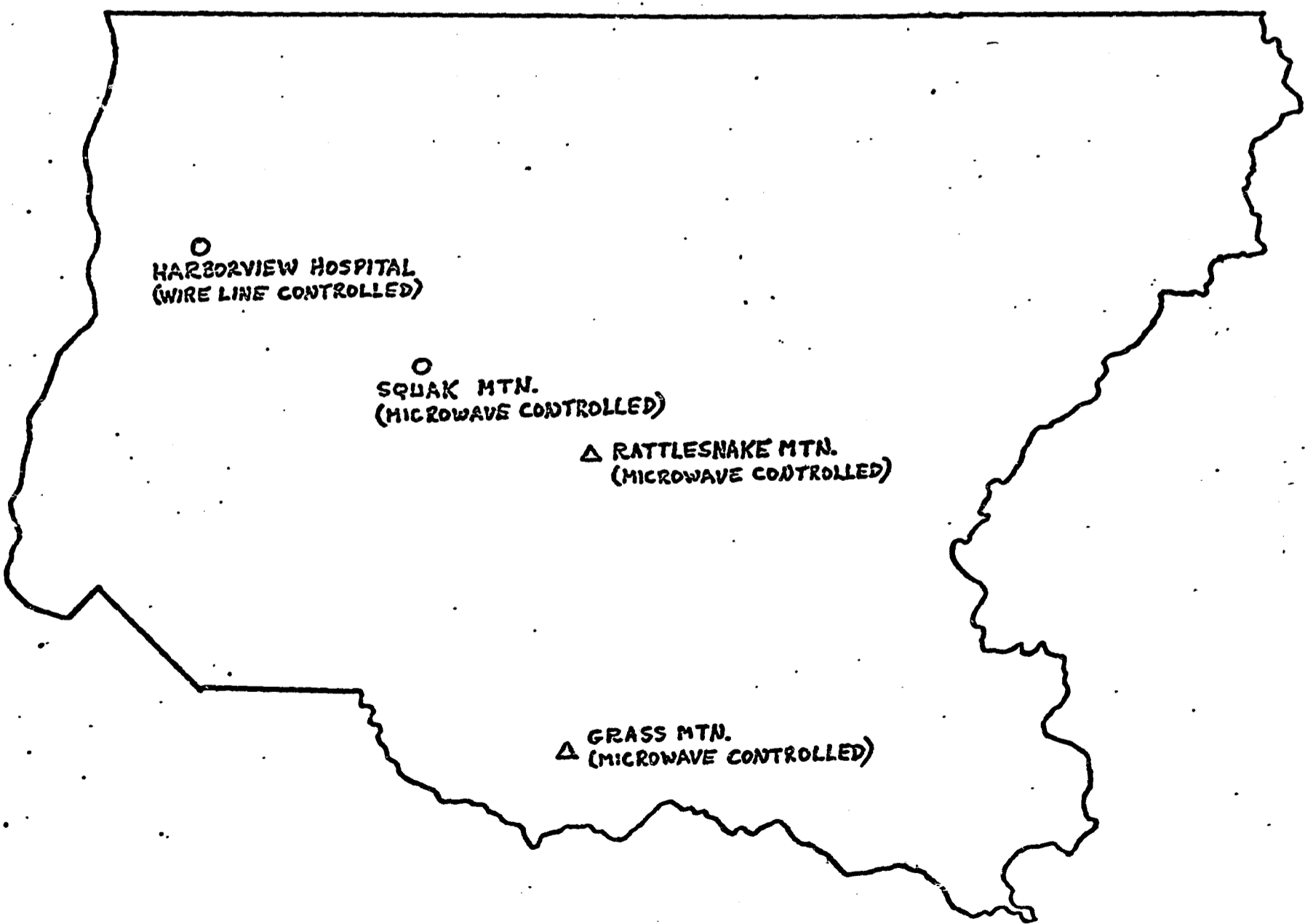
LEGEND:
 ○ = INSTALLED STATIONS
 Δ = STATIONS TO BE INSTALLED IN 1975
 X = PROPOSED SATELLITE RECEIVER

KING COUNTY DEPT. OF PUBLIC SAFETY
SOUTH WEST RADIO CHANNEL REPEATER SITES
 TRANSMIT FREQUENCY 460.400 MHz.
 RECEIVE #1 FREQUENCY 465.400 MHz.
 RECEIVE #2 FREQUENCY 460.400 MHz.



LEGEND:
○ = INSTALLED STATIONS
△ = STATIONS TO BE INSTALLED IN 1975

KING COUNTY DEPT. OF PUBLIC SAFETY
TAC-3 RADIO CHANNEL REPEATER SITES
TRANSMIT FREQUENCY 453.350 MHz.
RECEIVE #1 FREQUENCY 458.350 MHz.
RECEIVE #2 FREQUENCY 453.350 MHz.



