



Central Vermont Public Safety Authority (CVPSA) Telecommunications Needs Assessment

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1 EXECUTIVE SUMMARY

1.1 Introduction

The Central Vermont Public Safety Authority (CVPSA) is an independent union municipal chartered district that assists its member Cities (Montpelier and Barre City) and the Capital Fire Mutual Aid System, Inc. (CFMAS) with improvements to their respective public safety communications systems and capabilities. In response to reported issues with the legacy land mobile radio (LMR) networks, and the associated communications systems that support 9-1-1 incident dispatch and response in Central Vermont, CVPSA advanced a Telecommunications Needs Assessment to document the status of the existing public safety communications systems and solutions, to identify gaps in these systems and solutions, and to determine options to upgrade the systems to meet end user requirements.

CVPSA sought the expertise of a recognized public safety communications and information technology firm to conduct the needs assessment and end user requirements gathering, and to assess the functionality and performance status on the regional legacy public safety communications system, and retained Televate, LLC to perform the Needs Assessment.

The Telecommunications Needs Assessment was additionally designed to evaluate evolving regional plans to upgrade the existing regional LMR network, to investigate options to integrate commercial broadband into the public safety communications toolbox, to assess regional partnerships that could best facilitate the implementation of a regional radio network, and to assess and advance various public safety communications initiatives to the benefit of the public safety stakeholders and the communities they support.

1.2 Key Findings and Recommendations Overview

CVPSA logically designed the Needs Assessment program to engage CVPSA public safety stakeholders to define their respective requirements, and to assess Central Vermont regional communications systems and solutions to determine their operational status and quality. The delivery of timely and robust 9-1-1 emergency services to the citizens and communities of Central Vermont is anchored on the quality of the mission critical land mobile radio (LMR), 9-1-1 call taking and dispatching systems, and the ability of regional first responders to leverage these systems to support their mission. Reliable, high quality communications systems are paramount for ensuring the safety of regional citizens and the public safety practitioners that deliver emergency response to their communities.

An assessment was conducting during the second and third quarters of 2021 and was anchored on the following primary project tasks. A variety of sub-tasks were associated with each of the primary tasks, resulting in a comprehensive program designed to determine public safety communications gaps, operational requirements, and to provide relevant information on the condition of communications systems within Central Vermont and to assist CVPSA and its member in preparing a strategic plan to address the needs identified. The primary tasks were:

- Task 1: Complete a region-wide assessment of existing public safety communications systems and define stakeholder requirements
- Task 2: Propose solutions with designs and cost estimates for resolving indoor and outdoor radio dead zones in Barre City, Montpelier and for the CFMAS service area

1.2.1 The Stakeholder Interview and Survey Process

Televate conducted informative interviews with public safety stakeholders representing all major disciplines (fire, police, EMS, dispatch), with CVPSA board members, with potential partner regional utility and broadband entities, with the local radio shop, with a community representative, and with others to define their respective public safety communications requirements and to determine the quality of the existing systems and facilities. In conducting these interviews, Televate typically prepared questions to guide the discussion for each stakeholder and then guided the interview based on stakeholder responses.

The interviews for the regional public safety stakeholders were designed to obtain insights into the performance of the legacy systems, to identify gaps in those systems, and to obtain their requirements and suggestions on how to mitigate the reported communications gaps. The interviews with potential regional partners including Vermont electric cooperatives (Washington Electric Cooperative, VELCO) and a broadband non-profit municipal organization (CVFiber) presented opportunities for CVPSA to advance discussions on sharing tower and fiber/microwave backhaul assets along with other beneficial collaboration prospects.

Additional interviews obtained information from the Federal Communications Commission (FCC) on how to request the FCC’s assistance with radio channel interference, which is a major issue affecting reliable radio communication. Meetings with an ex-radio tower owner and with the region’s local radio shop provided valuable information regarding ideal radio towers for the regional LMR network and important information on the existing radio systems and the in-development plans for a future radio system upgrade.

An online survey was also developed and shared with additional public safety discipline stakeholders who were not interviewed. The online survey extended the stakeholder participation and provided further information and insight benefiting the needs assessment.

1.2.2 Requirements Gathering and Assessment

The interview and survey process allowed the public safety stakeholder to report their opinions on the quality of the Central Vermont communications systems and solutions and to document their communications requirements. Having this direct insight facilitated the development of recommendations on what enhancements, system upgrades, and operational practices would most benefit Central Vermont public safety, and the estimated financial investments that would be required to address and resolve reported communications shortcomings. This report details the primary requirements and recommendations, the most critical of which are summarized below.

Communication System/Solution	Gap and Requirement	Recommendation
Land Mobile Radio Systems	<ul style="list-style-type: none"> • Existing radio network does not meet operational requirements – a new radio network is required. The existing system: <ul style="list-style-type: none"> ○ Is anchored on old conventional analog radio technology ○ Operating beyond its useful lifecycle ○ Does not cover the required service area 	<ul style="list-style-type: none"> • A new, modern, regional, standards based, and Project 25 capable simulcast radio network is required for CFMAS, Barre City and Montpelier <ul style="list-style-type: none"> ○ Sufficient radio base stations/tower sites are required to expand and satisfy coverage requirements ○ Multiple interference free VHF channels are recommended to

Communication System/Solution	Gap and Requirement	Recommendation
	<ul style="list-style-type: none"> ○ Needs improved in-building coverage for fire radio communications within Montpelier and Barre City ● Radio interference from Canada and within the State of Vermont affects voice quality - an interference-free radio channel to support reliable dispatch is needed ● Fire ground TAC channel communications needs to be monitored by dispatch 	<p>avoid congestion on the primary dispatch channel</p> <ul style="list-style-type: none"> ○ Separate dispatch channels for Barre City/Montpelier and for CFMAS operations are required to segregate dispatch radio traffic and relieve congestion ○ Vehicular repeaters are required to improve in-building coverage ○ Additional TAC channel receivers are required to allow dispatch to listen to fireground TAC channel communications
Dispatch Consoles	<ul style="list-style-type: none"> ● Radio consoles are outdated, no longer supported by the equipment vendor ● Different consoles in each dispatch facility does not support seamless backup ● Upgrade and modernize dispatch consoles 	<ul style="list-style-type: none"> ● New radio consoles are required at both dispatch facilities, the legacy consoles are operating beyond their intended lifecycle, are no longer supported by the manufacturers, and are at risk of failure
End User Radios	<ul style="list-style-type: none"> ● Procure new radios to replace aging portable and mobile radios in disrepair <ul style="list-style-type: none"> ○ Approximately 200 new radios are required 	<ul style="list-style-type: none"> ● New radios should be procured to replace aging and all radios in disrepair ● A cache of spare radios (10-20) should be maintained and a process to request and distribute them should be developed
Computer Aided Dispatch (CAD)	<ul style="list-style-type: none"> ● A Computer Aided Dispatch (CAD) system would best support daily dispatching requirements – the current system employed is not a true CAD system 	<ul style="list-style-type: none"> ● A common CAD system should be implemented in Montpelier and Barre City that supports all dispatcher and public safety agency requirements
Broadband Systems and Applications	<ul style="list-style-type: none"> ● Commercial broadband coverage, including FirstNet does not meet public safety requirements ● Commercial Push-to-Talk (PTToC) and Mission Critical PTT (MCPTT) from FirstNet would be beneficial ● Various broadband applications needed 	<ul style="list-style-type: none"> ● CVPSA should engage with the State FirstNet public safety and rural broadband leadership and receive ongoing updates on the status of the FirstNet rollout and that of all commercial cellular carriers and to share their coverage requirements ● The integration of PTToC and MCPTT commercial broadband

Communication System/Solution	Gap and Requirement	Recommendation
		voice applications that are interoperability with LMR networks offer opportunities to enhance public safety communications <ul style="list-style-type: none"> • A strategic plan addressing public safety broadband data application requirements per discipline, optimal data hosting options, data sharing policy, security and all other factors should be developed

1.2.3 Central Vermont Public Safety Communications Systems Upgrades

The existing public safety communications systems supporting mission critical response within Central Vermont are outdated and are not providing reliable service, performance, or coverage. If not for the creative management of the Central Vermont fire, EMS, police, and 9-1-1 dispatchers, who have implemented operational workarounds to best ensure that the required communications are delivered, the risk to the community and to the first responders themselves could be even more concerning.

With the exception of the local police radio end users who operate on a different radio spectrum (UHF) than Central Vermont firefighters (VHF), and whose radio service areas are primarily limited to Montpelier and Barre City geographic boundaries and are generally considered to be adequate (though with some in-building coverage issues), public safety radio communications supporting firefighters are woefully inadequate. While a few police radio coverage and performance requirements were documented, the primary initial objective in the region should be to improve radio communications for firefighters and to upgrade outdated dispatch radio consoles supporting all 9-1-1 calls for emergency service. There are also regional interoperable radio communications limitations between police, fire, and the State Capital police that should also be addressed.

The recommendations developed in this report have been captured in the form of recommended enhancements to the existing Central Vermont public safety communications facilities and related operational best practices. The recommended improvements and estimated costs to implement the improvements are summarized in Table 1. The CVPSA is encouraged to determine their ability to fund the proposed upgrades, some of which are standalone investments, other of which are interrelated, and to prioritize the recommendations for implementation.

Table 1: Central Vermont Public Safety Communications System Upgrade Summary Cost Estimate

Primary Upgrade	Associated Upgrade Activity / Comments	Estimated Cost
Regional Radio System Infrastructure and Construction	Multi-site, multi-frequency regional analog simulcast land mobile radio network (LMR) Regional LMR system design, procurement, planning, project management & CVPSA governance modifications	\$2,900,000

Primary Upgrade	Associated Upgrade Activity / Comments	Estimated Cost
	Tower upgrades and reinforcement ¹	\$330,000
	Radio equipment shelters	
	Radio Consoles for Montpelier and Barre City dispatch	\$700,000
	TAC Channel Receivers (supports TAC fire ground radio transmission to dispatch)	\$300,000
	VMED Receivers (expands VMED coverage and interoperability within Central Vermont)	\$95,000
Upgraded mobile and portable radios: P25 capable (assume 200)	New radios required to replace outdated radio	\$700,000
Vehicular Repeater Equipment and installation (20 units)	These repeaters are installed on fire apparatus to improve in-building communications	\$285,000
Redundant fiber link between dispatch facilities	Redundant fiber link to connect the Montpelier and Barre City dispatch centers	\$100,000
Implementation of broadband applications to support public safety	Public safety broadband applications to modernize and enhance data communications for fire, police, EMS	\$150,000
Commercial broadband Push-to-Talk (PTT) or Mission Critical PTT application	Alternative public safety communications over interoperable to LRM broadband (FirstNet and commercial cellular carriers) to broaden coverage and provide additional communications options	\$154,000
Implementation of a modern Computer Aided Dispatch (CAD) system in both Montpelier and Barre dispatch facilities	A common CAD system should be implemented in Montpelier and Barre City	\$750,000
TOTAL COST ESTIMATE		\$6,464,000

1.2.4 Concluding Considerations

The legacy communications systems supporting mission critical public safety emergency dispatch and response are based on outdated technologies, most of which are no longer supported by the original equipment vendors, and they are at risk of failure. They do not provide sufficient coverage and need to be replaced and upgraded. In advancing the Central Vermont strategic plan to address these public

¹ The specific extent of radio tower upgrades could not be determined during the project. This determination would need to be made through specialized tower loading engineering assessment and whether new radio towers are required in the final radio network design. The associated costs stated here are a rough order of magnitude estimate and need further evaluation.

safety communications limitations and to meet the key operational requirements detailed by the stakeholder community, primary considerations for CVPSA include the following:

- The documented public safety communications gaps and requirements, particularly those supporting firefighter radio communications, need near-immediate attention. The safety of the regional community, and the first responders who depend on reliable and robust communications to deliver timely, quality emergency services to their respective communities, are at greater risk due to the limitations of the legacy systems.
- The funding of the system upgrades may be challenging to secure; however, the CVPSA and its member entities and jurisdictions, need to explore their options and agree on a viable source of funding.
- There are financial, administrative, and operational benefits to managing the procurement of the regional system as a consolidated purchase through a single Request for Proposal (RFP) vehicle. A decision on how best to facilitate the procurement needs to be determined.
- The opportunities to forge synergistic partnerships with regional and state-based utilities and broadband municipal entities should be further explored and advanced. These opportunities could offer valuable options to share and leverage existing radio tower and backhaul (fiber, microwave) transport assets to the mutual benefit of CVPSA, the potential partners, and the local community.
- Regional public safety communications systems provide efficient and effective system deployment and operational benefits that are best managed through a regional governing organization. CVPSA has an established governing structure that should be leveraged to facilitate decision making, procurement, and ongoing operational support and management of the future regional radio system. Effective governance will also result in the delivery of critical interoperable voice and data communications and associated operational best practices. CVPSA should continue to engage with its members and make whatever structural changes are necessary to continue to best serve their stakeholders.
- However Central Vermont advances the plan and implementation of enhanced public safety communications system, it is important to ensure that adequate annual operational funding is allocated to maintain these mission critical systems.

The dedication and passion of the Central Vermont public safety community and the executive leadership that support their mission to protect and serve their communities and citizens are extraordinary and should be commended. The findings and recommendations documented through the CVPSA Telecommunications Needs Assessment project provide a strong foundation on which an actional strategic plan to enhance Central Vermont public safety communications systems and solutions can be anchored. This important work requires the continued collaboration and partnership of the CVPSA membership to achieve the required objective to provide public safety with the best available communications systems.

