

Richard Chuck
MERA Communications Engineer

P.O. Box 0416
Cotati, CA 94931-0416

August 31, 2006

Marin Emergency Radio Authority
Mr. Martin Nichols, Executive Officer

Marty,

At the last MERA executive committee meeting we were tasked with finding an independent consulting firm to review system traffic loading (capacity) based on the following criteria:

- A. Establish a system capacity baseline with the current number of radios
- B. Determine current system capacity after installation of all users and at the 10 year expansion level.
- C. Analyze December 31, 2005 usage and determine contributing factors for system busy signals.
- D. Prepare recommendations on the need to expand the current system.
- E. Determine availability of equipment to increase system capacity.

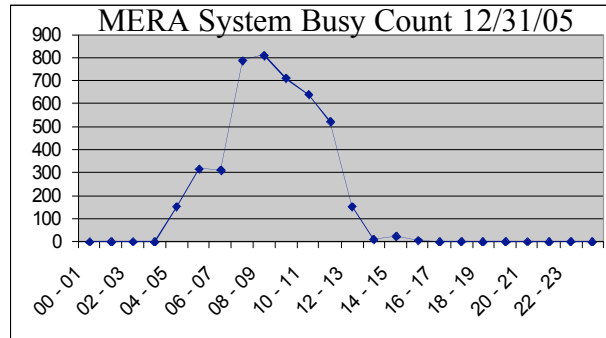
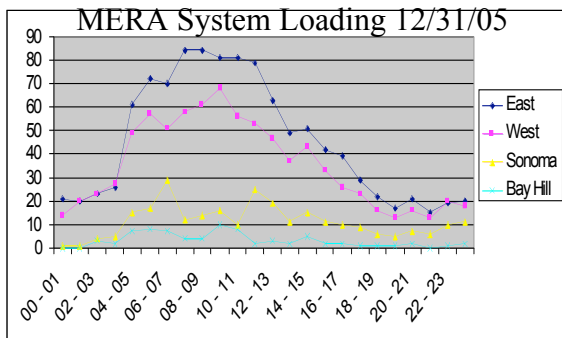
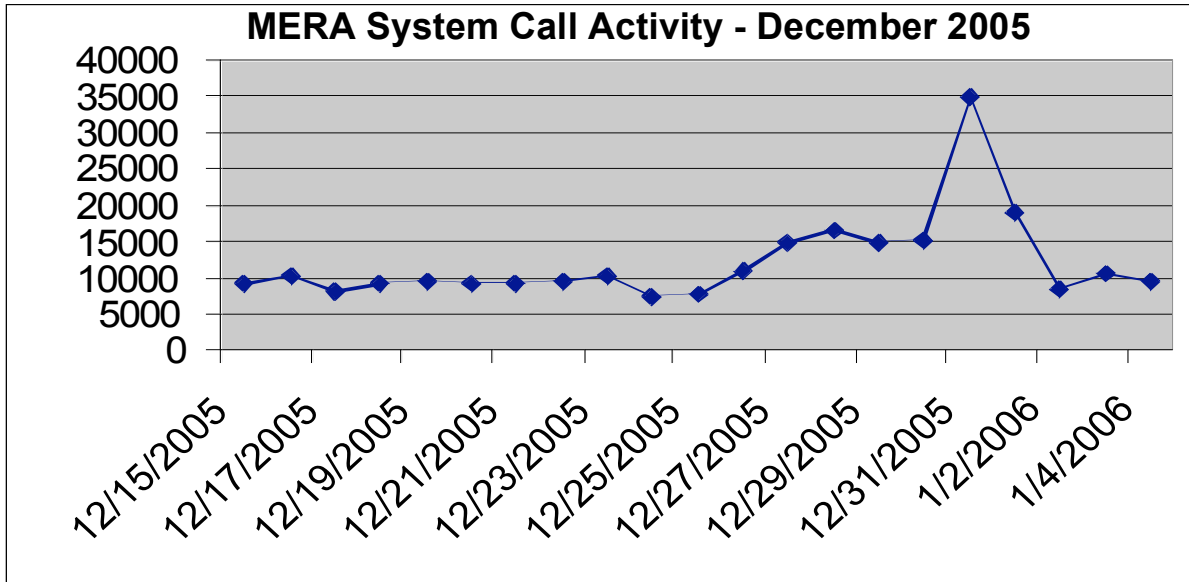
Background:

On December 31, 2005 the Marin County area was subject to severe flooding, primarily in the Southern Marin area. As public safety and public service work crews were called in to respond to this emergency the amount of radio traffic increased dramatically resulting in numerous "busy" indications and some excessively long waits before a radio channel was available. The excessive number of busies occurred during the hours of 04:00 AM to 01:00 PM. Some public safety users at the scene report that they had to "wait twenty seconds or more" for a channel. All MERA system channels in the Southern Marin area were operational at the time.

