



RadioResource

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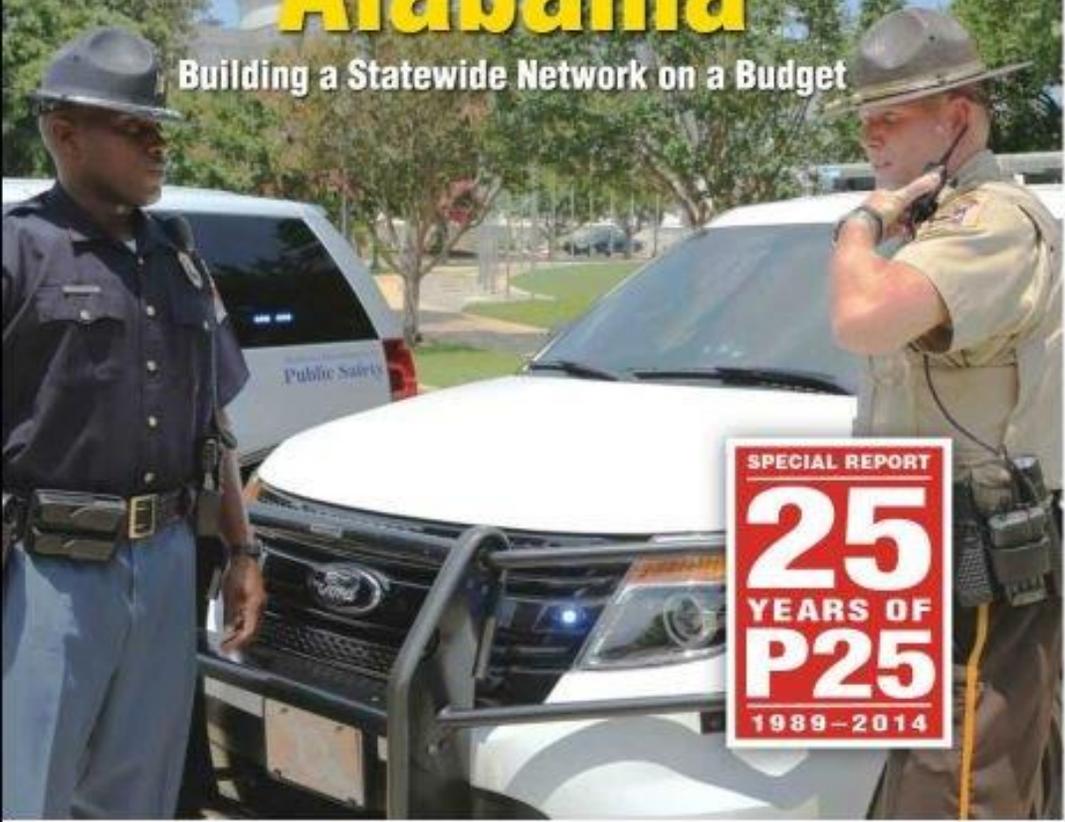
MissionCritical

COMMUNICATIONS

APCO
Issue

P25 in Alabama

Building a Statewide Network on a Budget



SPECIAL REPORT
25
YEARS OF
P25
1989-2014

Alabama's P25 System of Systems



With minimal federal grant money, several Alabama counties began collaborating and developed a system-of-systems approach to a statewide Project 25 (P25) network.

By Ernie Blair and Chuck Murph

The April 27, 2011, tornado outbreak across the Southeast was one of the deadliest in recorded history. The devastation was widespread, totaling \$4.2 billion with more than 2,400 injured and 316 fatalities, of which 234 deaths were in Alabama. Nearly simultaneous tornados struck densely populated areas hundreds of miles apart. Electrical power, telephone and Internet outages were commonplace. Responders in Alabama did a phenomenal job providing emergency services to thousands of victims throughout the state, but the lack of interoperable communications hampered efforts in some locations.

In early 2011, radio interoperability among first responders across Alabama was just a mirage. Jurisdictions had become dependent on a commercial push-to-talk (PTT) service that didn't interoperate with local public-safety radio systems. They found that even though the commercial PTT service was robust, dependable and provided a great everyday administrative communications platform, it would not serve the complete need of first

responders as a whole. Adding to the mirage was the widespread deployment of radio gateways years earlier, but through attrition and lack of training to new operators, most jurisdictions chose not to use the capabilities. A radio gateway can be an effective tool to foster interoperability if the operator is adequately trained, the gateway is managed and used on-scene at an incident, and the radios used by the gateway are properly configured and programmed. Ultimately, state and local officials saw the need for a unified Project 25 (P25) statewide communications system. The question was, how do they get there?

Alabama's Response

In response to the devastating tornadoes of April 2011, Alabama Gov. Robert Bentley appointed 19 community, corporate and non-profit leaders from the state to the Tornado Recovery Action Council of Alabama. The group conducted a comprehensive study of the storms and





Baldwin County, home to Orange Beach, contracted one of the first two P25 systems that were linked together in Alabama.

hosted seven community forums in devastated areas of the state. Research and citizen input was used to develop a report and 20 action-oriented recommendations to reduce damage and loss of life in future disasters.

One of those recommendations was the need for counties to maintain an up-to-date tactical interoperable communication plan (TICP) to foster local interoperability. Next, the governor created through executive order the Alabama First Responder Wireless Commission (AFRWC) to begin addressing interoperability from a strategic level statewide. The executive order was later codified by the Alabama legislature, creating a statewide governance structure to transcend administrations. The commission's 28 members represent first responder agencies, support agencies and elected officials from state, county, local and tribal governments. Spencer Collier, secretary of the newly created Alabama Law Enforcement Agency, was elected as the commission's first chairperson.

In its first year, the AFRWC formed two subcommittees to foster cooperation among interoperable radio system owners and potential users. The first committee represents state agencies while the second represents local

agencies. The committees schedule their meetings so they can first meet separately to address their respective concerns, and then later the same day, meet as a combined group to address common issues. The committees then make recommendations for consideration to the AFRWC. The commission encourages local governments contemplating new systems to cooperate with those operating existing systems to enjoy mutually beneficial cost savings.

Alabama's Statewide Interoperability Coordinator (SWIC) Chuck Murph began coordinated discussions among the various state and local first responder agencies needing statewide interoperable radio communications. In late 2011, Baldwin County on Alabama's Gulf Coast and Madison County, hundreds of miles north bordering the Tennessee line, contracted individually to construct countywide P25 interoperable radio systems in their respective counties. Envisioning the possibilities of a statewide radio system, Collier, then director of the Alabama Department of Homeland Security (DHS), authorized funding for a link between the two countywide systems on opposite ends of the state. Using a recently upgraded statewide microwave network operated by Alabama Public Television, Alabama DHS established a reliable link between the countywide systems. The microwave link initially established between Baldwin and Madison, once viewed as a mere "scientific curiosity" by many, is now widely recognized as a useful building block for an effective statewide communications network.

County Systems Grow

The two countywide systems became fully operational in late 2012, just in time to meet the 2013 FCC narrowbanding mandate. In 2013, Alabama DHS funded the construction of two new P25 sites in central Alabama. One is in Montgomery, the state capital, and the second is in Clanton, the home of the Alabama Emergency Management Agency. Morgan County has nearly completed a four-site system adjacent to Madison County.

In a P25 system, the master site or "switch" is the single most expensive component for a system owner. Morgan County chose to lease the use of Madison's P25 switch.



A tornado outbreak in April 2011 highlighted the need for an interoperable statewide system.

Using the same cost-savings approach, the city of Opelika, located in east-central Alabama, is constructing a single-site system that will operate through the Madison switch.

In 2014, the city of Birmingham, serving Jefferson County, and Calhoun/Talladega counties completed factory acceptance on P25 upgrades replacing their existing 800 MHz trunked systems. The University of Alabama, serving Tuscaloosa County, also completed factory acceptance of a new P25 system. All three multisite countywide systems are to be constructed by the end of 2014, each with a standalone master site. These switches, along with those of Madison and Baldwin counties, are geographically distributed around the state. By partnering with an existing switch owner, a potential future system owner can experience significant cost savings in capital outlay and maintenance expenses.

The city and county of Montgomery and the Mobile County Communications District (Mobile County 9-1-1) are in the construction phases of P25 systems. Other counties are contemplating the purchase of various P25 manufactured systems as well. A technology exists to connect P25 systems from differing manufacturers. The P25 Inter RF Subsystem Interface (ISSI) is a nonproprietary interface that enables RF subsystems built by different manufacturers to be connected, allowing users on different networks to communicate with each other. Advanced ISSI technology will allow seamless roaming among users and infrastructure from various manufacturers.