2 CVPSA TELECOMMUNICATIONS NEEDS ASSESSMENT

On behalf of, and in collaboration with its members, the Central Vermont Public Safety Authority (CVPSA) issued a Request for Proposal (RFP) to conduct a Telecommunications Needs Assessment to document the status of the existing public safety communications systems and solutions, to identify gaps in these systems and solutions, and to determine options to upgrade the systems to meet end user requirements. There are known issues with the legacy land mobile radio (LMR) networks, and the associated systems that support 9-1-1 incident dispatch and response in Central Vermont. CVPSA sought the expertise of a recognized public safety communications and information technology firm to conduct the needs assessment and end user requirements gathering, and to assess the functionality and performance status on the regional legacy public safety communications systems.

The Telecommunications Needs Assessment was additionally designed to evaluate development plans to upgrade the existing regional LMR network, to investigate options to integrate commercial broadband into the public safety communications toolbox, to assess regional partnerships that could best facilitate the implementation of a regional radio network, and to assess and advance various public safety communications initiatives to the benefit of the public safety stakeholders and the communities they support. This report further describes the Needs Assessment primary tasks, sub-tasks, and deliverables, and details the stakeholder requirements gathered together with recommendations and a strategic plan to address and mitigate public safety communications gaps discovered during the program.

2.1 CVPSA Overview

The CVPSA is an independent union municipal chartered district that assists its member Cities (Montpelier and Barre City) and the Capital Fire Mutual Aid System, Inc (CFMAS) with improvements to their respective public safety communications systems and capabilities. CVPSA provides its members opportunities to coordinate, consolidate and collaborate their public safety services and resources. It has provided and intends to continue to provide funds for regional training, planning and equipment.

The City of Montpelier and Barre City operate full-service police, fire and emergency medical services, and both Cities provide dispatching services to a variety of public safety entities. Montpelier dispatches the Montpelier Police, Fire/EMS, Capitol Police and 14 other fire departments within the Central Vermont area represented by the Capital West Communications Committee (Cap West). Barre City dispatches for Barre City Police, Fire/EMS, Washington County Sheriff's Office, Washington Fire Department and Williamstown Fire Department.

CFMAS is a municipal district that includes 33 towns/cities in Central Vermont, and provides dispatching services to a select number of member fire departments through a contract with the City of Montpelier. The dispatch contract is managed through a CFMAS committee called Cap West, which includes 18 member cities.

Together, the two dispatch facilities serve the following Central Vermont entities:

- Town of Berlin
- Town of Cabot
- Town of Calais
- Town of Duxbury
- Town of East Montpelier
- Town of Fayston
- Town of Marshfield
- Town of Middlesex
- City of Montpelier
- Town of Moretown
- Town of Northfield
- Town of Plainfield
- Town of Roxbury
- Town of Waitsfield
- Town of Walden
- Town of Warren
- Town of Waterbury
- Town of Woodbury
- Town of Worcester
- Barre City
- Town of Washington
- Town of Williamstown
- Town of Orange (parts of this town)

A map of these entities appears below.

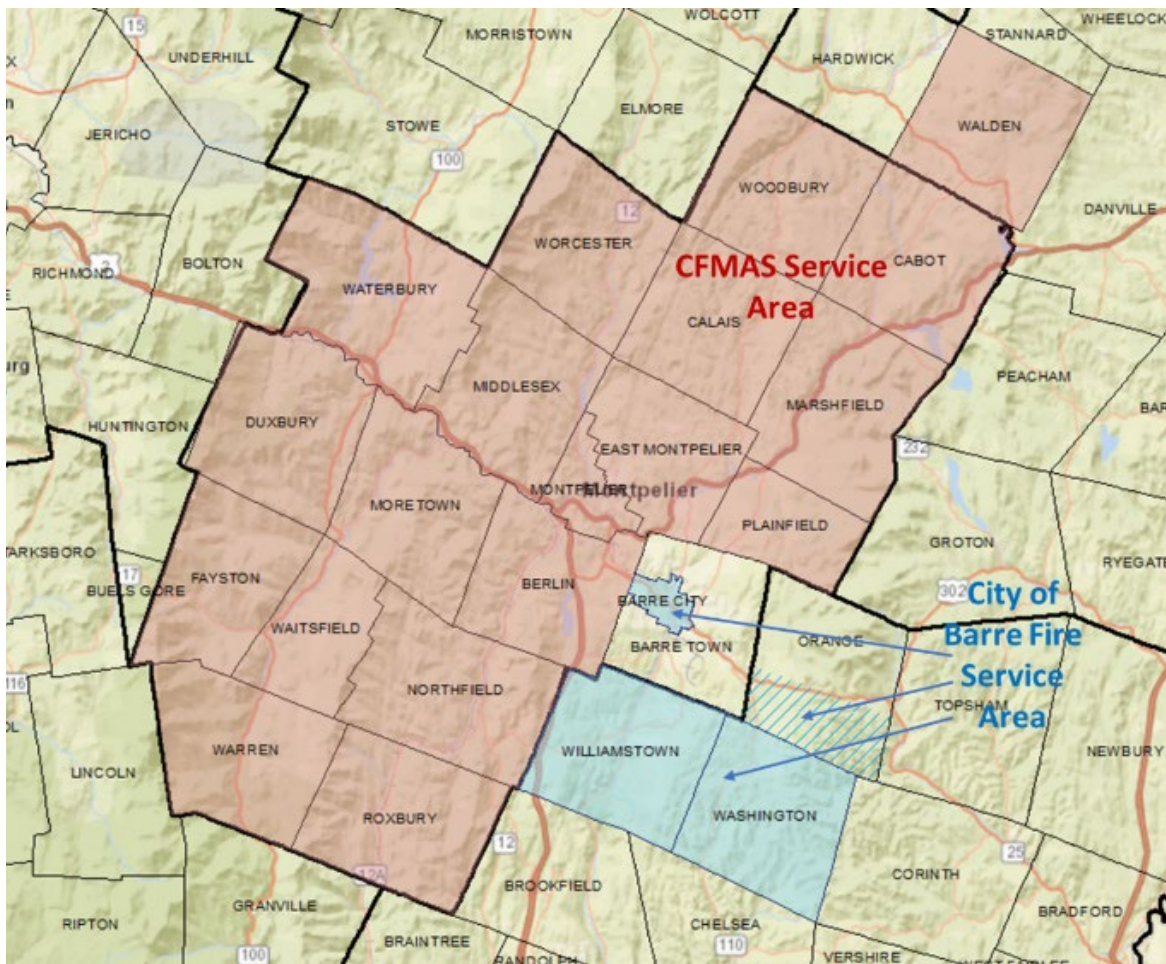


Figure 1: Central Vermont Towns Served by CFMAS, Barre City and Montpelier

2.2 Project Tasks

The CVPSA divided the *Telecommunications Needs Assessment* program into three tasks supported by multiple sub-tasks and deliverables. Individually, the project tasks focus on public safety

communications within the Central Vermont region to document the status of current capabilities and performance gaps, to identify stakeholder requirements, and to develop a strategy to address the gaps, and to evolve and enhance public safety communications throughout the region. Collectively, the tasks were designed to provide the CVPSA and its members and stakeholders a comprehensive analysis of the strengths and weakness in local and regional public safety land mobile radio (LMR) and mobile broadband communications and to provide an actional plan along with a new LMR network preliminary design and associated budget.

In conducting the needs assessment, Televate developed a comprehensive project plan that included the following tasks and subtasks.

2.2.1 Task 1: Complete a region-wide assessment of existing systems and needs

This task covers the public safety stakeholder requirements interviews and surveys and the documentation of existing LMR, backhaul and other public safety communications systems, solutions, and assets. The output of this effort is fundamental to successfully completing the remaining two tasks and provides a coherent and unbiased representation of requirements and network assets to guide the assessment of a regional LMR network and architecture.

- Subtask 1.** Identify and document current and future users of the proposed solutions.
- Subtask 2.** Meet with as many of the Central Vermont public safety stakeholders as is necessary to properly identify and document the current and future needs
 - a) Solicit users' perceptions of current system performance including gaps that do not meet their needs.

2.2.2 Task 2: Propose solutions with designs and cost estimates for resolving indoor and outdoor radio dead zones in Barre City and Montpelier

This task includes the development of recommendations and solutions to resolve coverage requirements, portable device communications enhancements, and the potential integration of commercial cellular wide area and microcells, and the integration of LMR and commercial cellular, including FirstNet, long term evolution (LTE) devices into the CVPSA public safety communications toolbox.

- Subtask 3.** Identify technical or other problems impeding portable to portable, and portable to dispatch communications, especially Fire and EMS communications and recommend solutions.
- Subtask 4.**
 - a) Identify and design engineered solutions necessary to correct gaps in public safety radio coverage that impact firefighter safety for Fire and EMS services within Montpelier and Barre (including inside buildings).
 - b) Identify engineered solutions necessary to correct communications between Central Vermont Hospital and EMS first responders within the municipalities of Cap West and the Fire Aid system, both within hospital buildings and during transmit of EMS patients.
- Subtask 5.** Assessment of any partnership possibilities with other users such as electric utilities and Communications Union Districts which may be limited to conceptual discussions with such possible partners, without detailed planning.
- Subtask 6.** Evaluate whether the use of integrated LMR and Cellular devices (i.e., Sonim and Tait) would better function to enable EMS and fire responses inside Barre and Montpelier buildings, and in LMR dead zones in Cap West towns

Subtask 7. Evaluate the extent to which planned or existing LTE microcell additions in towns dispatched by Montpelier or Barre would improve firefighter safety and service in those towns

2.2.3 Task 3: Describe preliminary plans and estimate costs for any new regional systems that would improve EMS services and resiliency architecture that would provide a basis for a later design project.

Within the scope of work for this task, a budgetary regional LMR design was developed, incorporating in the recommendations to advance cooperative arrangements guiding the use of LMR, Broadband, and LTE architecture and services of CVPSA member municipalities and agencies along with the assessment of electric utilities and Communications Union District partnerships.

- Subtask 8.** Identify how cooperative arrangements for the use of LMR, Broadband, and LTE architecture and services would enable each municipality to improve public safety communications. Particularly, identify any issues of lack of system communications or network redundancy. This may include identification of locations where additional repeaters, simulcast transmitters or LTE microcells might be best deployed, considering existing or planned transmission backhaul facilities needed to reach those locations.
- Subtask 9.** Identify and evaluate systems and strategies that would assist in alleviation of LMR radio system congestion such as CAD and AVL (or others). The identification of current radio equipment may be limited to data provided from current users or their service vendor, Burlington Communications, with assessment of technological capability to meet current public safety standards.
- Subtask 10.** Evaluate available Simulcast systems and frequencies proposed by CFMA to determine what system would enhance coverage and clarity of communications now and in the future.

2.3 Report Overview

As described above, this project entailed an investigation of existing public safety communications systems utilized within the Central Vermont area, an assessment of the needs of the region’s first responder community, identification of the gaps between the current capabilities and the recognized needs, and the identification of solutions to address the gaps.

Section 3 of this report summarizes the needs and communications gaps of the Central Vermont first responder community, as discovered during this engagement, and also describes recommended solutions to address the communications gaps.

Section 4 of this report provides additional detail pertaining to the recommended solutions, how they were developed, and what is required for implementation.

3 CENTRAL VERMONT STAKEHOLDER REQUIREMENTS

3.1 Requirements Task Overview

Thoroughly identifying the mission critical communications requirements of Central Vermont public safety stakeholders is essential for ensuring the strategic plan, leadership support, and investments that address the operational needs and mitigate the existing communications gaps and shortcomings. The future of public safety LMR and emergency dispatch communications in Central Vermont must be anchored on the stakeholders’ needs of today and should also reflect future emerging broadband

communications requirements. Current and future requirements are best determined through direct communications with the stakeholder community, which was a primary objective of this CVPSA project task.

While engaging the stakeholder community to define and design a plan around their needs is the ideal objective and outcome, the actual scope of the effort will be tempered by the availability of financial funding to implement the required solutions. The requirements must align with the availability of funding if the entire funding needs are not available upfront. As detailed in subsequent report sections, Televate has provided line-item cost estimates for each of the technical and administrative activities necessary to achieve all desired public safety communications requirements. In the event that sufficient funding is not immediately available, or only available over an extended timeframe, various initiatives would be prioritized for implementation.

In parallel with the stakeholder interviews and online survey, Televate gathered technical and operational information on the existing LMR, dispatch centers, and broadband networks and solutions facilitating regional public safety communications. This information was assessed in parallel with requirements gathering, and it provided valuable insight into the existing LMR network and dispatch center architecture and infrastructure. Televate referenced this data to determine the existing radio network coverage and to assess the lifecycle status of the infrastructure. We additionally worked with key stakeholders to identify potential new radio sites to incorporate into the future LMR network and conducted sites visits to inspect and quantify existing components and determine their suitability to support future network operational requirements.

A detailed description and assessment of the current communications facilities can be found in *Section 4.1* of this report.

The data gathered was also assessed against the public safety Interoperability Continuum developed by the United States Department of Homeland Security (DHS). The Interoperability Continuum (shown in below) is designed to assist emergency response agencies and policy makers in planning and implementing interoperability solutions for data and voice communications.

