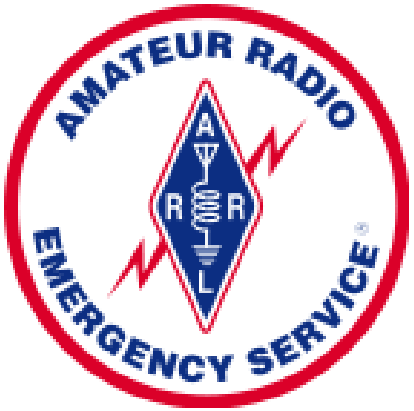


Infrastructure Improvements

June 20, 2017

Calvert AUXCOMM

Calvert EOC Status

- Primary EOC at Courthouse has old 2M radio, very marginal transmission line and old antenna
- Alternate EOC at Barstow has a RACES position but no radios or antennas
- Monopole behind courthouse will be coming down

Mt Hope Status

- New county-owned tower now under construction
  - Part of new county emergency comm system
- Older American Tower structure will remain for approximately 4 years then be taken down
- 146.985 repeater will be moved to new tower
  - No date yet for this move
  - Antennas for AUXCOMM already in county plan
- K3CAL-1 digipeater (145.750) operational using high antenna on old tower
  - Shared dual band antenna with 440 link

Prince Frederick Status

- 444.950 repeater on State Highway tower
  - Currently using Decibel DB-224 2M dipole array
    - SWR < 1.5
  - The Decibel DB-416 70cm dipole array and/or feedline has issues with coverage
    - Antenna problem ?
    - Sweep showed impedance bump at 230 ft down the 250 ft feedline
    - Could be tower shadowing that causes loss of coverage
      - http://urgentcomm.com/networks-amp-systems-mag/friend-and-foe
    - Longer standoffs might help
- K3CAL-10 digipeater (145.750) operational and sharing the DB-224 antenna with a diplexer

The Problem

- Need new antennas, feedline and radios at the primary (Courthouse) EOC.
- However, county will not allow any antennas on the courthouse that extend more than about 5 ft from the roofline at the back of the courthouse.
  - Unclear who or what group is behind this decision but we have to live with it.
- Tests on roof show marginal path to 147.105 Davidsonville (Central Regional Net).
  - Could raise 147.105 but short of full quieting
  - Critical in region-wide call-up
- Currently no AUXCOMM radios or antennas at alternate EOC in Barstow


Satellite
38°32.31' N 76°35.03' W, FM18QM
Overlays
Red Line is
Direction to ERN
Hallowing Park
Calvert County
Circuit Court
166° 24.5 miles
Duke St

County's Solution

- County has hired a communications engineering firm to help with the new county system build-up
- The consultant (he's also an amateur radio operator) has recommended we locate EOC antennas on the Barstow tower and use RemoteRig from the Courthouse EOC
  - RemoteRig connectivity using a dedicated and redundant Virtual LAN (VLAN) from the Courthouse to Barstow.
  - Independent of the internet
  - Buried fiber backed up by microwave
    - "0.99999 reliability"

The Catch 22

- The new county emergency communications system will be highly capable and robust
- Unlikely to need AUXCOMM except in the very worse case scenario
- But the worse case scenario may include loss of the VLAN, which would mean loss of AUXCOMM link from EOC to Barstow.
  - Calvert AUXCOMM EOC ops limited by low & small antennas

Compromise

- Use RemoteRig as proposed to link both primary and alternate EOC's to radios at the Barstow tower shelter.
- Include a separate radio at Barstow capable of acting as a cross-band repeater to reach Davidsonville
- Install 2 or 3 small dual band antennas (diamond X50A's) on the courthouse to reach the cross-band repeater as well as CARA repeaters/digipeaters
  - Note: Only radio front panels at EOC seats, so RemoteRig used to reach radio RF deck's in the EOC equipment rooms
  - These RemoteRig connections would be made by dedicated CAT5 cable. No VLAN.

