Contra Costa County Public Safety Radio System – Early History

In 2001, as Telecommunications Manager for Contra Costa County, I commissioned a study by Captain Alan Burton (Ret) of the Contra Costa Sheriff's Office. His family members have provided exceptional service to our community for many generations. As part of Alan's study, he provided a wonderful glimpse into the past of public safety radio communications in the San Francisco Bay Area.

Over the years Alan became my mentor and confidant on matters regarding public safety communications. I am grateful to have known him and his family. Take it away Alan…

Steve Overacker, Telecommunications Manager of Contra Costa County 2000-2008
One of the Founders of the CCRA, Trustee and Licensee of the WA6HAM repeater system

[This historical perspective is provided to acquaint the reader with how Contra Costa County (and specifically the Sheriff's Office) reached its present condition, and its present radio network. The information provided is based on the personal knowledge and perception of the author.]

The Contra Costa County Sheriff's Office began using mobile radios in 1930, through an arrangement with the Berkeley Police Department which had just developed a regional police radio broadcasting system. With a tower on the roof of the Berkeley P.D. building, the system broadcast reasonably to Sheriff's cars throughout Contra Costa. The system was one-way, and the radios were "receive only." Broadcasts were made "blind" instructing the deputy to call his office. As of 1934, there were four Contra Costa Sheriff's cars equipped with the one-way radios. This arrangement continued until about 1939.

In 1935, with the election of a new Sheriff, Contra Costa County embarked on a venture to develop a two-way radio system. Applications were submitted to the new Federal Communications Commission, and a license was issued for a 100-watt transmitter located in the County Courthouse in Martinez (now the Finance Building). The license was limited to only 100 watts due to an FCC requirement that transmitter power was tied to the population serviced. The county population was 100,000 and the maximum authorized power was 100 watts. The range of the transmitter was about ten miles. Consequently, the Sheriff's Office continued to receive dispatching services from Berkeley.

In 1939, the radio engineers for the Contra Costa and Alameda counties joined together to develop a regional system to cover the two counties. The system was designed to include high-powered transmitters in Martinez (for Contra Costa) and in San Leandro (for Alameda) which would be used to broadcast to the cars. In return, the mobile units for the two agencies would share an unattended automatic radio repeater on Mount Diablo. Because the range of the Diablo repeater extended much beyond the two counties, Contra Costa entered into agreements to provide two-way dispatch services to a number of other rural counties in Northern California. The combined populations were sufficient to justify a 500-watt base station in

Martinez. (The base station transmitted on 1658 kc; the mobiles transmitted in the 40 mc band, which were the highest frequencies then available from the FCC.)

In 1950, a new communications headquarters was built at 2130 Arnold Industrial Highway (now 30-40 Glacier). The 150-foot tower was removed from the Martinez Airport property and re-located to the new facility. A new, 1000-watt transmitter was purchased. Central dispatching was provided from this location until 1955 when the newly-elected sheriff moved all sheriff's dispatching to the new County Administration Building (called Control 2) and all other dispatching remained at Arnold (Control 1). The dispatching arrangement continued until 1964 when dispatching was again centralized on the seventh floor of the new administration building.

In 1959, two events occurred which would have a major impact on the sheriff's communications. The FCC decreed that they were phasing out the use of AM broadcast-band radio systems, upon which Contra Costa had relied since 1930, and their own system since 1939. Contra Costa was directed to abandon the use of the AM system and seek an alternative. At about the same time, the State of California served Contra Costa County notice that there was no longer room for the county's radio equipment in the State's radio vault on Mount Diablo. Although the State has since claimed that their action was not an actual eviction, it served the same purpose. Contra Costa was required to remove their world-renowned radio repeater from Diablo by 1960.

There were few alternatives available to Contra Costa at that time. The decision was made to license a two-channel network using new frequencies in the 155 MHz band, then known as VHF High Band (as differentiated from the frequency used on Mt. Diablo which was in the lower half of the VHF or Very High Frequency band.). Utilizing space in the East Bay Regional Parks building on Bald Peak (also known as Vollmer Peak), a simplex transmitter-receiver was licensed to cover west county. A new site was developed above Clayton that was known as Kregor Peak, and a second simplex frequency was licensed for this site to cover central and eastern county. A microwave radio system was designed to connect Bald to Kregor, and Kregor to Arnold. This two-channel simplex system was used from 1960 and has been modified continually in the years since. It is the basis or foundation of the existing Sheriff's system.

George Burton retired from the county as director and chief radio engineer in 1966, replaced by James F. Angliss. During Angliss' ten years with the county, he added radio sites at Rocky Ridge (above Danville), and Crockett Peak (since abandoned when the county developed Cummings later), and Martinez (County Administration Building). The additional sites permitted an expanded microwave network that was configured in a self-healing loop, connecting (in order) Arnold, Martinez, Kregor, Rocky, Bald, Arnold; with Crockett as a spur. The additional sites vastly improved coverage at a time when handheld portables were coming into general use.