Interoperability Continuum

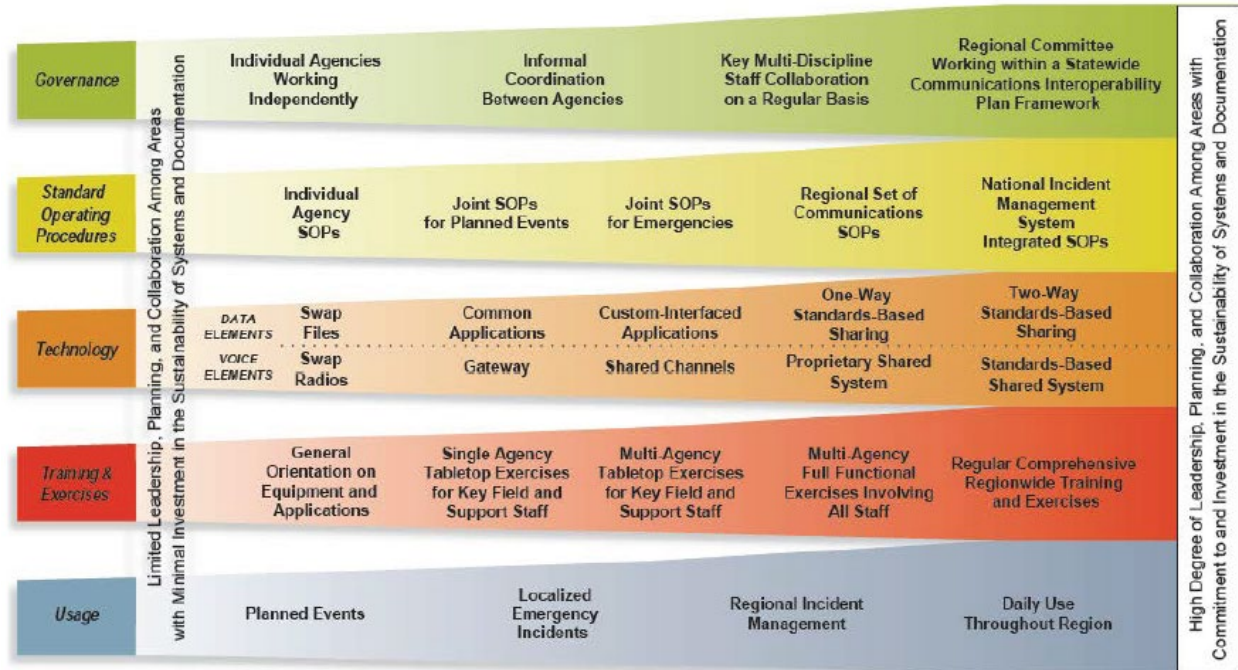


Figure 2: Interoperability Continuum

3.1.1 Task Purpose and Contributions

The objectives to define regional stakeholder requirements and analyze legacy network capabilities and architecture were intended to facilitate the design of the future public safety communications environment, and to validate a considerable body of previous work developed by the Central Vermont regional fire, police and dispatch center professionals. These professionals have long understood the mission critical communications challenges and gaps they experience on a near daily basis, and they have advanced ongoing efforts to present their plans to their respective leadership.

3.2 Task Approach

In designing our approach to this task, Televate developed a list of questions to guide the stakeholder interviews and provided them to the CVPSA Project Manager, Paco Aumand, for review and approval. Mr. Aumand developed a list of key stakeholders to interview and provided an introduction to Televate to facilitate the scheduling of the interviews. The interviews were conducted with a cross section of Capital Fire Mutual Aid System (CFMAS) Fire Chiefs and other knowledgeable and leadership members of CFMAS, along with fire and police leadership from Barre City and Montpelier and CVPSA board members. Additional stakeholders included dispatchers from Montpelier and Barre City, the Capitol Police Chief, Burlington Communications, a local citizen, and others with information of value to contribute to the project. A complete list of all interviewees is provided in Table 3.

Outreach to the Federal Communications Commission (FCC) was also undertaken to investigate their availability to assist with radio interference mitigation. The CFMAS legacy system currently experiences radio interference that impedes reliable communications and negatively affects voice quality.

In an effort to expand regional participation to give additional members of the public safety community the opportunity to share their needs, Televate prepared an online survey that covered radio and

broadband communications capabilities, requirements, and operational gaps. The draft survey was shared with CVPSA and others to obtain their input, and the final survey was posted online and shared with various local stakeholders. Overall, participants in the survey emphasized the need for better coverage for radio and cellular communications, including as a prerequisite to introducing new applications such as push to talk. Despite these coverage difficulties, many participants indicated they are currently able to communicate with the required agencies. The detailed results of this survey are provided in *Appendix B: CVPSA Needs Assessment Questionnaire Report*.

We additionally prepared a list of CFMAS, and Barre City and Montpelier radio network and dispatch center facility architecture, equipment, and system design information to support network coverage and capabilities analysis. Televate also conducted research of the FCC Universal License System (ULS) to verify radio system sites, frequency assignment and operating license status.

3.2.1 Public Safety Radio Network Information

Televate developed a list of information for the regional LMR network equipment and radio site infrastructure, dispatch center equipment, mobile and portable radio models and capabilities, and other public safety communications assets necessary to document and assess the status, age, performance, and lifecycle of these components. This information is required to model the coverage of the LMR networks and to determine if and what equipment could be integrated into the future network, would need to be replaced, or was not available and would be needed to support the mission critical grade (MCG) level of service fundamental for public safety radio networks. Public safety radio networks must be designed, constructed, and operated at MCG standards to ensure the required levels of geographic coverage, performance quality, reliability, and redundancy.

Over the course of the data gathering phase of the project, various stakeholders were able to provide much of the information required to assess equipment lifecycles, and to model the radio network coverage for the CFMAS, Barre City and Montpelier LMR networks. This data gathering effort highlighted various strengths and exposed a few weaknesses regarding information management procedures, and the quality and accuracy of the data. Barre City and Montpelier maintain network data files with full time personnel, who specialize on their respective radio networks, among other assigned responsibilities. While CFMAS maintains radio sites information files, it is more challenging for a volunteer agency to dedicate the requisite time to thoroughly maintain system data files.

3.2.1.1 Radio Network Information Findings and Recommendations of Interest

While in general, the breadth and accuracy of the communications system information maintained was very good and the individuals responsible for recoding the data are very dedicated professionals who understand the value of maintaining this data, there are a few areas that can be improved that will result in valuable communications system operations and maintenance (O&M) benefits. Table 2 describes key findings and recommendations regarding the system data management process.

Table 2: Central Vermont Public Safety Communications System Data Management

Category	Findings	Recommendations
Communications System Documentation	<ol style="list-style-type: none"> 1. Very challenging to maintain accurate current data 2. Facility documentation incomplete 	<ol style="list-style-type: none"> 1. Maintain a complete set of site and facility data files² 2. Develop list of data to be captured and maintained³ for each site file 3. Assign one or more individuals to record and maintain the information <ol style="list-style-type: none"> 3.1. Assist volunteer CFMAS with data capture and management 4. Facility documentation must include generators/batteries/UPS, HVAC, electrical and all non-radio components to be maintained
Communication System Maintenance	<ol style="list-style-type: none"> 1. Records regarding preventative and corrective maintenance vendors and status incomplete 2. Status on spare equipment and parts not clear 	<ol style="list-style-type: none"> 1. All system maintenance vendors and maintenance logs must be properly maintained and documented 2. All spare parts and equipment must be maintained along with the associated repair/replacement status and failure type and cost to repair

3.2.2 Central Vermont Public Safety Radio Communications Stakeholder Interviews

The following stakeholders participated in interviews to share experiences and requirements for the Central Vermont public safety LMR, dispatch, and mobile broadband communications capabilities. The interviewees include an extended group of public safety stakeholders representing multiple disciplines, CVPSA leadership, and other interested parties. These stakeholders individually and collectively shared valuable insight, information and their respective ideas on current radio communications capabilities, gaps, and their thoughts and efforts to address current flaws, and to evolve public safety communication into a more robust and reliable solution. Table 3 lists all stakeholders who participated

² By maintaining accurate data files, operators simplify the task of determining the lifecycle status of equipment and are better positioned to enter into and maintain preventative and corrective maintenance on all system components, which, among others benefits, allows the operator to properly budget for ongoing operations and eventual component or system refresh.

³ Specific data to be documented varies per facility type and category. As an example, at a minimum for LMR sites, the following data should be maintained: site location, FCC licenses, radio equipment by manufacturer (component name, model number, purchase date), transmission system components (TX/RX transmission and jumper cable line types/length/power loss/connector types), antenna types/gains/pattern, combiner/duplexer types/losses, transmitter output power and overall effective radiated power (ERP), and individual site coverage propagation model maps.

in the interviews and describes the primary purpose for each meeting. See Appendix C to review the meeting notes documented for each of the interviews.

Table 3: List of Central Vermont Requirements Task Interviewees

Participants	Meeting Overview
Joe Aldsworth (Deputy Fire Chief – Barre City)	Overview of regional radio communications and the ongoing strategy to enhance public safety radio communications
Doug Brent (Fire Chief – Barre City) Joe Aldsworth (Deputy Fire Chief – Barre City)	Overview of Barre City and Montpelier radio upgrade plan
Paul Cerutti (Fire Chief of Woodbury, Dispatch Committee Chairman of the Capital Fire Mutual Aid Systems [CFMAS]) Joe Aldsworth (Deputy Fire Chief – Barre City)	CFMAS overview and radio communications gaps, strengths and approach to implement the simulcast analog radio network
Todd Goad (Burlington Communications) Joe Aldsworth (Deputy Fire Chief – Barre City)	CFMAS conventional simulcast network plan and current system overview
Brian Peete (Police Chief – City of Montpelier)	Police communications capabilities and gaps and future vision
Scott Bagg (Capital West Dispatcher)	CFMAS radio communications gaps, strengths, and approach to implement the simulcast analog radio network
Ken Jones (CVFiber)	Overview of CVFiber and potential for supporting CVPSA
Frank Frievalt (Fire Chief – Mammoth Lakes Fire Protection District) Bob Rooks (Deputy Fire Chief – Mammoth Lakes Fire Protection District) Brian Peete (Police Chief – City of Montpelier) Doug Brent (Fire Chief – Barre City) Joe Aldsworth (Deputy Fire Chief – Barre City) Kim Cheney (CVPSA Board Chair – when this meeting occurred) Paco Aumand (CVPSA Project Manager)	Integration of FirstNet broadband mission critical push-to-talk (MCPTT) into the public safety radio communications toolbox
Steve Whitaker (Citizen)	Program overview
Matthew Romei (Chief of Police – Capitol Police) Joe Aldsworth (Deputy Fire Chief – Barre City)	Capitol radio communications capabilities and gaps, including regional interoperability
Fred Cummings (Director, Capital West Dispatch)	Overview of Capital West dispatching approach; review of public safety radio communications gaps, strengths, and requirements

Participants	Meeting Overview
Karl Rinker (Rinker Communications [retired]) Doug Brent (Fire Chief – Barre City) Joe Aldsworth (Deputy Fire Chief – Barre City)	Review of potential radio towers to support regional public safety communications
Dona Bate (CVPSA Board member) Doug Hoyt (CVPSA Board member)	Project overview and next steps
Federal Communications Commission (Technical staff)	Inquiry into process to report and resolve public safety radio interference
Russell Schauer (City of Barre Dispatch)	Dispatch operations for City of Barre Police and Fire
Mike Wolf (Central Vermont Medical Center) Jessica Cullen (Central Vermont Medical Center) Terri Lynn (Central Vermont Medical Center)	Hospital communications to ambulances and opportunity to mount antenna on hospital roof
Carrie McCool (City of Montpelier Dispatch)	Dispatch tour and dispatch operations for City of Montpelier and CFMAS
Larry Eastman (City of Barre PD)	Dispatch tour and dispatch operations for City of Barre and police department communications
Patty Richards (General Manager, Washington Electric Cooperative, Inc.) Dave Kresock (Director of Engineering)	Opportunity for collaboration in support of mutual communications needs
Dan Nelson (Velco VP of technology) Kim Wigmore (Director of Information Technology) Satish Angur (radio engineer) Mike Conlogue (network engineer)	The Vermont Electric Power Company (VELCO - www.velco.com) is the largest electric company in Vermont and maintains extensive radio and backhaul (fiber and microwave) systems. The meeting discussion focused on available opportunities for collaboration and asset sharing and should be further explored.

3.3 Key Stakeholder Requirements and Recommendations

In sharing their respective public safety communications requirements, the Central Vermont stakeholders demonstrated an admirable level of dedication, passion, and commitment to enhancing communications capabilities in the best interest of the community and for the safety of the first responders. Interviewees were direct and honest in expressing the operational quality and flaws of the respective communications systems and tools together with their requirements to enhance capabilities. Some stakeholders likewise shared their frustrations with the process to seek support, approval and funding for various initiatives that have been presented to address the existing operational gaps in mission critical public safety communications within Central Vermont.

Nevertheless, the interviewees expressed their support for the needs assessment efforts and were happy to have the opportunity to participate. There is general optimism that the opinions and needs expressed will result in a concerted leadership and stakeholder effort to address and mitigate the noted public safety communications issues. The momentum created through the Needs Assessment can

hopefully overcome various challenges in regional governance structures and in solidifying the required capital and operational funding, both of which will be further explored within the report.