Radios

- Need dual band radios capable of working with RemoteRig
- Need a radio capable of operating as a cross-band repeater that can also be remotely controlled (i.e. remote control of cross-band enable and disable).
- Possibilities:
  - Kenwood TM-V71A
  - Kenwood TM-D710G

Progress to Date

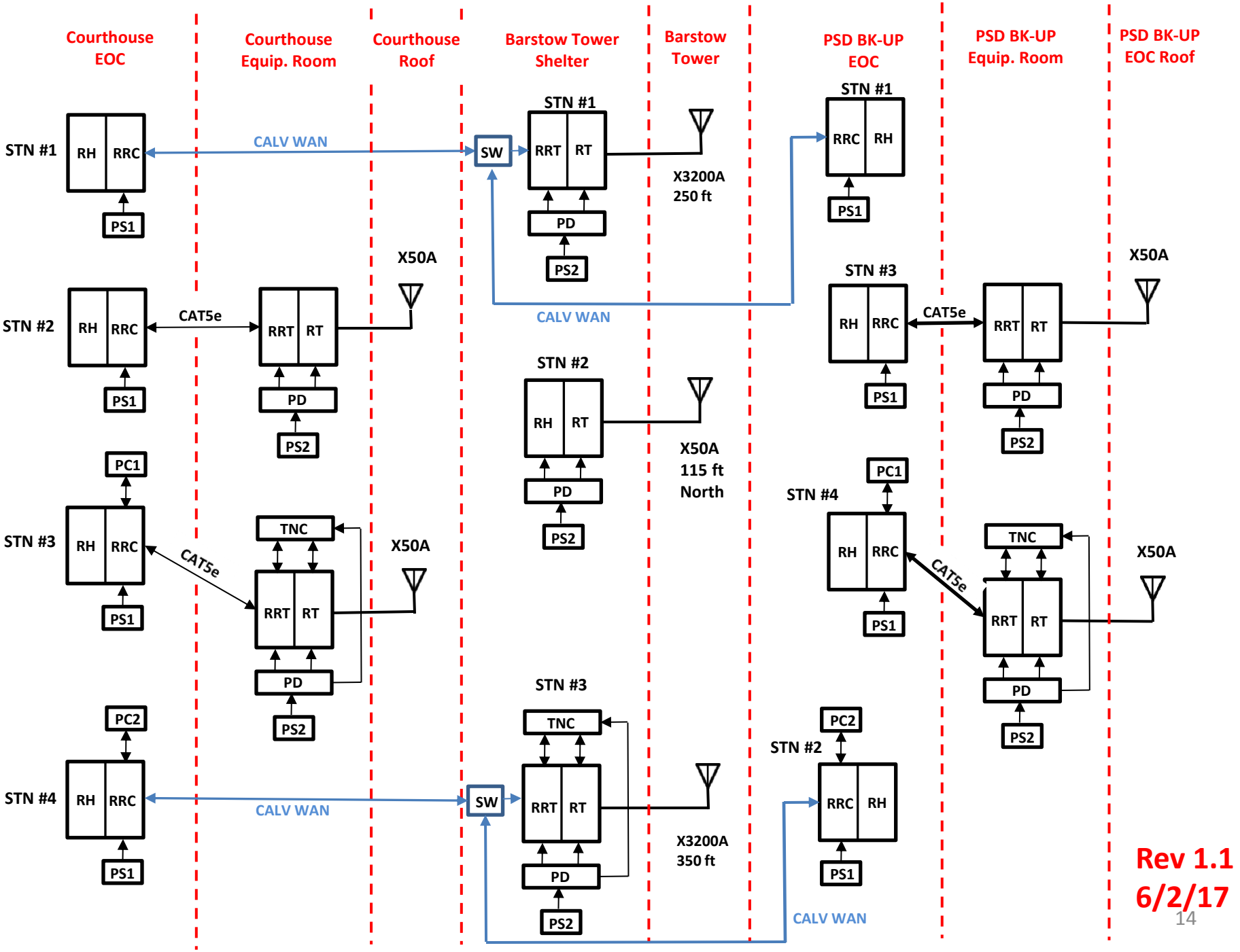
- The county has purchased a TM-V71A and a set of RemoteRig terminals for beta testing.
- The TM-V71A is cross-band capable and can also be remotely controlled using DTMF over the UHF side.
  - Significant learning curve to use the remote control feature if one cannot “see” the radio’s front panel.
  - TM-V71A has a built-in CW identification to meet FCC requirements when in cross-band, but implementation is not perfect.

Progress, continued

- N3AE and N3XMZ started to configure RemoteRig to work with the TM-V71A
  - Successful with both direct CAT5 connection and connection over a LAN
- Still need to confirm RemoteRig's "transparent" RS-232 link can be used to communicate with a packet modem (e.g. KPC-3+) located remotely with the radio RF deck.
  - latency problematic sending packet audio over a LAN
- Need to confirm RemoteRig will play over county VLAN.

The Big Picture

- Our EOC requirements as we see them:
  - Two AUXCOMM operator seats at each EOC
  - One voice radio and one packet radio at each seat
  - One PC and screen at each seat
    - County provided and connected to their LAN
  - Local voice repeater and digipeater access directly using roof mounted antennas (independent of county systems except building power).