△ GOLD MTN.
(MICROWAVE
CONTROLLED)

○ HARBORVIEW HOSPITAL
(WIRE LINE CONTROLLED)

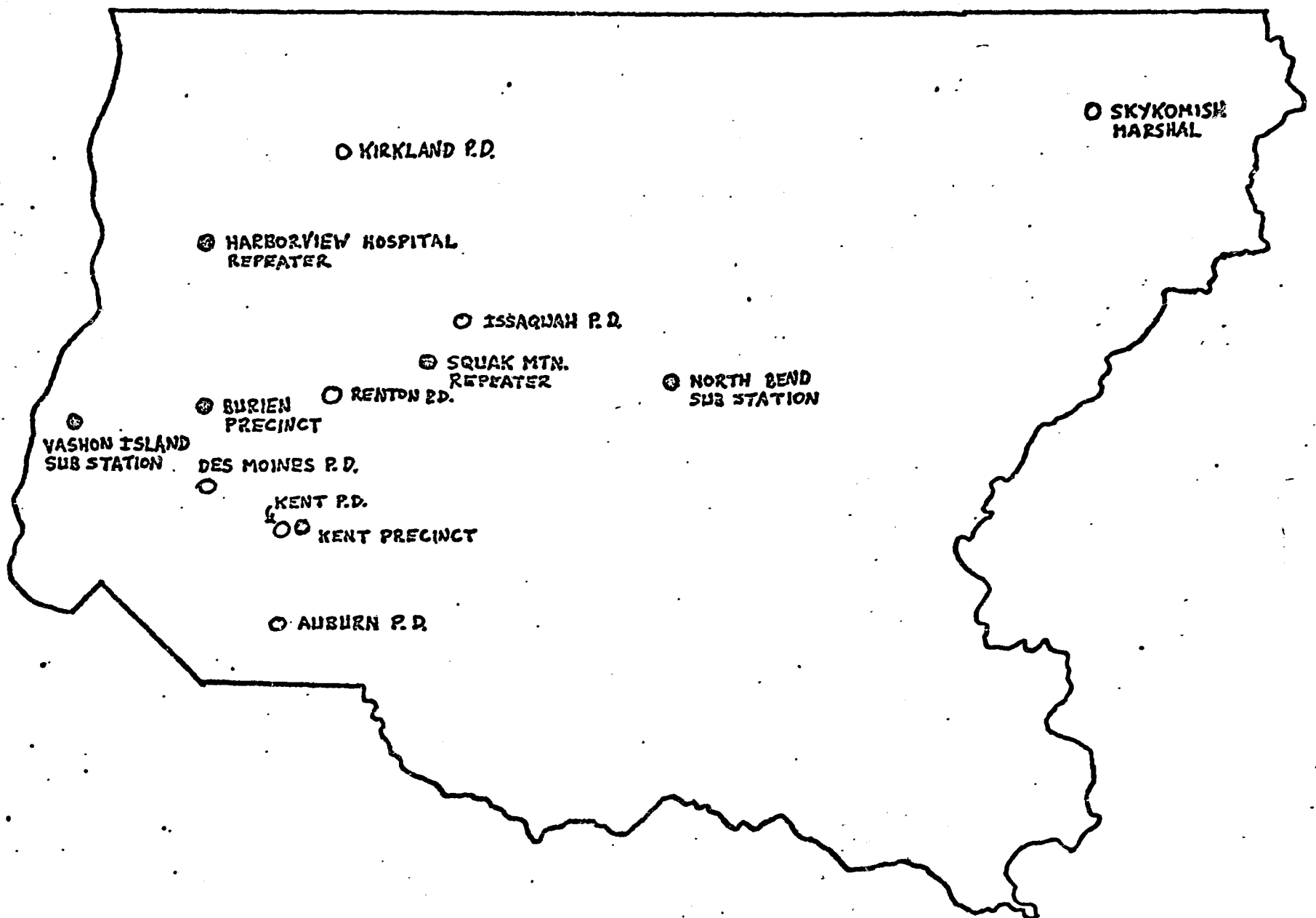
○ SQUAK MTN.
(MICROWAVE CONTROLLED)

△ RATTLESNAKE MTN.
(MICROWAVE CONTROLLED)

△ GRASS MTN.
(MICROWAVE CONTROLLED)

LEGEND:
○ = INSTALLED STATIONS
△ = STATIONS TO BE INSTALLED IN 1975

KING COUNTY DEPT. OF PUBLIC SAFETY
F-1 RADIO CHANNEL REPEATER SITES
TRANSMIT FREQUENCY 155.190 MHz.
RECEIVE FREQUENCY 154.650 MHz.
RECEIVE FREQUENCY 155.190 MHz.



LEGEND:

- ⊙ KING COUNTY D.P.S. BASE OR REPEATER STATION
- OTHER AGENCY'S BASE STATION

KING COUNTY DEPT. OF PUBLIC SAFETY
 F-1 RADIO CHANNEL
 BASE STATION LOCATIONS
 4-1-75 *J. L. Peters, Jr.*

END

7 11 11 11 11 11