3.3.1 Public Safety Land Mobile Radio – General Requirements

The mission critical land mobile radio (LMR) networks that facilitate public safety communications are an essential lifeline for first responders and the citizens seeking emergency support. The LMR system is the primary communications solution used to dispatch responders to an incident and to support communications en route to the incident, while on scene at the incident, and when transporting patients to the hospital or criminals to jail. Reliable radio communications are essential for supporting the day-to-day and emergency response communications needs of the public safety professionals of Central Vermont. LMR networks need to be designed and operated to a public safety grade (PSG)⁴ level of service to ensure that they satisfy the stringent operational requirements of public safety. Among many PSG communications facility requirements, system redundancy, system availability, and back-up power (battery, generator, and UPS) are fundamental to achieving the desired levels of PSG.

LMR networks additionally need to provide reliable coverage and are typically designed to deliver 95% reliable coverage over 95% of the service geography, typically referred to as the 95/95 coverage objective. The typical service environments for mobile radio and for portable radios communicating on-street, in-vehicle, and in-building also need to be defined to guide the LMR system design. In meeting the radio signal strengths required to support the various mobile and portable service environments, greater signal levels are required to support portable radio coverage resulting in the need to deploy a greater number of radio base stations and towers. The radio signal must be strong enough to overcome potential radio interference that can be received from co-channel frequency operations beyond the service area, and/or interference free radio frequencies must be licensed. There must also be sufficient radio channels/frequencies to support the required subscribers base and their various use cases.

Clearly, the commonly stated adage regarding cellular phone communications, “can you hear me now,” takes on an incredibly different meaning and risk for public safety. If radio networks are not designed to the described standards and best practices, the community and the public safety professional are placed at greater risk for their safety and welfare.

3.3.2 Public Safety Land Mobile Radio in Central Vermont

As demonstrated within the stakeholder requirements, and detailed throughout this report, the existing land mobile radio (LMR) networks servicing Central Vermont are seriously outdated, do not provide sufficient coverage, and place greater risks on end users and the communities to which they serve. Many of the basic LMR design and operational requirements and standards stated above are not inherent in the public safety radio network serving Central Vermont. While there are certainly a number of positive attributes of the legacy radio systems, and the public safety dispatchers and firefighters in particular have developed labor intensive operational workarounds, the region’s LMR networks are far from the state-of-the-art.

⁴ For additional insight into the public safety Grade of Service standards regarding mission critical communications systems as defined by the National Public Safety Telecommunications Council (NPSTC), the leading advocate for public safety communications, please see the NPSTC published report at https://www.npstc.org/download.jsp?tableId=37&column=217&id=3066&file=Public_Safety_Grade_Report_140522.pdf.

The remainder of this section details the key public safety communications gaps and requirements expressed by the stakeholders through the interview and online survey. The radio requirements are documented by user disciplines and jurisdiction, while other requirements are described by communications function or purpose. Televate’s recommendations briefly address the gaps and requirements and are directly aligned with the categories to streamline the review. Subsequent sections of the report provide greater detail on the proposed solutions together with budgetary investment analysis to guide the decision and resolution process.

3.3.2.1 Capital Fire Mutual Aid System (CFMAS)

The Capital Fire Mutual Aid System (CFMAS) is a municipal district comprising all 33 area departments career and/or volunteer that provide firefighting and emergency medical services to each of their respective towns (see Section 2.1 and Figure 1). The CFMAS owns and operates a VHF conventional analog land mobile radio (LMR) network to facilitate radio dispatching and emergency response communications. CFMAS member agencies are dispatched by the City of Montpelier under a contract guided by the Capital West Communications Committee (Cap West) of the CFMAS. Conventional radio networks are the most basic of LMR technologies and operate via independent coverage from each radio site/tower, typically nearest to the incident response or while en route to the incident. Due to the mountainous terrain common in Central Vermont, fire responders require coverage from more than one tower, along with coordination from dispatch on the appropriate tower, in order to receive continuous reliable transmissions. The legacy CFMAS radio network has been in operation for more than 20 years, is functioning at well beyond its useful lifecycle, and is anchored on outdated radio technology. The operations of this network also experience regular radio interference from Canadian radio operators and other public safety LMR systems within the State of Vermont that too frequently disrupt critical communications.

The following CFMAS focused requirements and associated Televate recommendations highlight these and other issues and concerns.

Table 4: Televate Recommendations for CFMAS Requirements

CFMAS Requirement	Televate Recommendations
<ul style="list-style-type: none"> • Existing radio network does not meet operational requirements – a new radio network is required <ul style="list-style-type: none"> ○ Does not cover the required service area ○ Radio interference from Canada and within the State of Vermont affects voice quality ○ Is anchored on old conventional analog radio technology ○ Operating beyond its useful lifecycle • Support for the CFMAS quote for the new simulcast analog radio network <ul style="list-style-type: none"> ○ Considerations now underway to integrate the CFMAS new radio network into an expanded formal LMR solicitation to include the LMR radio enhancements and radio console 	<ul style="list-style-type: none"> • A new, modern, standards based, and Project 25 capable simulcast radio network is required <ul style="list-style-type: none"> ○ Sufficient radio base stations/tower sites are required to expand and satisfy coverage requirements – Simulcast configuration eliminates need for dispatcher to choose a specific tower site. ○ One (1) interference-free VHF frequency pair is required; however, two (2) VHF channels are recommended – a two channel system will provide a backup dispatch channel in the event of a failure of the primary dispatch channel and will provide en route and on-scene firefighters an alternative repeated channel to avoid congestion on the primary dispatch channel • The CFMAS LMR quote represents a prudent radio network architecture and should be

CFMAS Requirement	Televate Recommendations
<p>equipment requested by Montpelier and Barre City</p>	<p>refined and enhanced to incorporate any additional or replacement radio sites, additional radio site upgrades (backup power, HVAC, grounding, etc.), monitoring and maintenance services, backhaul upgrades as necessary, and other enhancements as needed</p> <ul style="list-style-type: none"> ○ The strategy to integrate the CFMAS, Montpelier and Barre City radio network should be pursued ○ A formal solicitation and supporting RFP should be developed and managed by either Montpelier, Barre City, CFMAS or CVPSA – funding responsibilities need to be clarified under an acceptable governance structure (see additional comments within the governance requirements and recommendations section below) ○ Regarding the RFP, CVPSA could take on responsibility for funding, management of the RFP and serve as the future radio network governing body⁵
<ul style="list-style-type: none"> • A decision regarding the proposed CFMAS regional analog simulcast LMR is required 	<ul style="list-style-type: none"> • The proposed analog simulcast LMR network is the most appropriate and cost-effective LMR technology for CFMAS <ul style="list-style-type: none"> ○ The future radio network must be P25 capable to qualify for potential federal grants ○ The design of the proposed CFMAS radio network must be finalized before implementation ○ All sites proposed to support the coverage requirements must be determined,⁶ qualified as being structurally capable of supporting the radio transmission, and properly licensed

⁵ CVPSA could serve as a unified governing body that oversees the decision and the oversight implementation of the recommendations presented in this report accepted by CVPSA and its members. Within its current structure, CVPSA could adopt this role; the role of CVPSA should be discussed and decided with its membership.

⁶ The currently proposed CFMAS radio design includes six sites; however, over the course of the project, additional coverage gaps were identified that additional and/or relocated tower sites may better facilitate the radio coverage enhancements. One of the proposed radio sites has also not received approval due to a pending objection from an operator in New Hampshire. This issue needs to be resolved prior to implementing this radio site.

CFMAS Requirement	Televate Recommendations
<ul style="list-style-type: none"> • Procure new radios to replace aging portable and mobile radios in disrepair <ul style="list-style-type: none"> ○ Approximately 200 new radios are required 	<ul style="list-style-type: none"> • New radios should be procured to replace aging and all radios in disrepair <ul style="list-style-type: none"> ○ Need to confirm the total number of new radios required • A cache of spare radios (10-20) should be maintained and a process to request and distribute should be developed
<ul style="list-style-type: none"> • Ability for dispatch to monitor fire ground TAC channels (direct mode/talk-around) <ul style="list-style-type: none"> ○ Firefighter lives would be better protected if the fire ground direct mode TAC channel could be monitored by dispatch 	<ul style="list-style-type: none"> • Install an additional receiver at each radio site programmed to receive the primary fire ground TAC channel transmissions <ul style="list-style-type: none"> ○ Develop standard operating procedures (SOP) to assist dispatchers and on-scene incident commanders to determine if and how to alert dispatchers for assistance over the TAC channel
<ul style="list-style-type: none"> • Use of vehicular repeater system (VRS) to facilitate greater in-building coverage <ul style="list-style-type: none"> ○ A number of online stakeholder interviewees indicated an interest in the use of VRS to support on-scene communications with portable radios 	<ul style="list-style-type: none"> • The VRS is a cost-effective radio rebroadcast solution that could supplement repeated radio transmission <ul style="list-style-type: none"> ○ If the CFMAS simulcast system is not funded or under-funded and select radio sites are not deployed, the VRS should be considered as an option to expand on-scene radio communications

3.3.2.2 City of Montpelier and Barre City Fire Radio

The City of Montpelier and Barre City provide dispatch services for their respective cities. The two cities additionally own and operate LMR networks to support public safety dispatch and communications. Police radio communications is conducted over separate UHF radio systems, while fire dispatch, paging and communications is conducted over a VHF radio network that uses the same frequency/channel for both the City of Montpelier and Barre City. Police communications requirements within the two cities are addressed below, and this report section concentrates on fire department communications within these two cities. It is important to note that the cities have been actively advancing initiatives with their city executives to address existing coverage gaps, primarily in-building, and to replace outdated radio consoles. They have recently determined that there are efficiencies in combining the City radio communication and dispatch console procurement with the CFMAS LMR network upgrade and have proposed to issue a consolidated RFP.

Table 5: Televate Recommendations for City of Montpelier and Barre City Fire Radio Requirements

Requirements	Televate Recommendations
<ul style="list-style-type: none"> • A dedicated fire dispatch channel is required to support Barre City and Montpelier <ul style="list-style-type: none"> ○ Options for an independent simulcast cell to support Barre City and Montpelier that 	<ul style="list-style-type: none"> • Implement a dedicated analog simulcast cell supporting Barre City and Montpelier that incorporates a dispatch channel reserved for the two cities

Requirements	Televate Recommendations
<p>is interoperable with the CFMAS simulcast cell</p> <ul style="list-style-type: none"> • Improve in-building coverage for fire radio communications with the two cities • Identify and integrate interference-free radio channel to support reliable dispatch and responder communications • Develop a consolidated Request for Proposal (RFP) to procure the CFMAS, and the VHF radio coverage enhancements for the two cities, along with new radio consoles <ul style="list-style-type: none"> ○ Secure the required funding to advance the radio system upgrades ○ Obtain internal city executive and CVPSA support to release the RFP 	<ul style="list-style-type: none"> ○ The City “cell” should be integrated and interoperable with the CFMAS and both City dispatch centers should be able to dispatch and communicate over both cells – the two cells would constitute a single regional LMR network ○ Additional radio sites should be added to enhance City in-building coverage⁷ ○ If sufficient radio frequencies are available, include a repeated TAC channel that could be monitored by dispatch and also be available for tactical communications – all channels must be interference-free ○ City and CVPSA support is fundamental for advancing the required improvements for the City, and the CFMAS public safety radio communications objectives ○ Funding challenges must be explored and addressed through a cooperative arrangement between all stakeholder Cities and Towns <ul style="list-style-type: none"> ▪ Funding options are presented within the Governance requirements section
<ul style="list-style-type: none"> • The future public safety radio network should be Project 25 (P25) capable 	<ul style="list-style-type: none"> • The future radio network must be P25 compatible to both support national interoperability and to position Central Vermont for federal funding opportunities
<ul style="list-style-type: none"> • Upgrade and modernize dispatch consoles 	<ul style="list-style-type: none"> • New radio consoles are required at both dispatch facilities, the legacy consoles are operating beyond their intended lifecycle, are no longer supported by the manufacturers, and are at risk of failure

3.3.2.3 Montpelier and Barre City Police

During interviews with Montpelier Police Chief Brian Peete, and with Barre City police dispatcher and Deputy Chief Larry Eastman, they presented the following requirements. Chief Peete also expressed additional Montpelier Police communications related needs through a funding proposal made to the City manager. Police communications within Central Vermont is anchored on the UHF frequency band,

⁷ It is important to note that due to the physical dimensions of the VHF radio wavelength, the VHF signal encounters challenges propagating into buildings. The topical granite building materials of many city buildings additionally affects indoor signal propagation. Vehicular repeater systems (VRS) installed onto fire apparatus should be considered as a viable solution to enhance in-building coverage.

which has better in-building propagation characteristics than the VHF frequencies that support fire radio communications.

The coverage requirements of the City Police Departments are primarily limited to the geographic boundaries of the cities and therefore can be reliably provided with fewer radio sites than are required to support CFMAS. In-building coverage in Montpelier for portable radios could be improved and there are coverage issues in a few neighboring Towns that should be improved to support requests for mutual aid.