Based on the local governments' commitment toward the establishment of a statewide radio system, the Alabama Department of Public Safety's (DPS) Highway Patrol Division made a substantial investment in subscriber units. For each new trooper vehicle, DPS is installing dual-band radios to be operational on the dated troopers' analog VHF radio system and the rapidly growing statewide P25 system. Also, Alabama Emergency Management Agency is using the existing linked interoperable P25 sites in Madison and Baldwin, as well as sites in Clanton and Montgomery, for daily and emergency operations.

Next Steps

Because of funding constraints, the state of Alabama will never likely be in a position to fully finance a comprehensive statewide radio system. The logical approach to statewide radio interoperability is to capitalize on existing radio infrastructure, both at the state and local level, with carefully planned state expenditures to provide links between local systems, fill in gaps where local governments are unable to contribute infrastructure, and provide governance for future expansion. The resulting system-of-systems approach to statewide interoperability is viewed as both achievable and affordable, providing a great capitalization on the taxpayer's dollar.

The commission is seeking financial support from the Alabama legislature to provide connectivity and other sys-



The Strategic Technology Reserve Exercise in Orange Beach, Alabama, used the growing statewide P25 network for the communications preparedness exercise.

tem enhancements to encourage local governments to invest in interoperable radio infrastructure. State of Alabama financial support of the system of systems is viewed as a necessary ingredient for a successful statewide radio system.

The AFRWC provided the leadership to encourage multijurisdictional collaboration in the early construction and evolution of a system-of-systems approach to an Alabama statewide P25 interoperable radio system. With state financial support added to the investment of local governments, the goals of the AFRWC will certainly be met. Handheld radios used by different agencies in geographically diverse parts of the state will reliably communicate in day-to-day and crisis situations.

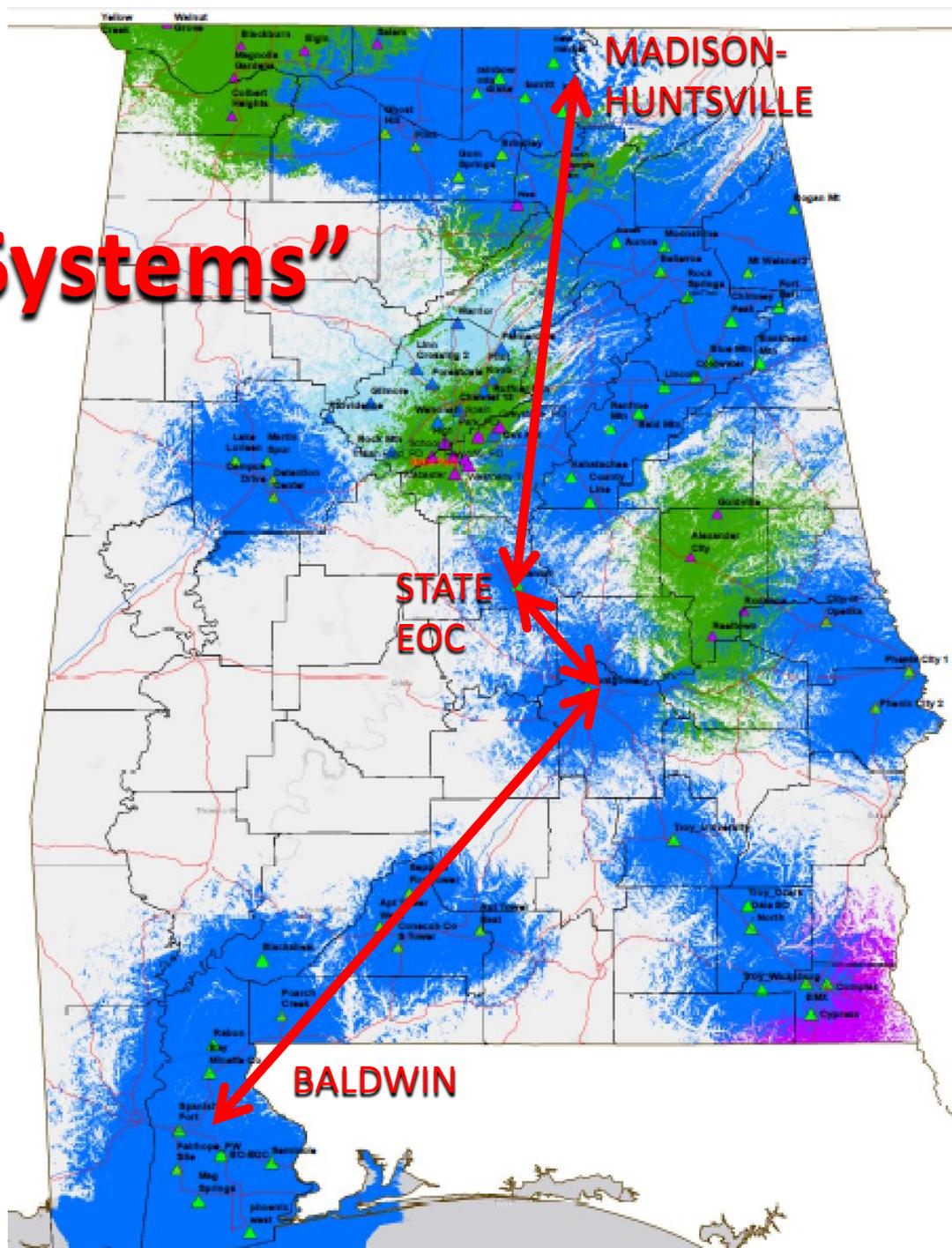
Imagine a repeat of the April 27, 2011, tornado outbreak scenario. There is widespread devastation, injuries and fatalities. Internet and telephone communications are completely disabled. Responders in the field in north Alabama could use the evolving statewide P25 radio system to call the state capitol in Montgomery or the Alabama Emergency Management Agency in Clanton to request resources and support. Baldwin County, in responding to a Hurricane on the Gulf, can do the same. Already, common statewide interoperability talk groups have been established by the AFRWC and are used regularly to support exercises to deliver simulated emergency traffic among locations across north, central and south Alabama. ■

Ernie Blair, emergency number professional (ENP), is the CEO and radio infrastructure director for the Huntsville-Madison County 9-1-1 System. Blair serves on the Alabama First Responder Wireless Commission (AFRWC) and the Alabama State 9-1-1 Board. He is an avid amateur radio enthusiast, fellow in the Radio Club of America (RCA), communications officer with the Civil Air Patrol U.S. Air Force (USAF) Auxiliary and holds every FCC license requiring an exam.

Chuck Murph is the statewide interoperability coordinator (SWIC) for Alabama, employed by the Alabama Law Enforcement Agency. Murph also serves on the AFRWC. Prior to his current position, he served as the director of the Monroe County Office of Homeland Security and Emergency Management. Email comments to editor@RRMediaGroup.com.



“System of Systems”



ALABAMA INTER-ZONE CORE OWNERS PARTICIPATION AGREEMENT

WHEREAS, the Baldwin County Commission owns and operates a Project 25 compliant Motorola Astro25 Communications System with an M3 Core configuration operating at software version 7.14, which is primarily used for public safety communications within Baldwin County, Alabama; and

WHEREAS, the Birmingham Emergency Communications District owns and operates a Motorola Astro25 Communications System with an M3 Core configuration operating at software version 7.14, which is primarily used for public safety communications within Jefferson and Shelby Counties, Alabama; and