Courthouse EOC
Courthouse Equip. Room
Courthouse Roof
Barstow Tower Shelter
Barstow Tower
PSD BK-UP EOC
PSD BK-UP Equip. Room
PSD BK-UP EOC Roof
STN #1
RH
RRC
PS1
CALV WAN
SW
RRT
RT
PD
PS2
X3200A
250 ft
STN #2
CAT5e
X50A
STN #3
PC1
TNC
X50A
115 ft
North
STN #4
PC2
X3200A
350 ft
Rev 1.1
6/2/17

Symbol Legends

- RH Radio front panel (radio head) for RT
- RT Radio RF deck – Likely Kenwood TMV-71A or TM-D710G
- RRC RemoteRig radio control panel interface, p/n 1258MkIIs-Con
- RRT RemoteRig radio RF deck interface, p/n 1258MkII-Rad
- PS1 RRC power supply “wall wart,” p/n 1258-PS-US
- PS2 13.8 vdc power supply for radio, RRT and TNC. Model TBD
- PD Fused power distribution panel – Likely RigRunner 4005
- SW Managed switch (or manual cable swap – access issues???)
- TNC Terminal Node Controller – Likely a Kantronics KPC-3+

Not specifically identified on the drawing are:

- DB-9 RS-232 cable and USB converter between RRC’s and PC’s
- DC power distribution cables with mating connectors for PD’s, RRT’s, TNC’s
- Audio cables between TNC’s and RT’s (microphone and speaker outputs)
- Microphones and headsets at EOC positions
- Any customized audio distribution equipment at EOC positions to select radio-to-headphone connections
- Any UPS required to keep equipment up after loss of mains

EOC Station Functions

- Station #1
  - Primary: Voice to CRN Davidsonville
  - Secondary: Simplex voice within Calvert
- Station #2
  - Primary: Access to Calvert voice repeaters on 2 meters and 70 cm
  - Secondary: UHF simplex link to the Barstow VHF/UHF crossband repeater in the event of RemoteRig equipment failure or County WAN link failure

Station Functions, continued

- Station #3
  - Primary: Packet/Winlink digital messaging within Calvert County either by simplex or using the existing digipeaters located on the State Highway tower in Prince Frederick and the Mt Hope tower
  - Secondary: Backup UHF simplex link to the Barstow crossband repeater in the event of RemoteRig equipment failure or County WAN link failure.

Station Functions, continued

- Station #4
  - Primary: Provide direct VHF/UHF packet/Winlink peer-to-peer messaging communications to adjacent counties and jurisdictions
  - Secondary: Calvert voice simplex

Cost

- Not a small expense for the county but they appear to be prepared to act
  - Already purchased TM-V71A and RemoteRig set for beta testing
- Could implement in phases, but at the risk of losing momentum

Open Issues

- Calvert VLAN microwave component encrypted?
  - Does VLAN use fiber as primary and microwave as backup?
  - Part 97 requires all amateur radio communications (we take that to mean on amateur radio frequenices) to be unencrypted. No WEP or WPA unless pw published.
  - But the Calvert VLAN microwave component is not under Part 97 so does it matter if they encrypt or not?
- Too many “eggs in one basket” at Barstow ?
  - Lose the tower or shelter and lose most of our capability.
- 1200bps or 9600bps packet (drives different TNCs) ?
- Barstow cross-band radio always powered – reliability effect ?
  - Could control power remotely
- Nearby jurisdictions looking at 220MHz for packet. Should we have that capability?
- Should we update radios and TNC’s at Mt Hope & Prince Frederick digipeaters
  - Allows remote control of frequency
  - Who would pay ?