Table 6: Televate Recommendations for Montpelier and Barre City Police Requirements

Requirements	Televate Recommendations
<ul style="list-style-type: none"> • The Valcour CAD/RMS (Crosswinds Technologies at www.crosswind.com/public-safety) is not a functional CAD system – a functional CAD system is required 	<ul style="list-style-type: none"> • A common CAD system should be implemented in Montpelier and Barre City that supports all of the dispatcher and public safety agency requirements. The current Valcour system is better suited as a records management system (RMS) for police data recording and management • Crosswinds offers a combined CAD/RMS solution that may meet the operational requirements and should be investigated to determine if it cost-effectively satisfies operational requirements. If not, and sufficient funding is available, a new CAD system should be considered • The future CAD system should include a mobile data dispatch application. Data dispatch will reduce radio traffic congestion
<ul style="list-style-type: none"> • In-building portable radio coverage in Montpelier is not as reliable as desired 	<ul style="list-style-type: none"> • An additional radio site in Montpelier may be required to provide improved in-building coverage with the City. The Montpelier Police Department did request an additional radio site within a recent budget request; however, the need for this site was not discussed during the interview. It is possible that one of the sites envisioned for the improved City fire system could be leveraged for this need.
<ul style="list-style-type: none"> • Would like to pilot the PTTtoC or MCPTT broadband cellular application in Montpelier to confirm usability 	<ul style="list-style-type: none"> • Recommend that both Police and Fire arrange for a PTTtoC and/or MCPTT pilot with both Verizon and AT&T/FirstNet
<ul style="list-style-type: none"> • Montpelier Police experiences coverage issues in the Towns of Marshfield, Northfield and Middlesex when providing mutual aid 	<ul style="list-style-type: none"> • Montpelier Police may be able to use a State of Vermont Chief of Police V-COMM channel, or a Washington County Sheriff’s Department radio channel to facilitate radio communications within these neighboring Towns. However, if Montpelier provides more frequent coverage

Requirements	Televate Recommendations
	into one or more of these Towns, additional radio towers, perhaps leveraging the future CFMAS tower locations, are recommended.
<ul style="list-style-type: none"> • Need additional vehicular repeater system (VRS) in Montpelier – one for each cruiser – to deliver reliable radio coverage between the mobile radio and the portable radio when officers leave the vehicle 	<ul style="list-style-type: none"> • Additional VRS repeaters should be procured, and in fact, a recent budget request included VSR equipment. The VRS is a cost-effective solution to expand LMR coverage to support portable on-street and in-building coverage.
<ul style="list-style-type: none"> • Need Mobile Data Terminals (MDTs) for each police cruiser in Montpelier to support officer research and decrease officer requests for dispatchers to conduct research 	<ul style="list-style-type: none"> • The MDT will provide capabilities for police officers to conduct on-scene and in-cruiser research, thus relieving dispatchers from providing this support • A cost-benefit analysis should be undertaken to determine the near-, mid-, and long-term benefits of using the MDT solution
<ul style="list-style-type: none"> • Implement License Plate Readers (LPRs) in each cruiser in Montpelier to support officer research and relieve research requests to dispatchers 	<ul style="list-style-type: none"> • The LPRs will provide direct capabilities for police officers to conduct on-scene and in-cruiser license plate research and relieve dispatchers from providing this support • A cost benefit analysis should be undertaken to determine the near-, mid-, and long-term benefits of using the LPR solution
<ul style="list-style-type: none"> • The Central Vermont regionalized tactical force have to be able to talk to each other under a continuity of operations plan • It should be noted that Central Vermont first responders are protecting the state capitol and we need state of the art technology to support our mission⁸ 	<ul style="list-style-type: none"> • Additional details on the regional tactical force needs to be defined, which may be an opportunity to form a committee under the CVPSA to assess and develop • A Communications Plan supporting the needs of the regional task force together with other multi-jurisdiction, multi-agency emergency response communications requirements could be developed

3.3.3 Governance

The Central Vermont Public Safety Authority (CVPSA) is a “union municipal district legislatively formed to enhance the safety and quality of life of the people of Barre and Montpelier.”⁹ The CVPSA operates as a regional public safety centric governance organization, consisting of an elected board of directors and appointed representatives from Montpelier and Barre City along with a representative from the Capital

⁸ This statement was provided during a police stakeholder interview and is presented as a global public safety communications capability requirement.

⁹ Central Vermont Public Safety Authority web site, <https://cvpsa.org/>.

Fire Mutual Aid System (CFMAS). CVPSA objectives are to enhance public safety services within its member communities. It works to accomplish this by developing plans to regionalize and/or consolidate public safety services and functions. The CVPSA conducts monthly and as-needed special meetings and spends meaningful time advancing public safety initiatives. The CVPSA also has the authority to collect fees from the community, restricted to Montpelier and Barre City, and can enter into contracts and raise capital through municipal bonds. With the exception of Montpelier and Barre City, the CVPSA cannot directly assess and collect fees from the Towns that the CFMAS provides fire and emergency medical services.

CVPSA was formed to enhance the public safety for the people of Central Vermont. The Cities of Barre and Montpelier are currently its only full members whose residents have voted to join the regional authority. CVPSA can add Towns to its membership. Each member city/town can appoint two representatives to the CVPSA board. CVPSA has the authority to tax these communities by placing a financial ballot request on its member's Town Meeting ballot. The board has three at-large elected members who have to collect signatures from its member city/town to get on their March Town Meeting ballots.

CFMAS has a limited membership granted through an MOU and has been given two CVPSA Board slots for its appointed representation. CVPSA currently has an empty board slot, though for years CFMAS had two active reps on the CVPSA Board. It is recommended that CFMAS fill the missing CVPSA Board position. CFMAS organizational structure does not give it any taxing powers. Therefore, CVPSA cannot tax CFMAS nor enter into any long-term financial commitment for purchasing equipment. CFMAS members annually go before their individual towns and request money for their operations and any capital expenses.

Each Town that passed a vote to join CVPSA, could become a full member with two appointed representatives and could be taxed by CVPSA according to the established cost allocation formula developed as part of the negotiations with the current CVPSA members.

3.3.3.1 CVPSA Governance Historical Overview

Among the historical efforts of the governance organization, the CVPSA previously advanced an initiative to create a consolidated 9-1-1 dispatch system. Due to various concerns of the CVPSA member communities, the consolidated dispatching system was not advanced. Public Safety Answering Point (PSAP) and 9-1-1 calling services for Central Vermont are provided out of the Town of Williston in Chittenden County, VT, one of the six PSAP facilities operating in the State. There appears to be some desire to look at the possibility for PSAP services being built into the dispatching services within Central Vermont. Combining 9-1-1 call handling and dispatching has many benefits, but it is important to highlight that the scope of work for the Needs Assessment did not include an analysis and recommendation of a central Vermont PSAP.

Televate was not tasked with assessing the functionality of the CVPSA governance structure or to make recommendations on the governance model and underlying activities of the board. However, a review of the CVPSA website and various public documents was performed, and a number of conversations on the role, responsibilities, and stakeholder sentiments of the CVPSA were conducted. Additionally, during multiple stakeholder interviews, participants were either asked questions about the strengths and weaknesses of the CVPSA, or participants offered unsolicited comments.

Although Televate does not have insight into the structure, success, and support of the CVPSA, we do have extensive experience designing, refining, and restructuring public safety interoperable communications governance organizations and supporting operating charters, agreements, and joint

communications network sharing and funding models. We offer the following thoughts and best practices for achieving and maintaining functional best practices. They are not intended to be representative of the CVPSA governance organization, or to highlight strengths or weaknesses of CVPSA. Instead, the comments address good governance behaviors and tenets that best facilitate desired outcomes.

3.3.3.2 Interoperable Communications Governance Structure Best Practices

Functional regional governance engaging the participation of a broad community of public safety agencies, independent jurisdiction leadership, and other key stakeholders is fundamental for advancing public safety interoperable communications and the associated initiatives and investments required to achieve the desired objectives. Governance represents one of the key tenets of the Interoperability Continuum. Whenever multiple jurisdictions and cross-discipline public safety agencies, public corporations, and other partners work together in concert to define and advance common communications objectives and capabilities, governance is even more important, and certainly more challenging.

Regional governance structures are typically structured and represented by Police and Fire Chiefs, independent government executives, and other community leadership, each with independent and innovative ideas to advance interoperable communication. Regional communities that cooperatively partner under common purpose, intentions, and actions will more effectively achieve their mutually desired outcomes. Good governance will deliver the intended results at reduced cost, time, and conflict. Good governance will design fair and equitable capital, asset and human resource sharing, and will provide an open forum for productive communications and compromise as important stakeholder and regional community needs are addressed.

Successful governance organizations require that the leadership from participating public safety agencies, elected officials, and other members of government and the community communicate and reach agreement under respectable civil discourse and honest, fact-based discussion with an objective of reaching consensus. Additionally important, the appropriate stakeholders must have a seat at the decision-making table and even when individual ideas are not, or are only partially, integrated into the final Executive Committee decision, respectful discourse is essential for the good of the extended community. Negative discourse can create harmful, disruptive, and long-lasting feelings and behavior that may be difficult or impossible to resolve and can result in key stakeholders removing themselves from the governance committee when their contributions are most needed.

The governing organization should also focus on creating specialized Committees and Sub-Committees responsible for providing recommendations on key aspects of the initiatives under assessment.

3.3.3.3 CVPSA Governance Requirement and Recommendations

The following CVPSA governance requirements and recommendations are anchored on broad and somewhat open-ended objectives. The ongoing and future role of CVPSA in guiding and facilitating regional public safety interoperable communications present intriguing, practical and philosophical considerations that will require that the CVPSA Board of Directors and its stakeholders continue to explore and strive for consensus.

Table 7: Televate Recommendations for CVPSA Governance Requirements

Requirements	Televate Recommendations
<ul style="list-style-type: none"> • Need to determine the roll for CVPSA in supporting various governance, procurement, 	<ul style="list-style-type: none"> • The CVPSA can and should play a key role in facilitating the procurement, implementation,

Requirements	Televate Recommendations
<p>and operations of Central Vermont regional public safety communications systems with a focus on the future systems and solutions</p>	<p>ongoing operations, and governance of public safety communications systems and solutions within Central Vermont.</p> <ul style="list-style-type: none"> The specific role of CVPSA needs to be discussed and consensus reached with the CVPSA Board of Directors and membership. The CVPSA governance support should be designed to complement the ongoing activities of the City of Montpelier and Barre City dispatch operations and CFMAS radio operations. Under the current CVPSA governance structure, the impact of CVPSA is both limited by charter and Board authority, both of which drive the effectiveness of the Board. However, the CVPSA board endeavors to promote collaboration, engagement, and advancement of initiatives to the benefit of the public safety stakeholders and the regional community. In addition to the current areas of CVPSA leaderships, future areas of CVPSA leadership could include oversight management of capital improvement funding, operational cost sharing, communications training and exercising, creating a forum to discuss ongoing advancements of public safety communications.
<ul style="list-style-type: none"> What is the roll of CVPSA in funding the future Central Vermont radio network investments? 	<ul style="list-style-type: none"> The CVPSA is in a unique position to facilitate the funding of the required public safety communications systems upgrades. The CVPSA has the authority to issue a bond to fund aspects of the upgrade if appropriate, however, as currently structured, the CVPSA cannot make funding commitments on behalf of the Towns represented by the CFMAS. Funding from CFMAS Towns, would need to be secured by the local CFMAS Fire Chiefs. During the course of this project, the CVPSA did produce an earmark application that was delivered to Senators Leahy and Sanders. The earmark was prepared by various Board members and stakeholders and included most of the capital and operational improvements identified in this report. It is important that the Board maintain ongoing discussions with the Senators to obtain status and to promote the

Requirements	Televate Recommendations
<ul style="list-style-type: none"> • How to address regional issues with CVPSA and raise local participation and support from membership and the regional community? 	<p>critical benefits of this funding vehicle to Central Vermont.</p> <ul style="list-style-type: none"> • The existing CVPSA governance structure is sound in that there is ongoing Board member and stakeholder participation, and meeting discussion are directed towards issues of regional mutual interest. However, as described during the stakeholder requirements interviews, various interviewees expressed concerns with certain aspects of the CVPSA governance approach and alluded to the ineffectiveness of CVPSA governance. An assessment of the CVPSA governance was not a Needs Assessment project scope item, but due to the importance of the role of regional governance in advancing regional public safety communications, briefly addressing governance was proper. • There is certainly room for improvement and a dedicated project to interview Board members (all CVPSA Board members were not interviewed in support of this project) and key stakeholders to identify their respective opinions on the CVPSA governance model, issues and flaws that could be mitigated, and their ideas for enhancements is recommended. A confidential independent assessment will identify gaps and requirements to strengthen the governance functionality and provide CVPSA leadership with options to enhance the governance model. • CVPSA could also assess the interest of the individual Towns to become members of the CVPSA
<ul style="list-style-type: none"> • Greater fire chief participation on the CVPSA Executive Board 	<ul style="list-style-type: none"> • A number of stakeholder interviewees mentioned the need for greater Fire and Police Chief participation on the CVPSA Board of Directors. The current Board of Director governance structure is mandated by State charter and may not be simple to modify. The current structure does provide a single Board representation to CFMAS, which could be delegated to a CFMAS Fire Chief if of interest to CFMAS. It is recommended that a CVPSA Fire and Police Chief Committee be created that

Requirements	Televate Recommendations
	<p>would meet independently, and present specific requirements and Board agenda items of interest focused on the needs of their respective public safety disciplines. Alternatively, the Committee structure could be designated as a Working Group if that structure provides greater anonymity.</p>
<ul style="list-style-type: none"> • CVPSA Committees and Sub-Committees and Working Groups 	<ul style="list-style-type: none"> • If not currently integral to the CVPSA governance structure, Committees, Sub-Committees and/or Working Groups could be created that focus on specific activities of important to public safety communications. These groups could include dispatch, training, exercises, system operations, SOPs, funding and others of interest.
<ul style="list-style-type: none"> • CVPSA should study, and if necessary, lobby to have the local dispatch facilities (Barre and Montpelier) recognized as Public Safety answering Points (PSAPs). 	<ul style="list-style-type: none"> • Currently, neither dispatch facility is a recognized PSAP and therefore 9-1-1 calls are not directly delivered to either facility. Central Vermont 9-1-1 calls for emergency service are first answered by a PSAP in Williston, VT and then transferred. While 9-1-1 services were out of scope for this project, demonstrated operational efficiencies exist when emergency calls are received and dispatched from the same entity.