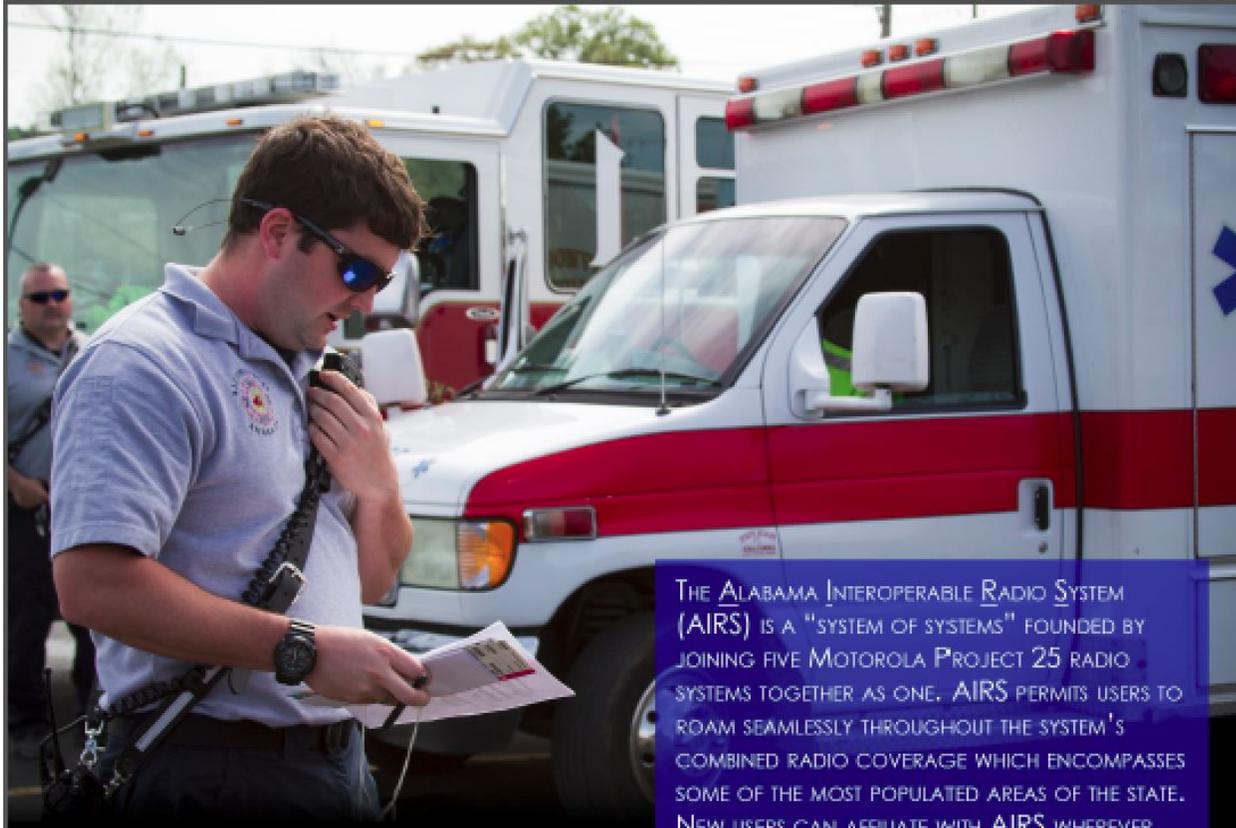
WHEREAS, the Calhoun County 9-1-1 District owns and operates a Project 25 compliant Motorola Astro25 Communications System with an M3 Core configuration operating at software version 7.14, which is primarily used for public safety communications in Calhoun County, Alabama; and

WHEREAS, the Madison County Emergency Communications District owns and operates a Project 25 compliant Motorola Astro25 Communications System with an M3 Core configuration operating at software version 7.14, which is primarily used for public safety communications in Madison County, Alabama, and those portions of Limestone County within the city limits of the Cities of Huntsville and Madison, Alabama; and

WHEREAS, the University of Alabama owns and operates a Project 25 compliant Motorola Astro25 Communications System with an M3 Core configuration operating at software version 7.14, which is primarily used for public safety communications in Tuscaloosa County, Alabama; and

WHEREAS, the Core Owners are desirous of interconnecting the Cores of their respective Communications Systems as a benefit for the participating Users to share Interoperable two-way communications capabilities and coverage among the various agencies, organizations and jurisdictions which are represented; and





COMMUNICATIONS SOLUTION

THE STATE OF ALABAMA HAS STRUGGLED FOR YEARS TO DEVELOP A PLAN TO PROVIDE COMMUNICATIONS FOR PUBLIC SAFETY. IN FACT, ALABAMA IS ONE OF ONLY TEN STATES WITHOUT A SECURE, DIGITAL COMMUNICATIONS SYSTEM WITH STATEWIDE COVERAGE. FORTUNATELY, SEVERAL LOCAL JURISDICTIONS ARE OPERATING RADIO INFRASTRUCTURE THAT IS EXPANDING TO ALLOW FUTURE USERS TO LEVERAGE PAST INVESTMENTS AND THE EXISTING RADIO COVERAGE WHILE GROWING THE SYSTEM'S FOOTPRINT ACROSS THE STATE!

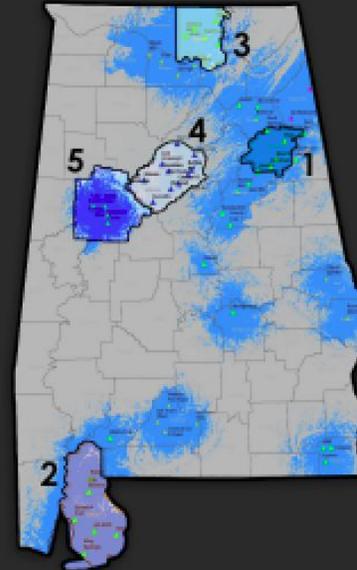
THE ALABAMA INTEROPERABLE RADIO SYSTEM (AIRS) IS A "SYSTEM OF SYSTEMS" FOUNDED BY JOINING FIVE MOTOROLA PROJECT 25 RADIO SYSTEMS TOGETHER AS ONE. AIRS PERMITS USERS TO ROAM SEAMLESSLY THROUGHOUT THE SYSTEM'S COMBINED RADIO COVERAGE WHICH ENCOMPASSES SOME OF THE MOST POPULATED AREAS OF THE STATE. NEW USERS CAN AFFILIATE WITH AIRS WHEREVER THERE IS SUFFICIENT EXISTING RADIO COVERAGE. FOR AREAS WITH INADEQUATE OR NO RADIO COVERAGE, ENTITIES MUST PROVIDE THEIR OWN INFRASTRUCTURE WITH CONNECTIVITY TO ONE OF THE FIVE AIRS ZONES.

- ZONE 1 - CALHOUN COUNTY
- ZONE 2 - BALDWIN COUNTY
- ZONE 3 - MADISON COUNTY
- ZONE 4 - JEFFERSON COUNTY
- ZONE 5 - TUSCALOOSA COUNTY

WITH EACH NEW AIRS USER, ALABAMA GROWS CLOSER AND CLOSER TO ACHIEVING ONE STATEWIDE INTEROPERABLE RADIO SYSTEM THAT IS DESIGNED FOR THE MISSION-CRITICAL NEEDS OF PUBLIC SAFETY. AIRS IS (OR WILL SOON BE) AVAILABLE IN:

- CHEROKEE COUNTY
- CITY OF FAIRHOPE
- CITY OF NORTHPORT
- CONECUH COUNTY
- MORGAN COUNTY
- CITY OF OPELIKA
- PHENIX CITY
- POARCH CREEK INDIAN RESERVATION
- TALLADEGA COUNTY

AIRS - ZONES AND COVERAGE



Alabama Interoperable Radio System

Zone 1 - Calhoun County

Zone 2 – Baldwin County

Zone 3 – Madison County

Zone 4 – Birmingham

Zone 5 – U of A

“Core Owners”



Alabama Interoperable Radio System

Motorola
“Infrastructure Owners”

- Cherokee County
- City of Fairhope
- City of Northport
- City of Opelika
- Conecuh County
- Jefferson County
- Morgan County
- Phenix City
- Poarch Creek Indian Reservation
- Russell County
- Talladega County
- Troy State University



AIRS GOVERNANCE TODAY

- Seven (7) Member Board of Directors
 - Five (5) Core Owner Members
 - Zone 1/Calhoun 9-1-1: **Kevin Jenkins**
 - Zone 2/Baldwin County: **Brian Peacock**
 - Zone 3/Huntsville-Madison 9-1-1: **Ernie Blair**
 - Zone 4/Birmingham 9-1-1: **Greg Silas**
 - Zone 5/U of A: **Rich Ranson**
 - Two (2) Infrastructure Owner Members
 - Jefferson County: **Denise Trimmier**
 - City of Northport: **Scott Collins**