During Angliss' tenure, he developed the use of mobile radios as base stations at all the county's transmitter sites. This novel and unprecedented approach saved the county space in the cramped vaults. Because the size of the vaults was dictated by practical issues including availability of funds, the approach was necessary. At the same time, Angliss found it expeditious to manufacture some communications equipment in the Sheriff's comm shop. The county used a

number of VHF Low Band channels, and each of those required a filtering device known as a cavity, which resembles a stovepipe about six feet long. For many years, cavities were homemade, which saved the county considerable amounts. The mobile radio base stations and the homemade cavities are still in general operation, but it is expected that they will be phased out in the near future. The change from using mobile radios as base stations will impact on space in the existing and future vaults.

In 1974, Angliss quit, claiming he had been promised that Communications would be removed from the Sheriff's Office and was not. Alan Burton was named interim director for eighteen months, replaced by Roy Kong, who remained in the position for only eighteen months. Following his departure, Burton was named as permanent director where he remained until 1984.

During the period 1974-84, the system continued to grow. The Crockett Peak site was closed, replaced by Cummings Peak, utilizing a combination of solar cells and a windmill for power. Highland Peak, above Morgan Territory, was added at the same time, with the same power sources.

In 1975, the county implemented a new radio system for ambulances and paramedics. This system uses two channels in what is known as the "UHF T-band" (the channels having been originally allocated to broadcast television). These two channels (in the 488-491 MHz range) remain in operation today. It was the County's first venture into the UHF band.

Delta Regional Communications Center (DRCC) was opened July 1, 1981. At the time, the Sheriff's Office still used only the two original (1960) radio channels. DRCC made use of a third channel which had previously been used by Antioch P.D. As part of the contract with the cities, it was agreed that if the DRCC dissolved, the new channel would revert to County control and use. The DRCC did dissolve, and the channel is now one of three used by the Sheriff.

A major microwave radio system expansion occurred 1980-81, creating a larger self-healing ring which included (in order) Arnold, Kregor, Stoneman, Delta, Highland, Rocky, Bald, Nichol, Cummings, Martinez, and Arnold. Non-ring spurs included Brentwood (fire), Pinole (Animal Control), Lafayette (fire), Danville (fire), Concord (Fire Station 10). It was intended that the new system would/could be used for telephone interconnect, and there was a microwave terminal in every telephone exchange area in the county. New FCC and PUC rules negated that proposal. It was also intended that a low-level cross-band network could be installed that would permit the Sheriff's Office (on VHF HB) to communicate with the police departments that were using UHF (460) channels. Frequencies were licensed and set aside for that purpose.

After 1985, the technical services unit of the Sheriff's Communications Division was reassigned to the General Services Department (GSD). It was reported that the rational was because radio services in other counties had followed that course. Although technical services were removed, the Sheriff retained the services of one technical radio manager. There are strong perceptions that GSD's management of the public safety radio infrastructure left much to be desired, from the viewpoint of the Sheriff's Office. It is reported that an internal CAO consulting report recommended that telecommunications be removed from GSD and transferred to the Department

of Information Technology (DoIT).due to customer and employee dissatisfaction. The transfer was accomplished in 2000.

It was after 1990 that efforts were made by the Sheriff's Office to correct severe portable radio coverage deficiencies. The system was changed from three simplex radio channels to three repeated channels. In the former, mobiles and portables would be heard only by the dispatchers, and those other units close enough to hear them. In the new system, one predominant site was selected that best-covered the zone, and that site was used to repeat (at higher elevation and power) whatever it heard from the mobiles and portables. This arrangement added considerably to the range of the low-powered portables and was a distinct enhancement.

Unfortunately it had a downside. For example, the west zone uses Bald Peak as the predominant repeater site. Anyone who uses the western zone will have their message repeated on Bald Peak, regardless of their location. (It is acknowledged that the dispatcher can select an alternate repeater, which in the western zone is Cummings Peak, above Crockett, but the selection is not automatic – it requires a conscious decision and a manual action.) The difficulty arises when two units are outside of the coverage area of Bald Peak; for example, in Crockett. The two units may be able to see each other, but since neither can hear Bald, they cannot communicate. It is true that they can contact the dispatcher and ask for the repeater to be switched, but this also requires an understanding of the system at the moment, and a conscious act on the part of a user or a dispatcher.

The reason only one repeater is turned on at a time deals with a technical requirement. Since the western zone can be covered with two or three repeaters, the logical question would be: Why not have all three repeaters broadcast at the same time? The answer is that you can, but for those mobiles/portables that are able to receive messages from more than one repeater, their resulting received message will be garbled. To correct this deficiency, the use of "simulcasting" equipment is often specified. Simulcasting uses a technology in which all the repeaters are timed to turn on a fraction of a second different from each other. The required equipment is sophisticated but is in general use, and has been proven to be of great value. In the example cited above, with simulcast, two west county units in Crockett would be able to talk because their transmissions would be repeated on Bald and Cummings at the same time (as well as any other repeaters necessary to cover the zone). The reception would be clear and readable regardless of their location.

Changing to a repeater concept was a good idea; it improved communications. It was also a bad idea because it left many users with poorer communications than they had before. To return to the former simplex system does not appear to be a reasonable or prudent alternative. To continue with the system in its current state raises officer-safety issues.

During September of 2001 Contra Costa County Sheriff, Warren Rupf made a special presentation to Alan Burton. It was a very special day.