3.3.4 Dispatch Centers

The dispatch centers located in the City of Montpelier and Barre City provide emergency call taking and emergency dispatching for police, fire, and emergency medical services (EMS) within their respective cities. They additionally provide dispatch services for contract Towns that each city independently serves. The City of Montpelier dispatches for all CFMAS towns through their agreement with Cap West, and Barre City dispatches for the towns of Washington, Williamstown, and parts of Orange. The cities depend on the fees paid by the Cities and Towns which they serve, and the extent of the fees collected by each dispatch center are essential to their respective operational budget. The fees cover labor and other operating expenses, but do not provide excess funding to support technology upgrades and refresh. These dispatch centers are operating outdated equipment, or do not operate common public safety industry tools, such as a Computer Aided Dispatch (CAD), or are implementing a Next Generation 9-1-1 (NG9-1-1) system¹⁰ to facilitate seamless dispatch center backup operations. These and other improvements should be considered.

¹⁰ The State of Vermont covers the cost of various 9-1-1 system equipment for State sponsored PSAPs.

Table 8: Televate Recommendations for Dispatch Center Requirements

Requirements	Televate Recommendations
<ul style="list-style-type: none"> • The legacy radio consoles are operating at well beyond their useful lifecycle and need to be replaced 	<ul style="list-style-type: none"> • Radio consoles at both dispatch centers need to be replaced and updated to the latest console technology <ul style="list-style-type: none"> ○ The radio consoles at both dispatch centers should use common radio vendor solutions ○ Common radio consoles best facilitate dispatch center backup operations • It would be prudent and operationally beneficial if the Montpelier and Barre City dispatch centers employed common technologies and best practices to facilitate daily and backup center operations
<ul style="list-style-type: none"> • The fiber optic circuit that connects the Montpelier and Barre City dispatch centers is not redundant – a redundant connection is required 	<ul style="list-style-type: none"> • A redundant fiber circuit, or alternative high-speed connection between the two dispatch centers is required to meet mission critical grade of service best practices
<ul style="list-style-type: none"> • An enhanced LMR network is required to maintain existing agreements with CFMAS town and others and to expand service agreements with additional towns – the radio network improves the ability of the cities to raise additional operational capital for the centers 	<ul style="list-style-type: none"> • While enhancing the reliability and performance of the regional radio network is primarily required to protect and service the citizens and first responders of Central Vermont, opportunities derived to dispatch for additional towns and increase operating revenues would certainly result in another positive outcome of a new radio network
<ul style="list-style-type: none"> • Assess the impact of enhanced radio communications, including monitoring fire ground TAC and other radio channels, and emerging broadband and other solutions on the number of required dispatchers 	<ul style="list-style-type: none"> • Staffing the required number of dispatchers will reduce the burden and stress on the current staff and provide additional professional relief
<ul style="list-style-type: none"> • A Computer Aided Dispatch (CAD) system would best support daily dispatching requirements – the current system employed is not a true CAD system 	<ul style="list-style-type: none"> • A common CAD system should be implemented in Montpelier and Barre City that supports all dispatcher and public safety agency requirements. The current Valcour system is better suited as a records management system (RMS) that primarily supports police data recording and management
<ul style="list-style-type: none"> • Standard Operating Procedures (SOP) discussed but no specific requirements were offered by dispatch 	<ul style="list-style-type: none"> • In the event that SOPs are either not available, or need to be upgraded, SOPs facilitating dispatch center backup between the two centers should be developed. Affected dispatchers and other stakeholders should be trained to establish the operational backup configuration, which should be exercised

Requirements	Televate Recommendations
	(tabletop and actual setup) at least annually. Any technical enhancements or modification to support dispatch center backup operations should also be implemented.

3.3.5 Regional Public Safety Interoperability

Interoperable communications for public safety is best achieved through concerted local, regional, and state collaboration with a focus on common goals and objectives to define and achieve the desired levels of voice and data communications interoperability. The DHS Interoperability Continuum as referenced and described in *Section 3.1 Requirements Task Overview* provides a meaningful set of activities and best practices to guide and measure advancing levels of interoperability. The primary tenets on the continuum address the following capabilities:

- Governance
- Standard Operating Procedures
- Technology
- Training and Exercises
- Usage

The State of Vermont operates the Vermont Communications System (VCOMM). VCOMM is an interoperable radio system that operates on the VHF and UHF radio bands and connects first responders located within a state VCOMM coverage area to the Williston and Westminster dispatch centers. VCOMM is intended to provide interoperable radio coverage and service throughout Vermont and provides an **alternative** interoperability solution for first responders where their primary Land Mobile Radio (LMR) system is not working.¹¹ This is an important alternative for Central Vermont Public Safety agencies, but everyone must have knowledgeable regarding its availability and use.

This report section will focus on the Standard Operating Procedures (SOP) tenet, which includes Communications Plans (Comm Plans), and the Training and Exercise tenet. The three remaining tenets have been directly or indirectly addressed in other sections.

Successful interoperable communications for public safety requires the development of SOPs and Comm Plans describing the who, how, what, and when to facilitate intra-agency and inter-agency voice and data communications within a single jurisdiction. Similar SOPs and Comm Plan are also required to guide multi-agency, multi-jurisdiction interoperable communications.

An SOP is also required to guide the operations and maintenance (O&M) of the public safety voice and data communications systems. The O&M centric SOPs focus on preventative and corrective maintenance process and procedures and support network managers and technicians in defining, maintaining, tracking, and reporting on the O&M process.

The following table includes several stakeholder-described requirements along with others that should be considered by Central Vermont as important to develop and to advance along the Interoperability Continuum and achieve the highest levels voice and data interoperability for Central Vermont.

¹¹ Information on VCOMM can be found at <https://rts.vermont.gov/vcomm>.

Table 9: Televate Recommendations for Regional Public Safety Interoperability Requirements

Requirements	Televate Recommendations
<ul style="list-style-type: none"> • Need for documented radio communications plans 	<ul style="list-style-type: none"> • Central Vermont encompasses a diverse public safety community serving cities, Towns, and the State Capitol. The region is supported by multiple individual LMR networks, and a regional (CFMAS) network transmitting over VHF and UHF frequencies. Interoperable communications for public safety in Central Vermont would be best served with the development of a multi-purpose Comm Plan to guide inter-agency, intra-agency and intra-jurisdiction voice and data communications. The Comm Plan can be modular in design to support small, medium and large-scale incident response and communications and support inter- and intra-agency, and inter-jurisdiction communications including with Capitol Police. The Comm Plan could be developed by a CVPSA Comm Plan committee with 3rd party support provided as necessary.
<ul style="list-style-type: none"> • Need for documented radio communications training and communications centric exercises 	<ul style="list-style-type: none"> • Interoperable communications for public safety in Central Vermont would be best served with the development and delivery of LMR and broadband data systems and usage training to support the broad community of paid and volunteer responders. • Training should be facilitated by an agency specific trainer in a train-the-trainer structure. • Annual public safety centric communications table-top and field exercises should be conducted to verify communications capabilities. The annual exercises should reflect enhancements to the regional communications capabilities. • The communications training and exercises could be developed by a CVPSA “Training and Exercise” committee with 3rd party support provided as necessary.
<ul style="list-style-type: none"> • Need for radio network operating procedures 	<ul style="list-style-type: none"> • Public safety communications systems and solutions should be operated and maintained (O&M) under functional SOPs that guide preventative and operational maintenance.

Requirements	Televate Recommendations
	<ul style="list-style-type: none"> The O&M SOPs will facilitate system budget management and allow the network operator(s) to document and track system and component level maintenance and operational status and failures.

3.3.6 Radio Templates

All radios per public safety discipline should be programmed with common Radio Templates that include similar repeated and direct mode (talk around, radio-to-radio) channels/frequencies along with regional interoperable channels, State of Vermont V-COMM channels, and national mutual aid channels. In support of radio operational continuity, radio channels per public safety discipline and jurisdiction (CFMAS, Montpelier, Barre City) should also be programmed into common radio zone positions in the radio. Additionally, the radio templates should designate common radio features and how various radio features are designed to be accessible on the radio.

Table 10: Televate Recommendations for Radio Template Requirements

Requirements	Televate Recommendations
<ul style="list-style-type: none"> CFMAS radio templates should adhere to a common design and format <ul style="list-style-type: none"> A radio programming sub-committee developed a common template; however, that template was not adopted – radios are currently programmed differently by the VFDs 	<ul style="list-style-type: none"> All CFMAS radios should be programmed based on a common standard: <ul style="list-style-type: none"> Common radio programming templates are an accepted best practice and simplify operations – best facilitate training on how to use the radio – supports the use of any discipline radio by any responder. All Central Vermont radios should be programmed based on a common template to deliver greater radio communications interoperability: <ul style="list-style-type: none"> Radios should be programmed to include all regional repeated and TAC channels, national mutual aid, and all V-Comm channels into similar radio zones.
<ul style="list-style-type: none"> Radio training should be available to all radio end users 	<ul style="list-style-type: none"> Radio training should be developed and provided to all radio end users. Train-the-trainer personnel should be identified per fire/EMS and police department and those trainers should provide the required training materials. Training on the future regional simulcast radio network will be required for all firefighters. Training materials should be developed and distributed and made available over the CVPSA

Requirements	Televate Recommendations
	and other jurisdiction website to simplify access to the materials for all radio end users.

3.3.7 **Commercial Broadband – Including FirstNet**

Commercial cellular broadband technologies, including 4G LTE and 5G offer opportunities to integrate mobile data communications for public safety. Commercial broadband, particularly the services offered by AT&T FirstNet and Verizon Wireless, who both offer public safety priority service and the preemption of commercial users in the event of network congestion, and nationally have the most robust coverage and data throughput options. Commercial broadband is currently designed to supplement public safety LMR voice communications to deliver mobile data communications over wireless high speed data networks. These networks are not designed to replace LMR, and even if into the future commercial broadband, including FirstNet, were an optional replacement for LMR, the network coverage would need to significantly improve and mission critical grade (MCG) solutions including generators at all sites, equipment redundancy and other enhancements to achieve MCG would be required.

Importantly, commercial broadband service within Central Vermont does not provide reliable coverage in many rural and challenging topographical areas of the region. Additionally, FirstNet, which is designed to provide public safety with the best broadband communications solution for public safety, does not now meet the operational and coverage requirements of Central Vermont. While new FirstNet transmission sites continue to be deployed by AT&T, construction and network integration is slow, and it is unlikely that the eventual network will provide the needed coverage into rural geographies of Central Vermont that also require reliable coverage.

Also noteworthy, when considering the integration of commercial broadband communications into the public safety toolbox, there are operations costs associated with the cost of broadband services, device terminals and equipment (smartphones, mobile routers, mobile/body cameras), data applications, data hosting, storage and retrieval, communications planning, training and other operational considerations. While there are certainly important benefits available through the integration of broadband mobile data into the public safety communications landscape, including Push-to-Talk that is interoperable with LMR, LMR network enhancements must be the priority for Central Vermont today, and sufficient funding, along with network coverage improvements, need to be designated. Broadband service alone will not satisfy public safety requirements.

Table 11: Televate Requirements for Commercial Broadband Recommendations

Requirements	Televate Recommendations
<ul style="list-style-type: none"> • Commercial mobile broadband coverage does not meet operational objectives 	<ul style="list-style-type: none"> • CVPSA should engage with the State FirstNet public safety mobile broadband leadership and receive ongoing updates on the status of the FirstNet rollout and to share their ongoing coverage requirements. • CVPSA should request meetings with FirstNet representatives to discuss specific coverage requirements for the region and to gain insight into FirstNet deployment status.

Requirements	Televate Recommendations
	<ul style="list-style-type: none"> • CVPSA should request a meeting with Verizon Wireless to assess their ability to meet coverage and performance requirements of Central Vermont. • Consideration should be given to use the best provider or to use both providers depending on various decision criteria.
<ul style="list-style-type: none"> • Prioritize investments in regional LMR for public safety <ul style="list-style-type: none"> ○ Focus on broadband distracts regional attention from LMR 	<ul style="list-style-type: none"> • While broadband wireless offers important mobile data capabilities for public safety, the primary near-term focus for Central Vermont must be on improving LMR system coverage and performance and in making the necessary dispatch radio console upgrades. The LMR networks are seriously flawed and require immediate attention.
<ul style="list-style-type: none"> • Investments in public safety broadband wireless communications should be made in conjunction with efforts to compel commercial operators to improve coverage and network reliability 	<ul style="list-style-type: none"> • In the event that sufficient funding is available to integrate public safety mobile broadband into the communications toolbox, a strategic plan addressing broadband coverage requirements, data application requirements per discipline, optimal data hosting options, data sharing policy, security and all other factors should be developed to guide Central Vermont’s efforts to deploy practical, independent and cross agency, interoperable data applications and technologies.
<ul style="list-style-type: none"> • Determine the role of commercial push-to-talk (PTT) including PTT over Commercial (PTToC) and Mission Critical PTT (MCPTT) 	<ul style="list-style-type: none"> • The integration of PTTtoC and MCPTT commercial broadband voice applications that provide interoperability with LMR networks offer opportunities, primarily for public safety chiefs and other senior members, to communicate with their personnel over the LMR network. PTTtoC and MCPTT facilitate LMR interoperability from anywhere in the county or the world where cellular coverage is available. • Unfortunately, cellular broadband service in Central Vermont does not provide reliable coverage within the rural areas of the region and is more reliable in the urban areas and along major highways. Due to these coverage limitations, these applications are not yet meaningful for all first responders within the region but should be considered for specific user categories and use cases.