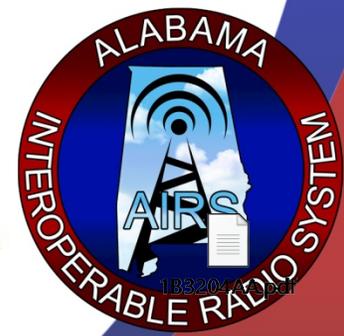
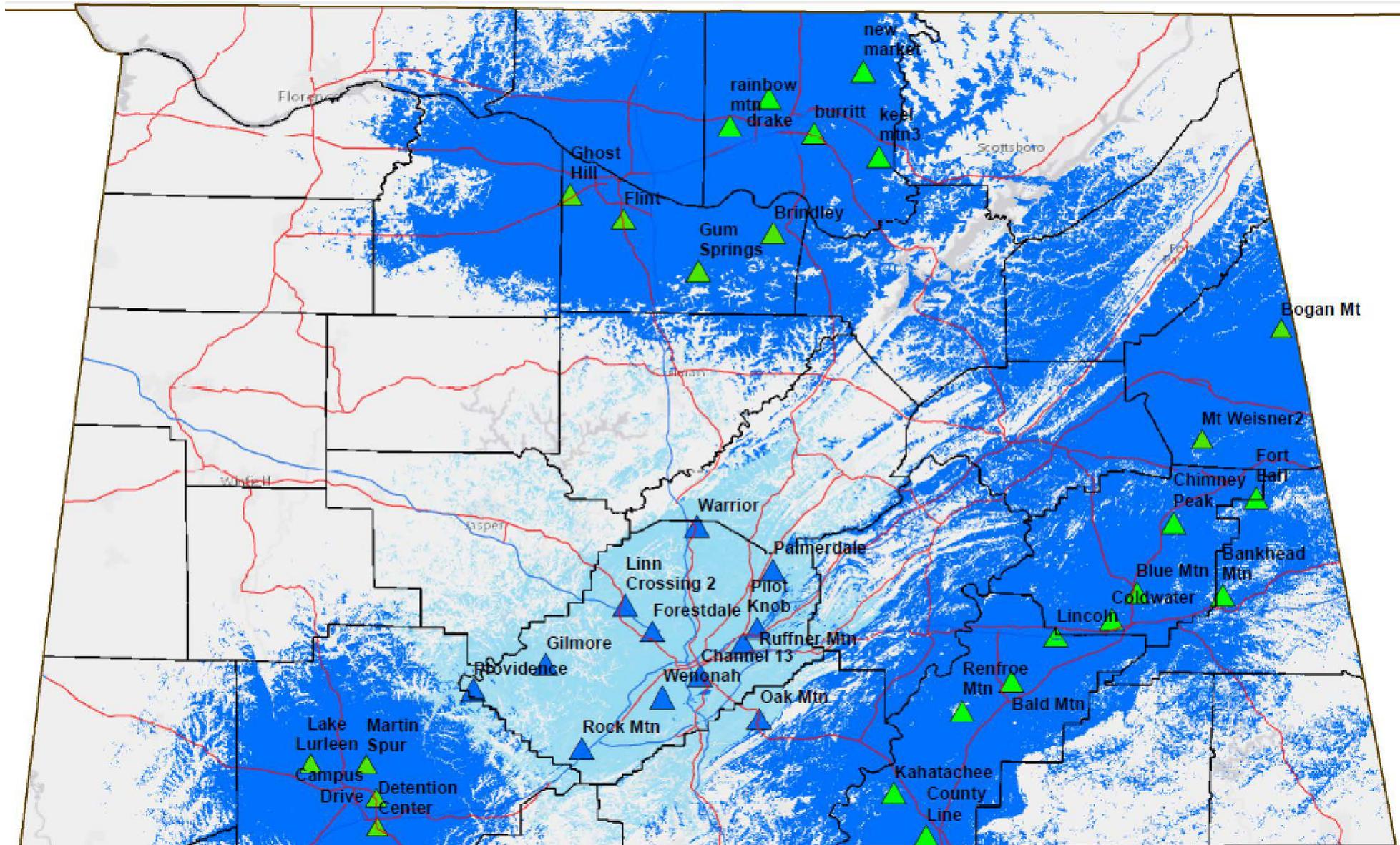


AIRS GOVERNANCE IN THE FUTURE

With adequate funding appropriations, other jurisdictions and the State of Alabama can choose to participate in the cooperative governance of AIRS.

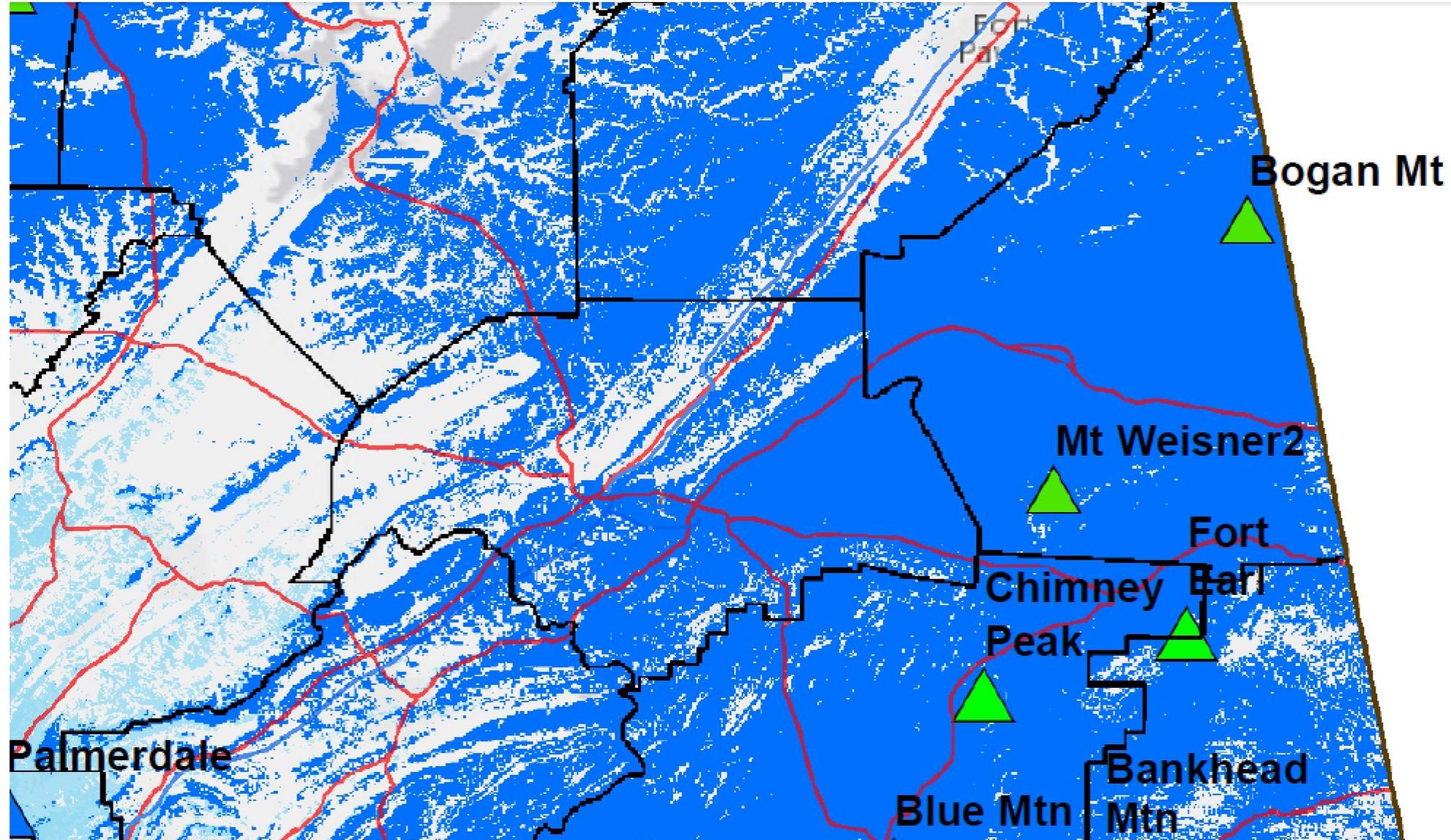
AFRWNC?