Alternative Approaches

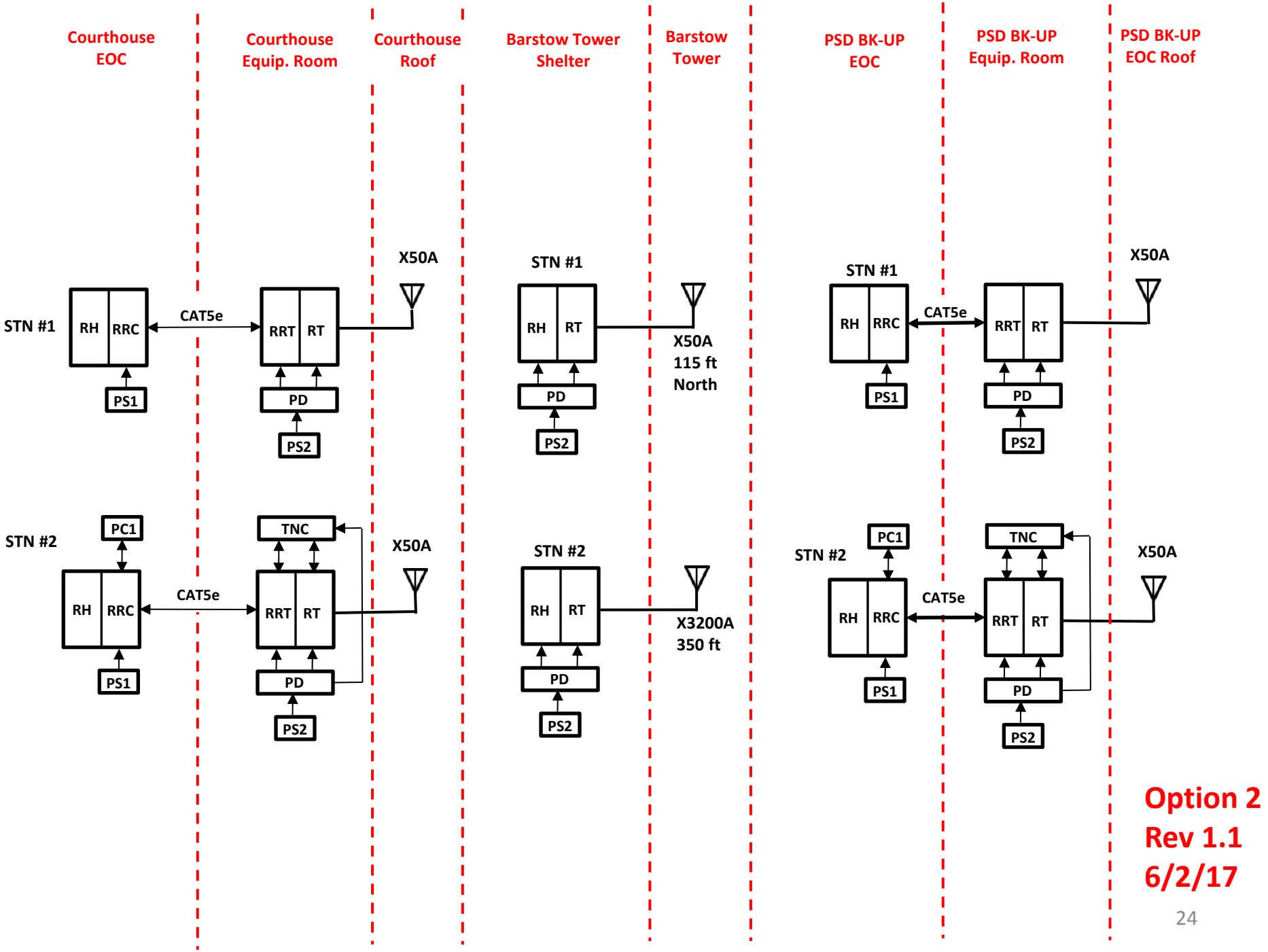
- Crank-Up Mast or Tower or trailer tower at Courthouse (in back; can't be seen when retracted)
  - Pros
    - Cuts reliance on county backbone VLAN
    - Simpler – less to go wrong (unless the mast will not raise…possible single point failure)
  - Cons
    - Not vetted with county
    - Not cheap – refurbished 60 ft pneumatic mast $6,800
      - 55 ft MA-550MDP crank up mast $11,300
    - No separation between antennas (mutual interference)

Locking Pneumatic Mast

Motorized Crank-Up Mast

Options, continued

- Downsized option using cross-band repeaters at Barstow for “reach” to Davidsonville and for wide area Calvert “simplex.”
  - Pros
    - Cuts reliance on county backbone VLAN
    - Simpler
    - Cheaper
  - Cons
    - Steep learning curve for remote control of radios
    - Lose two radios at each EOC compared to initial plan



Option 2
Rev 1.1
6/2/17

Options, continued

- Use initial proposed architecture but replace Calvert VLAN with AUXCOMM dedicated point-to-point microwave TCP/IP link
  - 3 or 5 GHz (no/reduced competition with Part 15 devices)
  - Pros
    - No reliance on county VLAN infrastructure
    - No issues with Part 97 encryption issues
    - Possible expansion into county-wide MESH type network
  - Cons
    - May not be as reliable as county VLAN
    - Additional equipment, antennas and stuff that can fail

Discussion