System Information:

The MERA system was designed in 1998 to accommodate 1717 mobile and portable radios with a P.01 grade of service. In other words, the MERA network can accommodate 1717 radio users during a peak busy period and only 1 user in 100 should be blocked from making a call. Normal voice traffic on the system will not notice any "busy" delays on a day to day basis. The MERA system will give a caller a "busy" only when all of the radio channels in a zone are busy. The Eastern zone has 9 available channels (1 is used for the control channel and not available for voice traffic) and the Western zone has 6 available channels (1 is used for the control channel and not available for voice traffic). In addition, all radios in the system are assigned a "priority" which gives public safety radio users a higher preference over public service radios if they are put into the busy queue due to heavy system activity. Priority only comes into play when all channels are busy and a queue has been formed by more radios wanting to talk than there are available channels. Statistics showed the busy queuing and

priority systems worked as designed during the flooding. On December 31, 2005 over 35,000 transmissions were recorded on the MERA network with over 130 hours of actual on the air radio usage. The MERA backbone was transmitting continuously on the air 87 percent of the time during these hours. Original system design calls for a peak period loading of 60 percent.



Actions Taken since December 31, 2005:

Following the December 31, 2005 flooding, the system performance was analyzed by myself and the personnel from the County Radio Shop. The results were presented to the TAC committee and their recommendations were:

- A. Find out how many new radio channels are available?

The consulting firm of CSI has been hired to investigate and license any available UHF-T band radio frequencies that could be used to expand the MERA system. A number of possible channels have been identified in the local area but, the search

must be continued in a 40 mile radius to meet FCC requirements. More information on these possible channels will be known in the next few weeks and a face to face meeting with MERA executive officer will be scheduled to discuss anticipated action plans.

- B. Meet with agencies to review individual training scenarios to include enhanced operational training regarding system busy operations.

The training committee has met once regarding operational issues which were identified as a result of the December 31, 2005 activity. Training issues were identified and will be incorporated into future and remedial training. It should be noted that a number of agencies such as County Fire and SO have been issued their portable radios for interoperability with other MERA agencies already converted and using the new MERA system. In depth training for these agencies was not planned until the mobile radios were to be installed following the Bolinas site install. Marin County Fire has held additional radio training regarding at scene use of the MERA system and conventional channels.

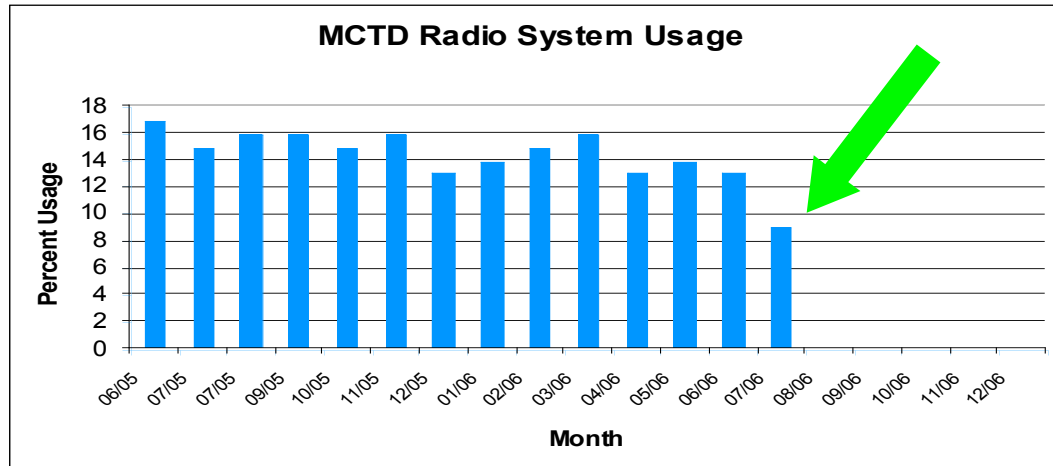
- C. System "Hang-Time" duration review.