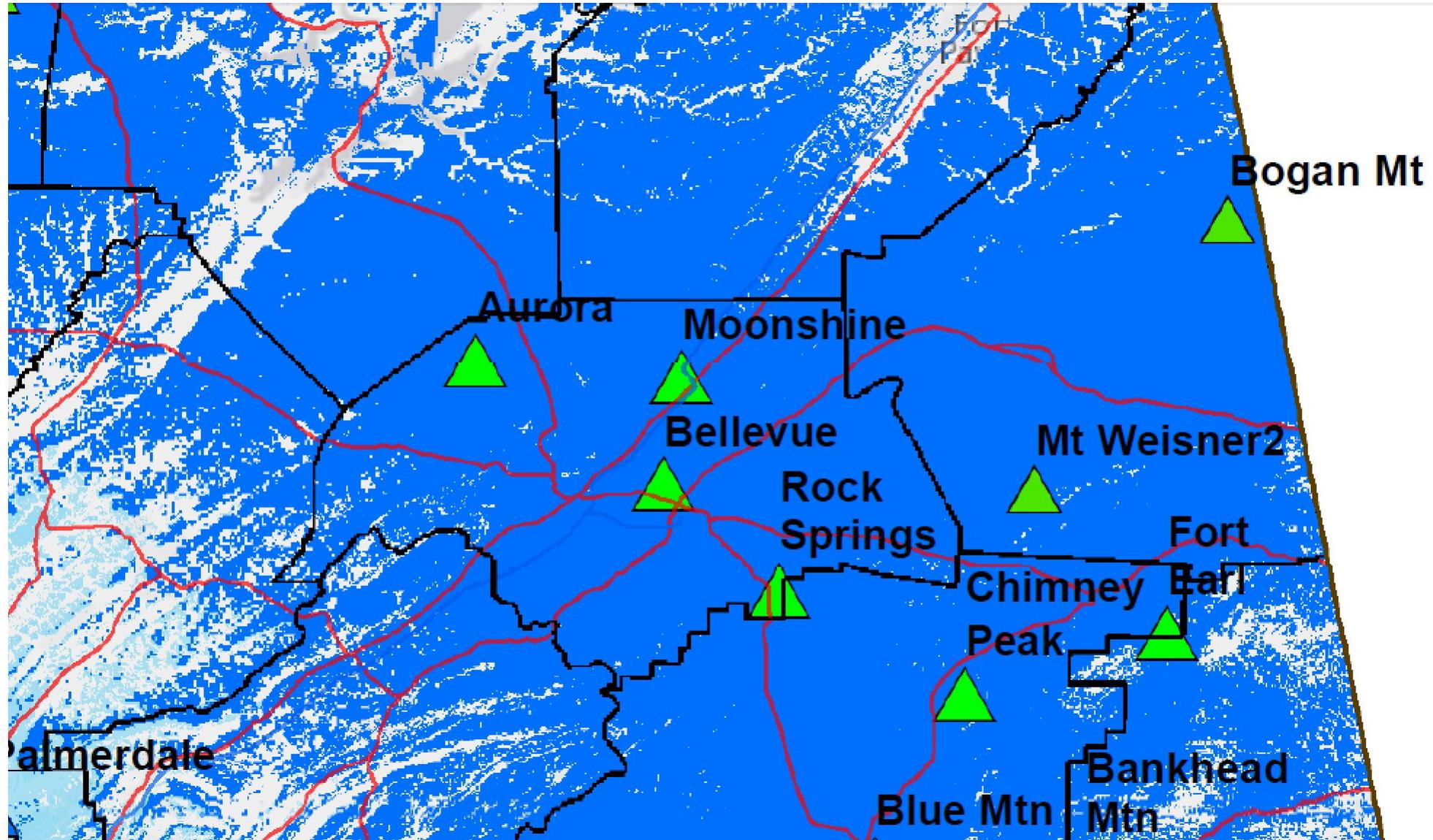


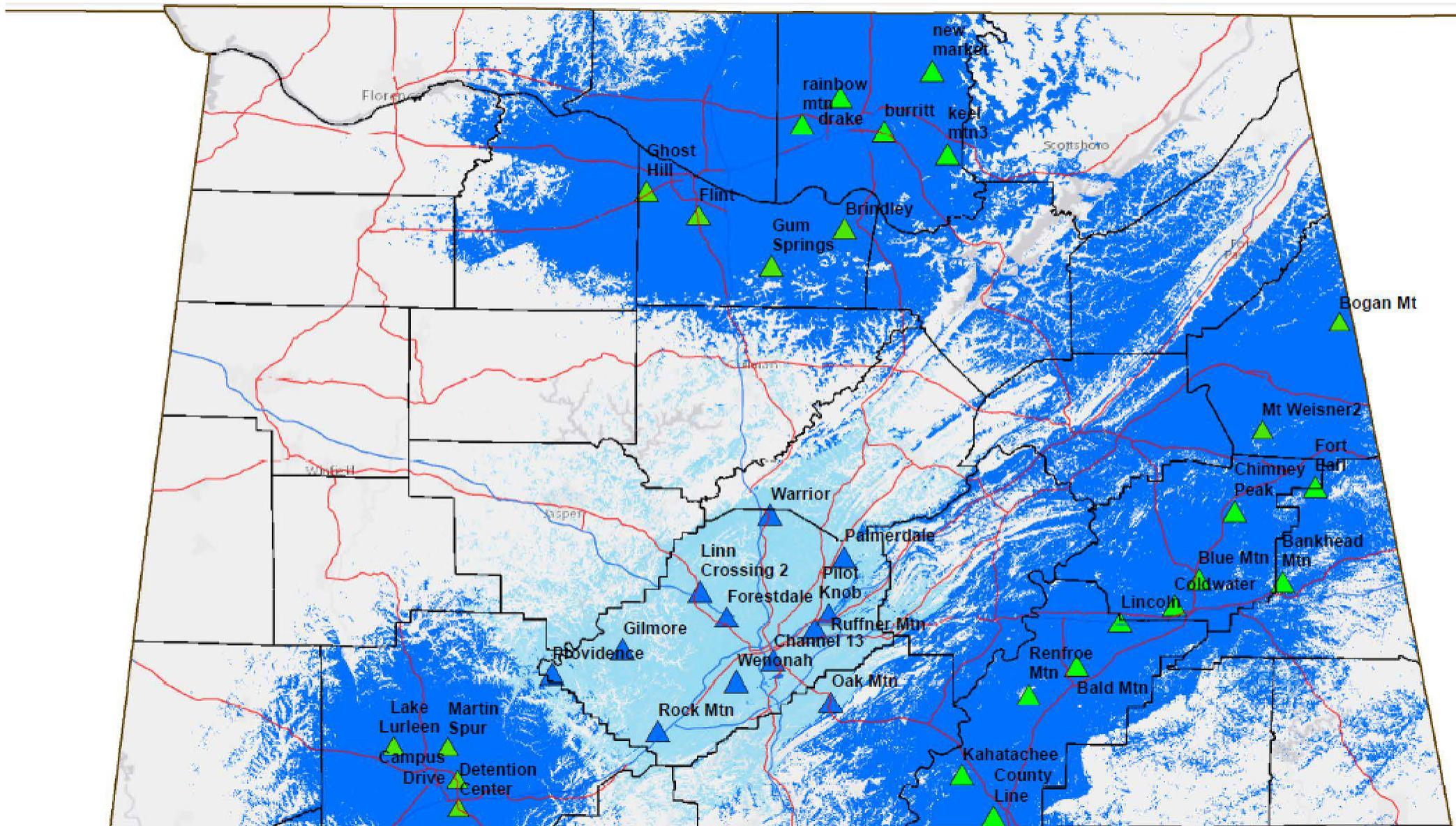
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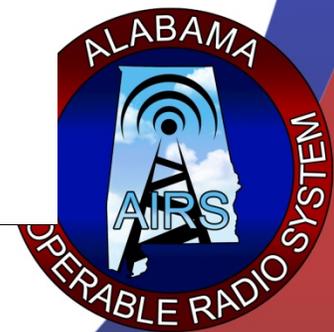
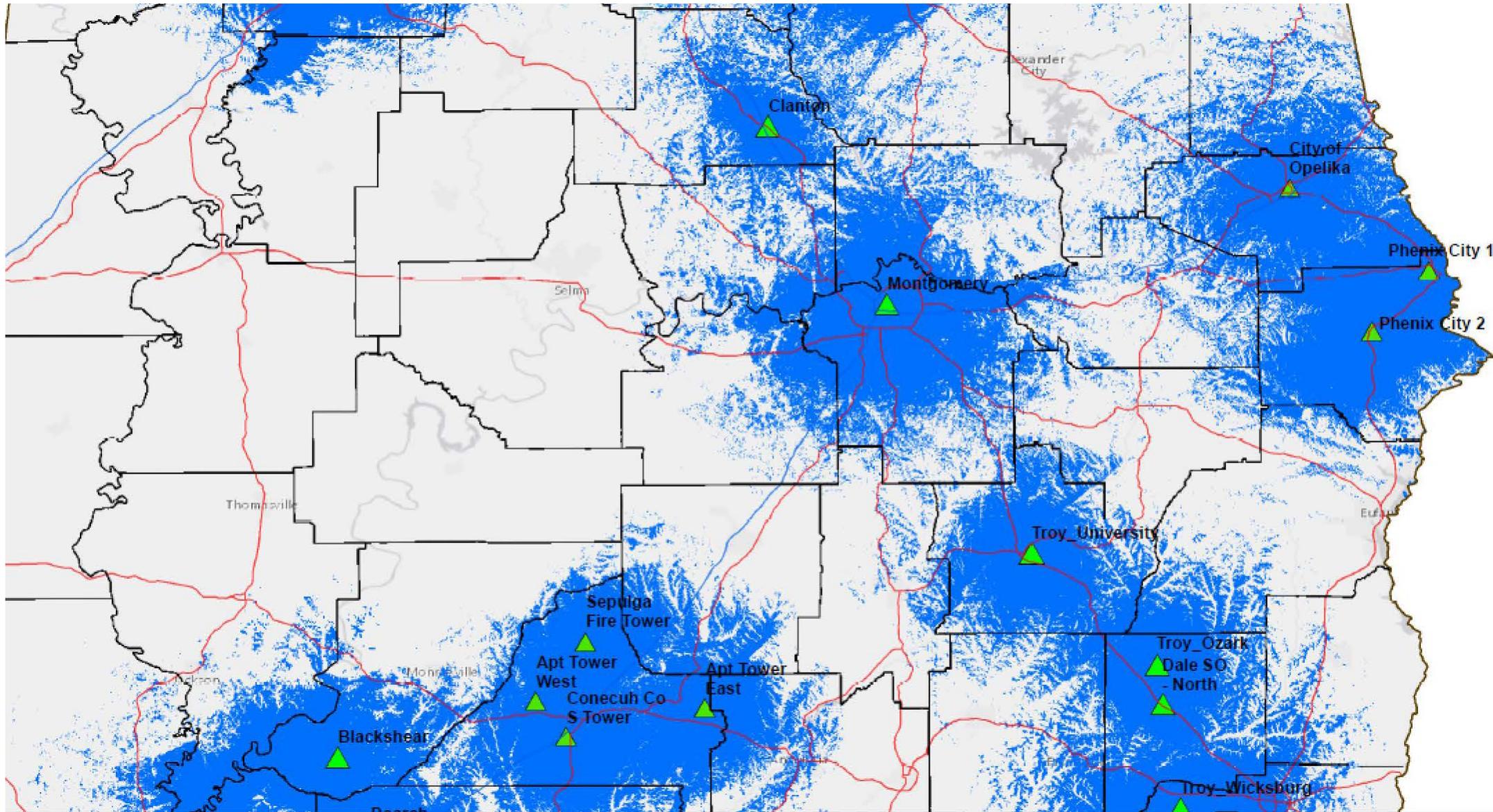
WITHOUT ETOWAH COUNTY AND GADSDEN SITES