Time can be saved by reducing the amount of time the system waits (called hang time) for one radio to reply to another before the channel is made available for other users. Calculations showed over ten hours of valuable talk time were consumed by the hang time function on December 31, 2005. The system wide hang time was reduced from 3 to 1.5 seconds. It is not desirable for total system operation to reduce this time completely to zero. By reducing this time it gives the higher priority public safety users more opportunity to get in and make a call. The change was accomplished on a system wide basis and has made a reduction in system loading. This reduction in hang-time has very little effect on day to day operations and will only be noticed during heavy system operations when a busy queue is initiated.

- D. Review amount of air-time used by MCTD (Whistle Stop).

During the period of December 2005 Whistle Stop Wheels was the largest user of air time on the MERA network. The conversations used for WSW dispatch operations tend to be longer duration than public safety dispatch calls. This fact, in addition to the hang time issues stated in the above paragraph, represented a significant chance to produce system busy delays for other public safety system users. In an effort to reduce the chance of WSW conversations causing busy delays to higher priority public safety users, all WSW radios have been programmed to have a minimum hang-time. In this mode, each transmission drops immediately and gives other higher priority users an opportunity to make calls on to the system. WSW dispatchers have been contacted to visit various public safety dispatch centers so their dispatching techniques could be revised in an effort to save air time. Preliminary reports indicate the WSW system usage has been reduced from approximately 17% to approximately 9% or less

on a daily basis. Use of digital dispatching (MDT's) for WSW units is also being explored.



System Capacity Expansion Study:

The initial MERA system capacity study was completed in 1998. The data used as a basis for this study was collected from computer aided dispatch records and best guess estimates from field operations personnel. A review of the original request for proposal prepared by The Warner Group showed the proposed MERA network would need to support 1,717 radios. The actual number of radios installed, or yet to be installed, on the MERA network is 2,467 radios which reflects a 43 percent increase over initial predictions. Of course the actual number of radios used on the network at any one time is less than the total number of radios. These radios were added during the subsequent system design and contract negotiation process along with individual agency procurements. Day to day activity on the existing MERA network is an excellent source of empirical data and a predictor of system activity and is a tremendous aid to fully characterize the present and anticipated system loading and usage patterns.

Motorola has informed MERA that after January 2007 certain equipment required to expand the backbone network will no longer be available, although parts will continue to be available to repair the existing MERA network. **Any system expansion is impossible without additional radio channels.** Motorola has provided a ball park estimate of four million dollars to expand the MERA network by adding three channels on the East system and six channels to the West system. A system upgrade may involve a re-allocation of system resources and could possibly encompass more than just adding channels to the network. Motorola will perform a proprietary "NetCalc" engineering study of present system usage and make recommendations for capacity upgrades for \$50,000. A negotiated portion of the Motorola study fee would be applied towards purchase of the system upgrade. The MERA TAC felt this cost was excessive and recommended to the MERA Board that \$25,000 be approved to obtain an independent capacity study. I have made inquiries with consulting firms regarding a capacity study and have found firms hesitant to commit to such a study without knowing how many radio channels would be available for expansion. No independent firm is willing to

August 31, 2006

guarantee capacity under varying load conditions with the number of channels unknown. The firms I have contacted are MACRO Consulting, CSI Telecommunications Engineers and Hatfield & Dawson Engineering.

MERA has the option of not proceeding with any system upgrade at this time. Should this option be exercised, the consequences are 1) the possible loss of any new radio channels acquired during the expansion process, 2) substantially higher cost of system backbone expansion after supplies of Motorola SmartZone 3.0 trunking backbone equipment are no longer available, and 3) if MERA waits too long to upgrade, the only option may be to implement a totally new network.

My recommendation is that MERA approve the \$50,000 Motorola study and have the Executive Officer negotiate with Motorola to get the greatest possible rebate credited to a future system upgrade should MERA decide to proceed. With the study results in-hand Motorola can then provide an accurate cost estimate for the system expansion.

Recommendations:

- A. All agency training personnel should refresh their MERA mobile and portable training.
- B. Change all non-public safety radios to utilize a minimum hang time.
- C. Negotiate with Motorola to determine the best possible rebate on the cost of the \$50,000 capacity study should MERA proceed with a system upgrade.
- D. Contract with Motorola to do the \$50,000 system capacity study.
- E. Have Executive Officer meet with CSI to assure their licensing time line meets our goal of having channels allocated within the next 90 - 120 days.
- F. Perform a monthly review of system activity and report on the effects of changing system parameters.

Sincerely,

Richard Chuck