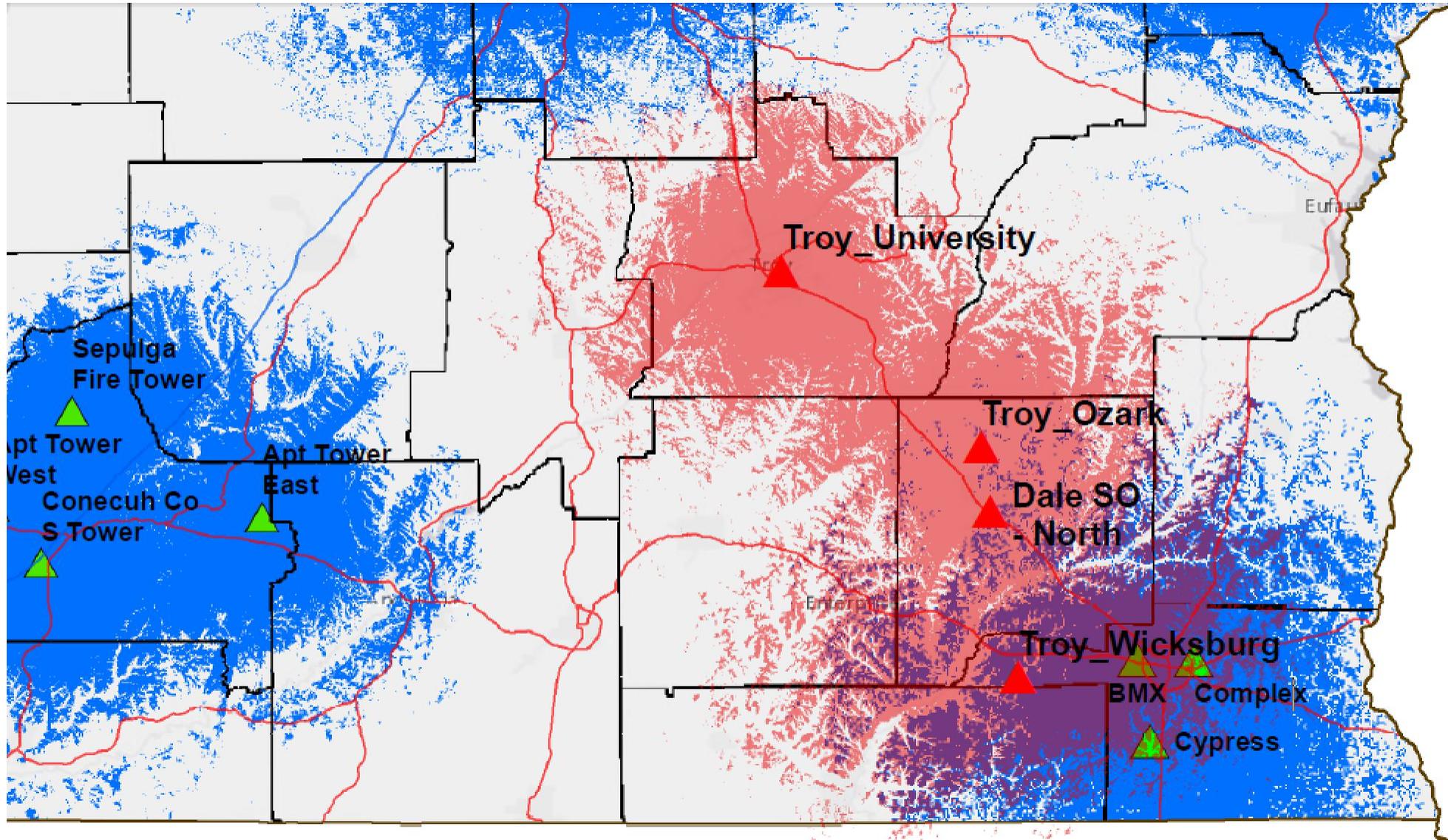


WITH ETOWAH COUNTY AND GADSDEN SITES









Operations and Sustainment of P25 Existing Infrastructure



Alabama Interoperable Radio System

What are the necessary components to deploy, operate **and sustain** a statewide communications system?



1. GOVERNANCE



2. SKILLED MANAGEMENT AND SUPPORT STAFF



3. INFRASTRUCTURE



4. HIGH-AVAILABILITY NETWORK



5. **HAPPY USERS!!**



6. 24-7-365 MAINTENANCE AND OPERATIONS



7. CURRENT AND FUTURE UPGRADES



8. SUSTAINMENT PLANNING AND FUNDING



9. CACHE OF SPARE PARTS



TECHNOLOGY: THE UPGRADES WILL NEVER END!

2012	2013	2014	2015	2016	2017
✓	✓	✓	✓		
v7.4	v7.4	v7.14	v7.14	v7.16	v7.16

...a continuum...

“A continuous sequence in which adjacent elements are not perceptibly different from each other, although the extremes are quite distinct.”



Coverage and Reliability

- Where P25 coverage is available, portable subscribers benefit from the availability of multiple communications sites which provide overlapping coverage
- P25 system design allows for optimal in-building portable coverage
- Systems are typically engineered to provide 95 percent mobile coverage to the predicted area 95 percent of the time

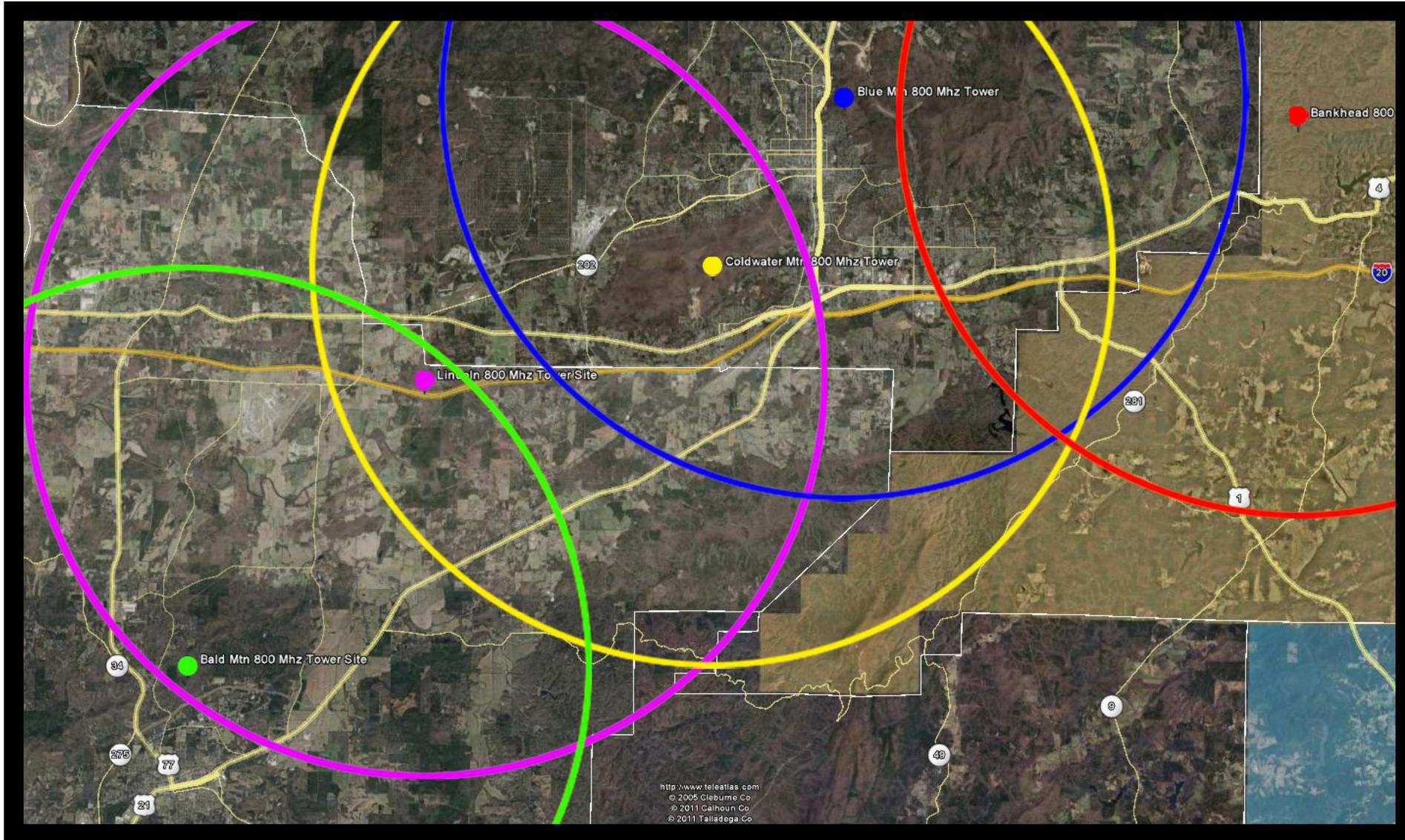


WHY 700-800 MEGAHERTZ?

- Allows users to communicate clearly and effectively using portable radios (“walkie-talkies”) inside of buildings and structures.
- The shorter wavelengths of the 700-800 MHz signal allow for better penetration of common building materials like concrete, wood, drywall and glass
- Passes through apertures and slots more easily than the longer VHF and UHF wavelengths



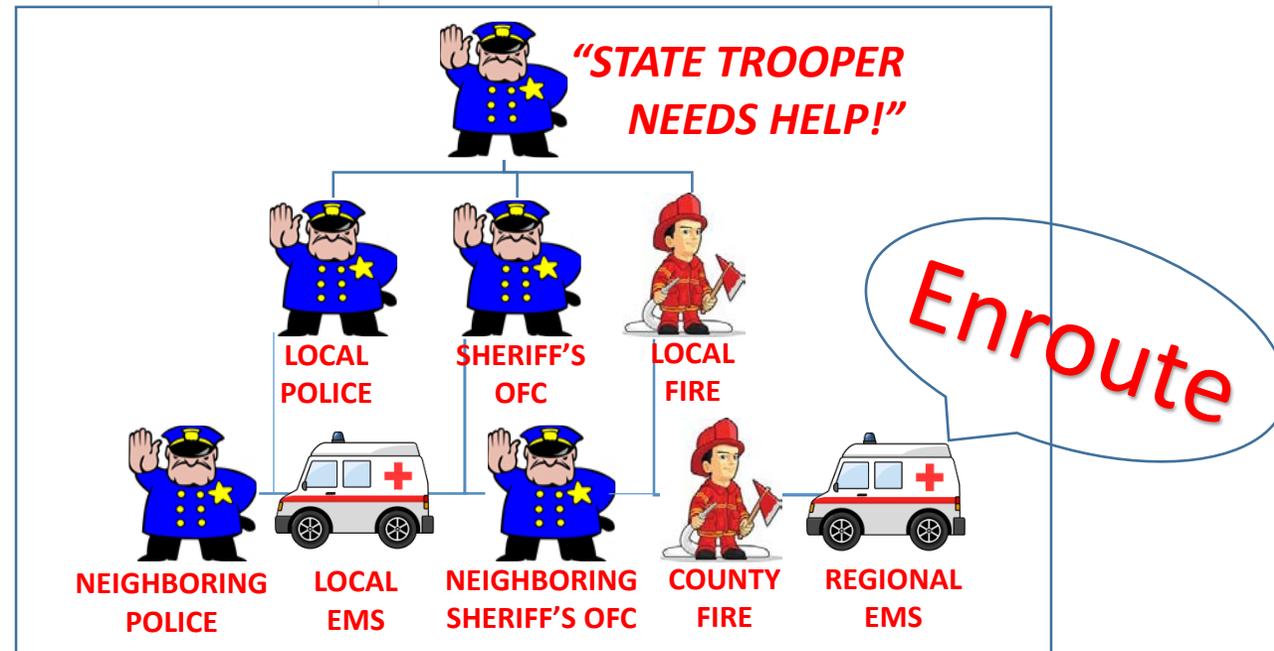
Redundancy / Multiple Sites / Overlapping Coverage



AIRS P25: Built for Interoperability

- Interoperability is the ability of units and agencies to talk and share data in real time
- Ideally, responders from different jurisdictions are able to coordinate their efforts using compatible radio equipment.
- Unfortunately, communications interoperability is a challenge because public safety agencies use radios that operate in various frequency bands. Often times, responders may not be able to talk with each other directly via radio.

Help!



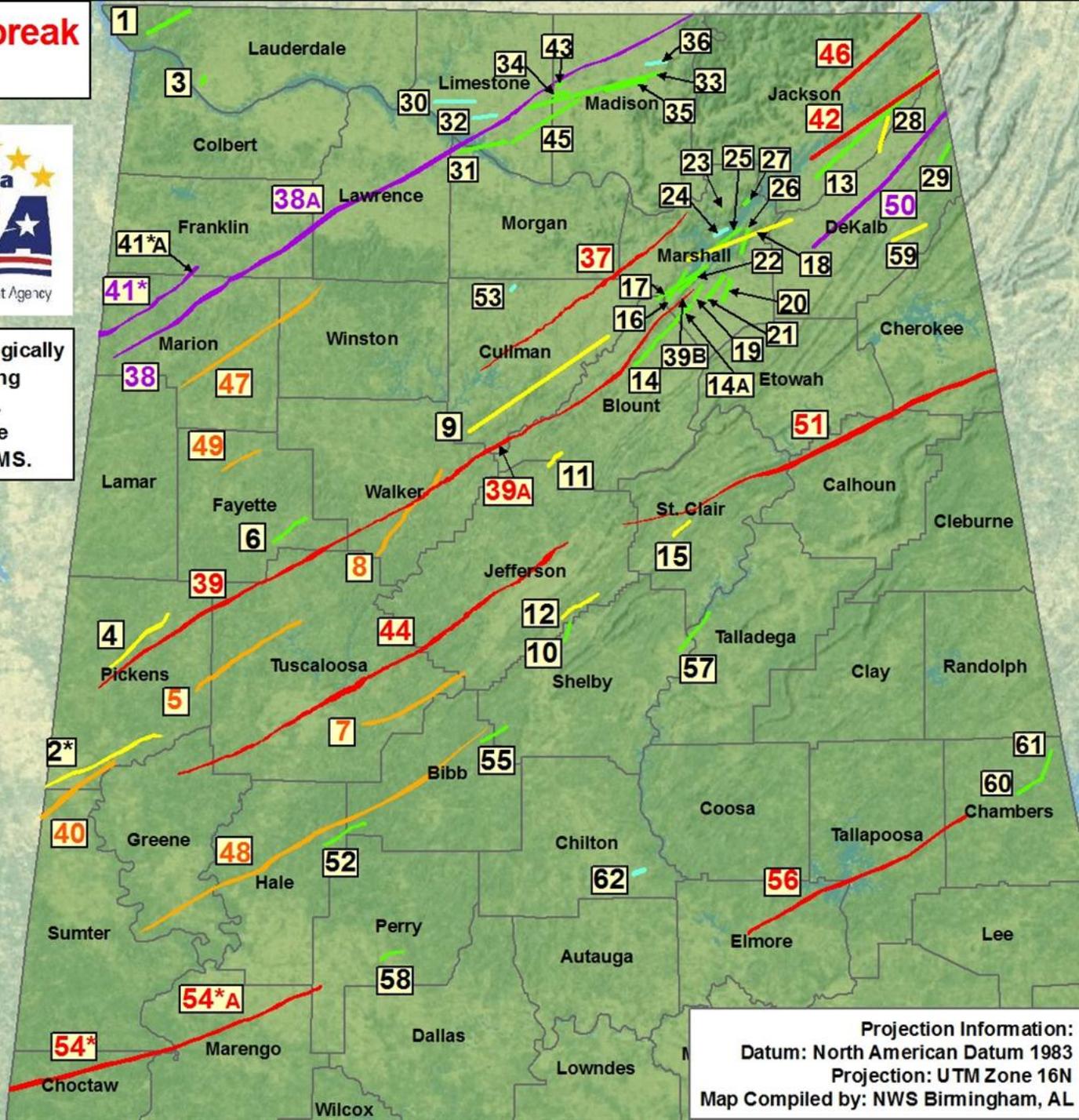
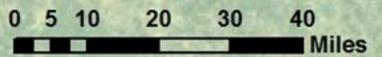
Historic Tornado Outbreak April 27, 2011



Tornadoes are numbered chronologically by time of touchdown beginning on the morning of April 27th.
*Tornadoes 2, 41, and 54 were ranked EF-2, EF-5, and EF-4 in MS.

EF-Rating

- EF-5
- EF-4
- EF-3
- EF-2
- EF-1
- EF-0



Projection Information:
Datum: North American Datum 1983
Projection: UTM Zone 16N
Map Compiled by: NWS Birmingham, AL



Leveraging Existing P25 Infrastructure for All of Alabama



Alabama Homeland Security Partnership

- Alabama HLS provided network through Alabama Public Television link to Madison and Baldwin County's Motorola P-25 system (2011).
- AL HLS funded HMC 9-1-1 to construct four channel P-25 sites in Clanton and Montgomery (2012)
- As a result, systems in North Alabama, Gulf Coast, Montgomery (state capital) and Clanton (AL EMA) were linked.



Three Additional Core Owners

- In 2015, Motorola Core Owners signed an MOU to Cooperate and Interconnect:
 - Calhoun/Talladega Counties
 - University of Alabama/Tuscaloosa County
 - Birmingham/Jefferson County
- MOU Will Coordinate True Interoperability Throughout State



Alabama First Responder Wireless Commission (AFRWC)

- Established by Governor's Executive Order and Codified by State Legislature
- AFRWC encouraging efforts to link P-25 "System of Systems" and expand P-25 network
- AFRWC helps coordinate a statewide system and assists in growing and enhancing additional infrastructure and coverage.
 - AFRWC Policy Committee in place.
 - AFRWC State and Local Subcommittees formed.



Additional Potential P-25 Partners

- Statewide, we are holding discussions with additional agencies and jurisdictions
 - Each “Core Owner” is recruiting neighboring jurisdictions for additional interoperability and coverage
 - Several Jurisdictions around each core are very interested in joining neighboring “Cores” (based on proximity)
 - Discussions continue to coordinate “True P-25 Interoperability” throughout state.



ALEA Mutual Aid Channels

- The Core Owners are providing Alabama State Troopers access to their mutual aid talk groups to enhance interoperability.

Troopers are installing dual band VHF and 700/800 MHz radios in all new vehicles.

- AL State Troopers may eventually use local and state-owned 700/800 P-25 systems for day-to-day business/dispatching.
- **AFRWC can assist to locate funding sources to makes this a reality!**



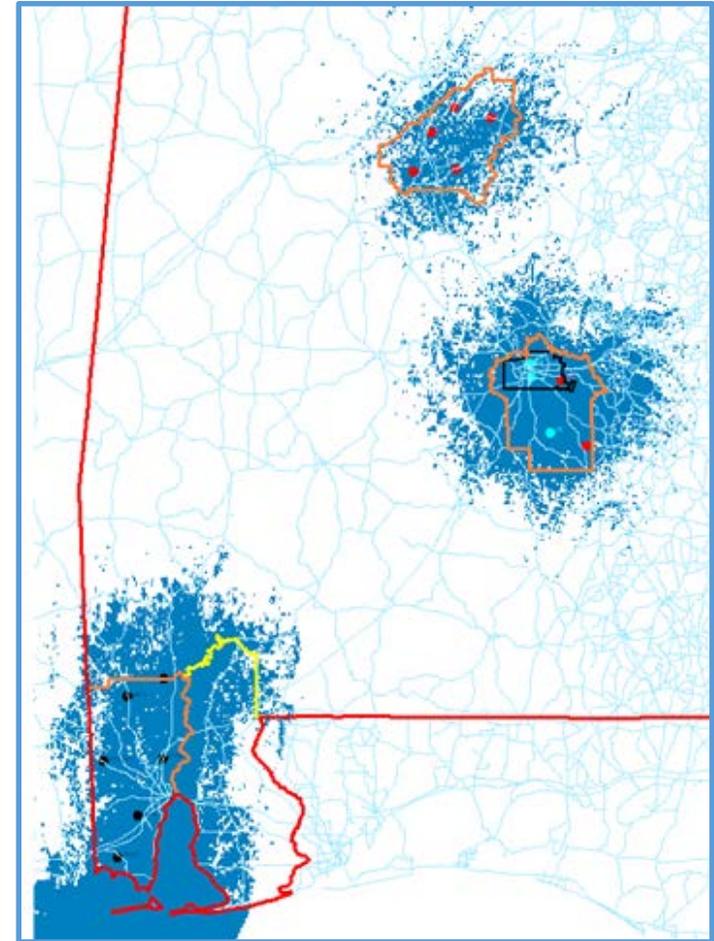
ANGEN and Alabama Supercomputer Authority

- Alabama Next Generation 9-1-1 (ANGEN) plans to link every 9-1-1 Center in Alabama through the Alabama Supercomputer Authority Network
- Surplus Capacity on the Supercomputer Network can be used to cost effectively link P-25 radio systems together
 - Up to 8 MB capacity between 9-1-1 Centers can be obtained for \$25/MB/month!



True Interoperability...Not Just Motorola Systems!

- ISSI Technology will allow these users to interoperate with Harris systems under construction!
 - Mobile
 - Montgomery
 - Shelby County
 - Center for Domestic Preparedness (CDP) Anniston
 - Others
- AEMA Harris radios are operational on Clanton system and Montgomery system
- Kenwood and Relm subscribers are now being tested



Alabama P-25 Summary

- Originally, Madison, Baldwin, and Morgan Counties, as well Cities of Clanton, Montgomery, and Opelika P25 systems were up, running and linked together.
- Cores in Jefferson, Tuscaloosa, and Calhoun/Talladega Counties now connected.
- Harris Systems in Mobile, Montgomery, and Shelby Counties close to operational.
 - P25 ISSI standards for future seamless operation
 - Need funding to accomplish ISSI connectivity (or “bridge”) between Harris and Motorola cores
- AFRWC can potentially provide coordination and supporting funding legislation for common needs and additional coverage.



Alabama P-25 Summary

Need for State Funding

- State funding now required for P25 growth
 - New tower sites in underserved areas
 - Connectivity between Cores and Infrastructure Owners
 - Dynamic Systems Redundancy
 - ISSI to connect Harris and other vendor systems to Motorola
- AIRS plans to continue to work with our partners: AFRWC, ALEA, and AEMA to expand P25 throughout Alabama



Alabama P-25 Summary

Through our partnership with AFRWC, AIRS has made tremendous progress over the past four years to promote P25 adoption throughout Alabama

- System of Systems approach primarily through local investment
- A large percentage of Alabama's population is now covered
- Expand geographically into less populated, underserved areas
- Discussions with new jurisdictions for P25 expansion



Alabama P-25 Summary

- AIRS seeks to continue our mutually beneficial partnership with AFRWC
- Much can be accomplished through cooperation, collaboration
- Good communication is the key!
- Let's keep talking to determine how to best serve the needs for all of Alabama's Public Safety needs.



NEED MORE INFORMATION?

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