3.3.8 Additional Considerations

There are additional considerations and cooperative relationships that can potentially advance mission critical public safety communications within Central Vermont. The following requirements offer opportunities to explore and implement regional partnerships and relationships that could result in meaningful, cost effect, and mutually beneficial LMR and broadband communications initiatives. The preliminary introductions and discussions advanced over the course of the Needs Assessment project opened doors that CVPSA and its partners will need to assess the value of pursuing and promote accordingly.

Table 12: Additional Recommendations

Regional Partnerships	Televate Recommendations
<ul style="list-style-type: none"> • CVPSA requested a Needs Assessment task to explore opportunities to leverage CVFiber¹² broadband network capabilities <ul style="list-style-type: none"> ○ Can CVFiber provide connectivity for regional LMR and commercial broadband systems 	<ul style="list-style-type: none"> • CVFiber is in the early stages in the planning of the future fiber optic network deployment – by charter, the fiber services can only be offered within unserved and underserved areas of Central Vermont – CVFiber cannot deploy fiber into areas that are covered by commercial carriers. • A few of the fiber route maps that CVFiber shared bypass a few of the future CFMAS radio sites; however, the cost of delivering the fiber from the designated routes to the radio site would need to be explored. Due to the construction required to run the fiber to the radio sites, it is not clear that the cost of delivering the fiber is beneficial. The radio sites do not require the bandwidth transport capacity of the fiber and use of the fiber could be cost prohibitive. • CVFiber could be beneficial to the commercial cellular carrier broadband networks, and CVFiber should market to the carriers to determine their respective needs and interest.
<ul style="list-style-type: none"> • CVPSA requested a Needs Assessment task to explore opportunities to partner with regional utilities to leverage utility assets for the LMR network and to investigate LMR network sharing or subscriptions options 	<ul style="list-style-type: none"> • There are opportunities to partner with local municipal power utility companies such as Washington Electric Cooperative (WEC)¹³, the Vermont Electric Company (VELCO), and perhaps others that provide electricity service in Central Vermont.

¹² Central Vermont Fiber (CVFiber) is a regional public corporation designing and deploying broadband fiber optic circuits into unserved and underserved communities in Central Vermont.

¹³ At the time of the report development, a meeting is being planned with Green Mountain Power to determine their LMR capabilities and their interest in partnering with CVPSA on the implementation of the future Central Vermont public safety radio network.

Regional Partnerships	Televate Recommendations
	<ul style="list-style-type: none"> Partnership opportunities extend to asset sharing, joint ownership of the LMR network, or providing subscription service to the utility over the future radio network. Some specific opportunities for tower co-location and backhaul sharing at specific sites have been identified. Follow-up discussions with WEC and VELCO are recommended.
<ul style="list-style-type: none"> CVPSA requested a Needs Assessment task to explore opportunities to partner with regional hospital and private ambulance entities to explore opportunities to forge LMR network use partnerships and to improve communications 	<ul style="list-style-type: none"> The Central Vermont Medical Center (CVMC) operates a VHF radio network to facilitate radio communications with medical staff and ambulance and EMS professionals. The CVMC indicated that their radio network does not cover their required service area. Therefore, there are opportunities for CVPAS to enter into discussion with CVMC to determine their interest in partnering, subscribing to, or integrating their communications into the future regional LMR radio network. Televate recommends that this discussion occur as planning for the regional network is finalized.

4 RADIO SYSTEM ANALYSIS AND RECOMMENDATIONS

4.1 Existing System Background

Public safety organizations, including Law Enforcement, Fire and EMS in Central Vermont operate a variety of Land Mobile Radio (LMR) systems in support of their operations.

4.1.1 Law Enforcement Agencies

The following law enforcement agencies support Central Vermont and utilize the following LMR systems for their critical communications.

- Barre City Police: UHF analog radio repeated system operating from one primary location
- Capitol Police: UHF digital (P25) repeated system operating from a single location
 - This system also incorporates a repeater system to cover a Capitol building underground walkway connection
- Montpelier City Police: UHF digital (P25) repeated system operating from one primary location
- Washington County Sheriff: UHF analog repeated system operating from one primary location

Stakeholders in general indicated that law enforcement communications work well, and they could communicate in most areas, with the exception of some buildings, and with most other law enforcement agencies, as necessary. They did note some difficult areas in the State House at the Capitol Plaza, although an in-building repeater is used to enhance communications there. Additionally, the

Montpelier police chief shared his hopes of expanding reliable radio coverage into the neighboring towns of Northfield and Middlesex.

4.1.2 Fire and Emergency Medical Services Departments

The Fire/EMS departments that support Central Vermont include:

- City of Montpelier
- Barre City, and
- Capital Fire Mutual Aid System, Inc (CFMAS), which is a municipal district formed under authority of the Vermont Statutes.

The Barre City Fire and Emergency Medical Service Department is dispatched by the City of Barre PD and responds to calls for service within the City of Barre and the Barre PD also dispatches for the towns of Washington, Williamstown and parts of Orange.

CFMAS is dispatched by the City of Montpelier PD and provides service to the following entities:

- | | |
|---------------------------|----------------------|
| • Town of Berlin | • Town of Northfield |
| • Town of Cabot | • Town of Plainfield |
| • Town of Calais | • Town of Roxbury |
| • Town of Duxbury | • Town of Waitsfield |
| • Town of East Montpelier | • Town of Walden |
| • Town of Fayston | • Town of Warren |
| • Town of Marshfield | • Town of Waterbury |
| • Town of Middlesex | • Town of Woodbury |
| • City of Montpelier | • Town of Worcester |
| • Town of Moretown | |

The response areas for the two fire organizations are shown in the Figure 3 below.

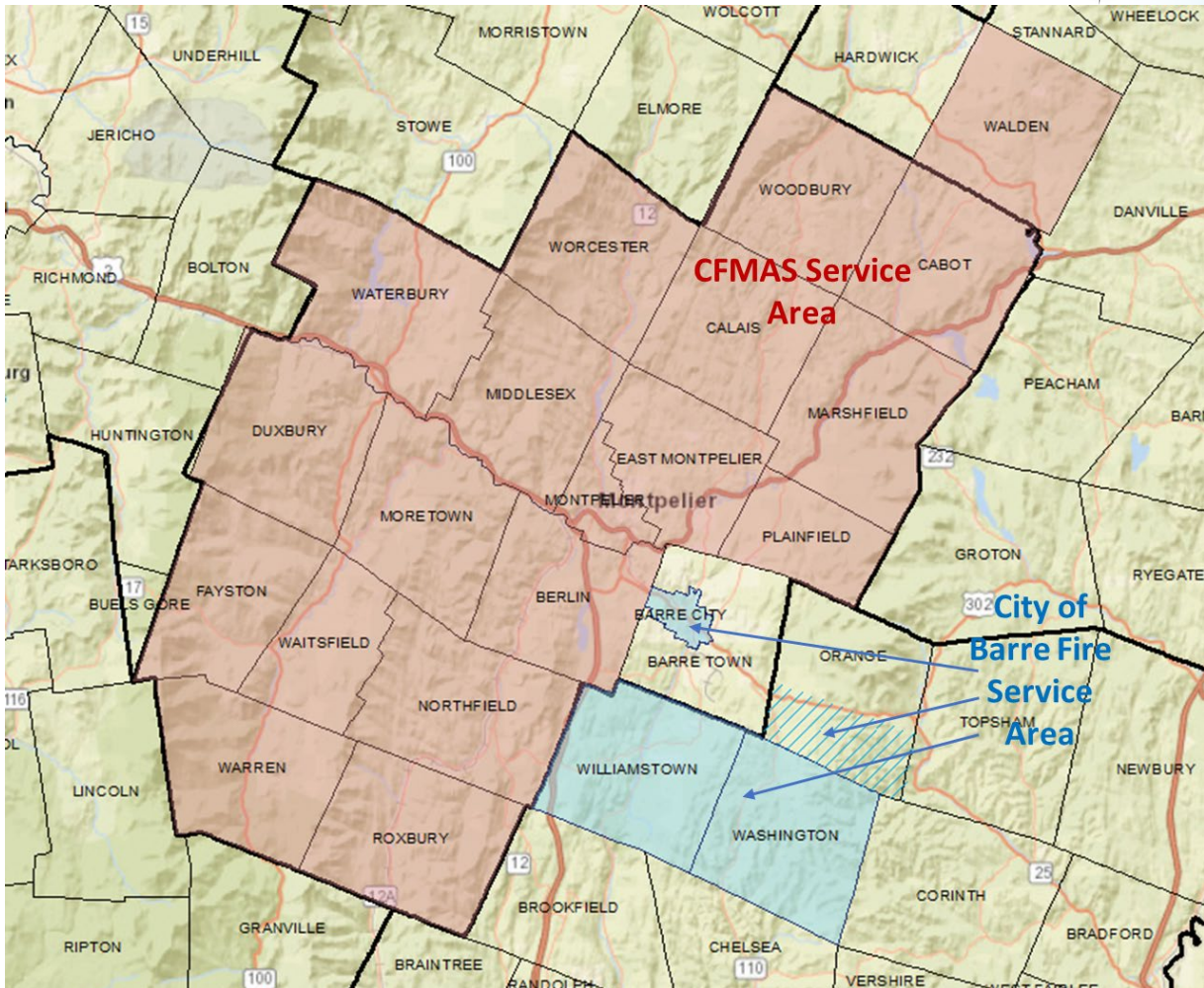


Figure 3: Central Vermont Fire Service Areas for CFMAS and City of Barre

All fire departments in the Central Vermont area utilize a single simplex VHF frequency for their fire dispatch and operations. The fact that **ALL** departments use the same frequency and given the simplex format uses the same frequency for communications both out to the field and into dispatch leads to the possibility for significant communications congestion. The dispatchers have learned to deal with this issue as best they can, but separate repeated frequencies would greatly enhance their operations.

The City of Barre primarily uses a tower site on Mount Pleasant, although a second voted site on the Barre City Auditorium facility is also used.

CFMAS uses a total of five transmit/receive towers, with two additional sites for a relay and backup, and a complex network of interconnecting circuits and links to provide coverage to their complete service area. A diagram of the network is shown in Figure 4 below.

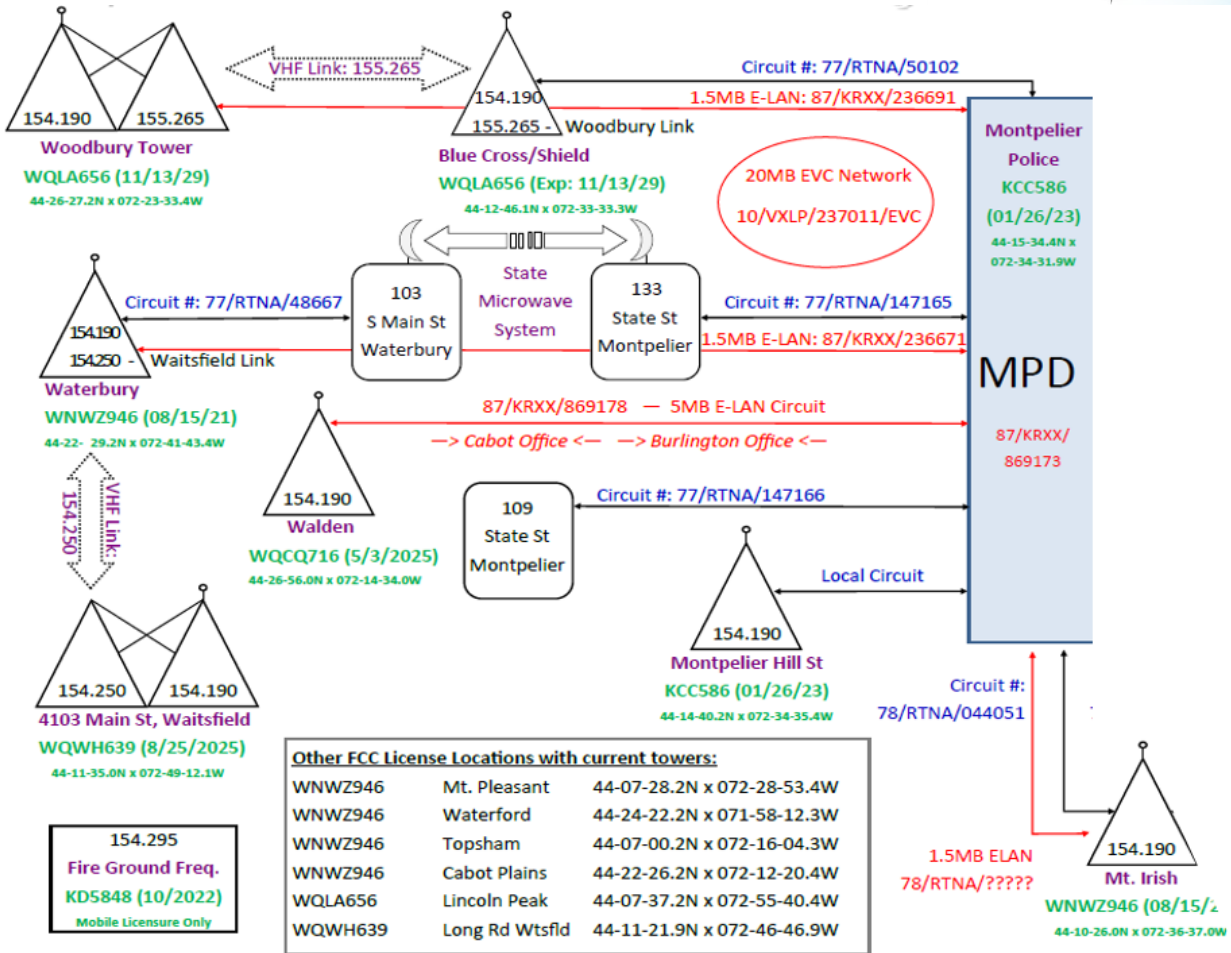


Figure 4: CFMAS Current Radio System Architecture

The radio sites in use today are listed below, along with the current means of interconnecting to the site:

- Blue Cross/Blue Shield: E-LAN and circuit connection (used for relay only)
- Mount Irish: E-LAN and circuit connection
- Hill St.: Circuit connection (backup site only)
- Waitsfield: Connection to Waterbury tower (described below), then RF link (154.250)
- Walden: E-LAN circuit
- Waterbury: E-LAN to 133 State St., then Microwave to 103 South Main St. Waterbury, then circuit connection, and
- Woodbury: E-LAN/circuit connection to Blue Cross/Blue Shield then RF link (155.265).

4.1.2.1 Fire Department Existing System Coverage

A detailed propagation simulation was developed for the existing fire department systems to predict and track the coverage being provided today. The VHF radio coverage simulations utilized the EDX SignalPro™ application, which is a standard propagation tool employed by public safety to model the system elements and to predict coverage by incorporating industry standard propagation algorithms in

addition to terrain and land use databases. The simulation predicts coverage for a mobile radio, as well as a portable radio in-street (outdoors) and also within buildings up to a specific assumed dB signal loss or signal attenuation value. Once the simulation was developed, the recorded data from the signal testing was factored into the SignalPro™ application in order to calibrate the simulation and improve its accuracy. During a recent site visit, Televate captured VHF radio signal measurements that were integrated into the EDX propagation model to optimize the propagation model to generate an improved radio coverage prediction.

Barre City Fire Department Radio Coverage

The predicted coverage for the City of Barre system, using both the Mount Pleasant and Barre Auditorium sites is shown in the figures below, where mobile radio coverage is shown in Figure 5 and portable coverage is shown in Figure 6, with outbound (dispatch-to-field) coverage shown on the left and inbound (field-to-dispatch) on the right. Both predictions for portable coverage assume the field user is in a building of “medium” construction (20 dB of in-building signal margin required).

These results seem to underscore the need for the Barre Auditorium site, as it appears in-building coverage in the City would be very limited without this site.



Figure 5: City of Barre Current System Predicted Coverage for a Mobile Radio

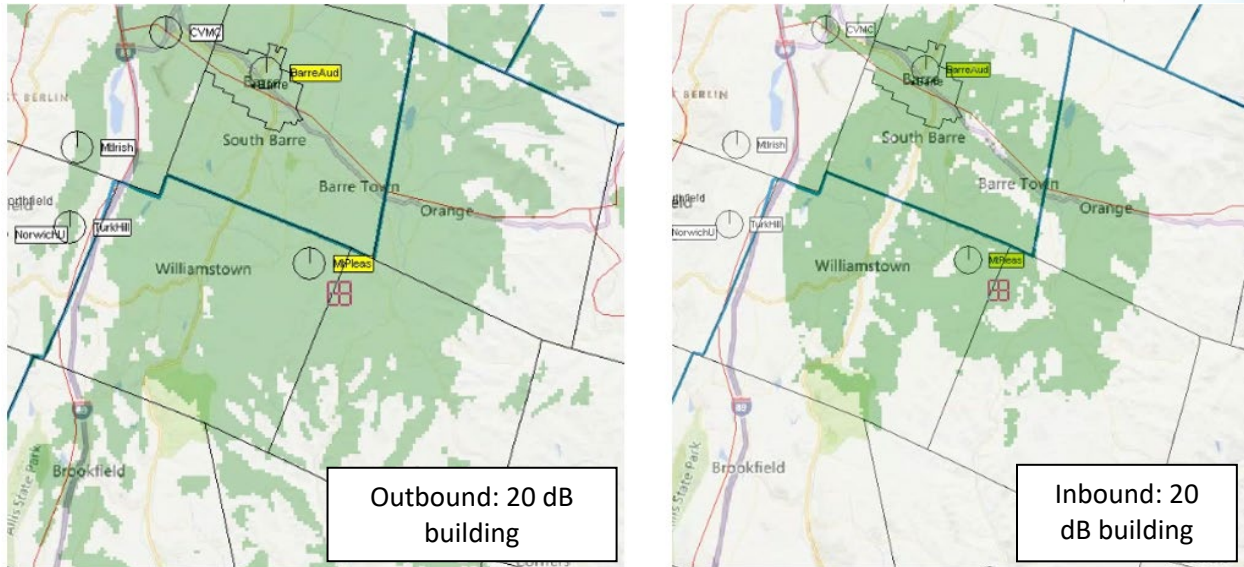


Figure 6: City of Barre Current System Predicted Coverage for a Portable on Hip

4.1.2.1.1 CFMAS Radio Coverage

The predicted coverage for the current CFMAS system is determined by utilizing the five current transmit/receive sites identified above. The predicted coverage to and from a mobile radio is shown in Figure 7.

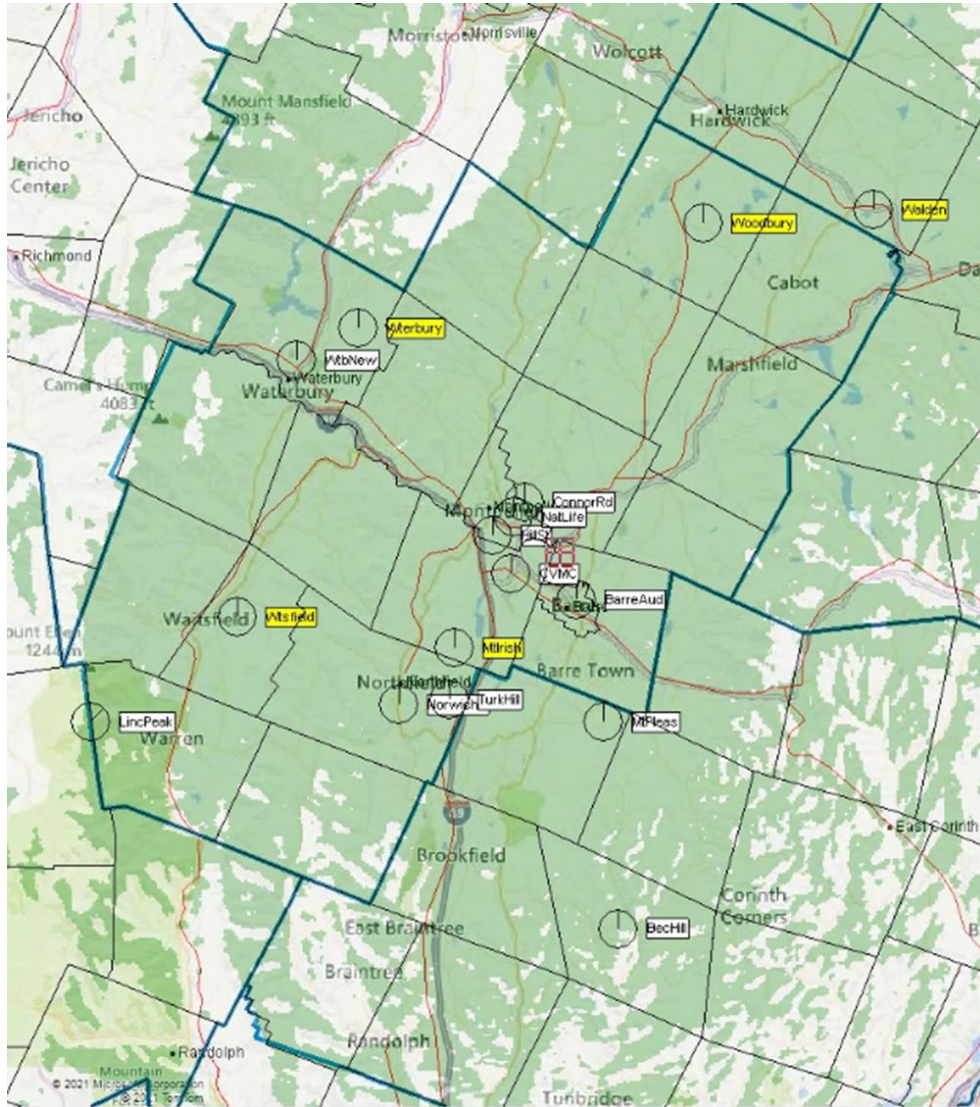


Figure 7: Current CFMAS System Predicted Mobile Radio Coverage from Simulation

Similarly, the coverage to and from a portable radio worn at the hip, is shown in Figure 8 below.

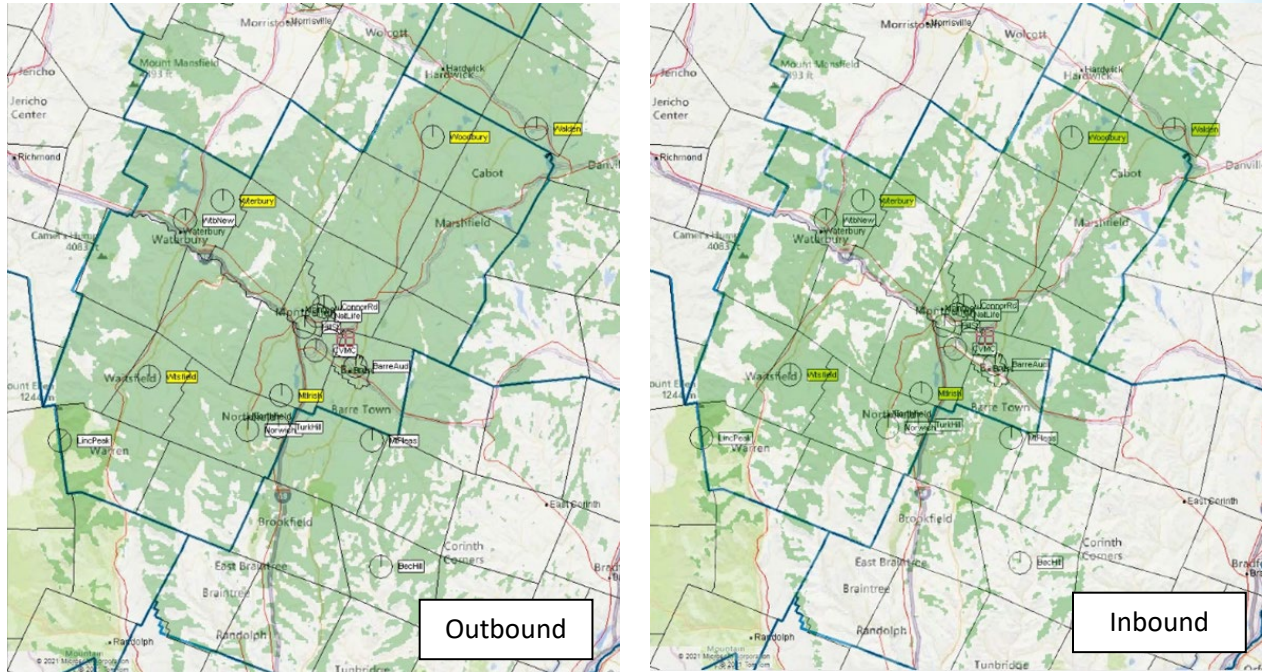


Figure 8: Current CFMAS System Predicted Portable on Hip Coverage from Simulation

The figures above demonstrate that while coverage to and from a mobile radio is mostly comprehensive throughout the service area, coverage to and from a portable radio shows significant gap areas, especially in the central portion of the region west of Montpelier, as well as in the southern portion of the service area. These represent serious gap areas that should be addressed in order to improve system performance.

These predicted gap areas explain the difficulty dispatch has alerting all potential responding volunteers with paging alerts and the difficulty portable field users have hearing and especially responding back to dispatch. Additionally, given that this predicted coverage for portable users shown is for on-street communications, portable users, and volunteers with pagers inside buildings would have even greater difficulty. One of the primary areas that require significant in-building coverage is in the City of Montpelier and the Capital district area, which is serviced today by the CFMAS. However, the propagation simulation indicates very little medium in-building coverage (20 dB of in-building margin) in the City of Montpelier from today's system – see Figure 9.

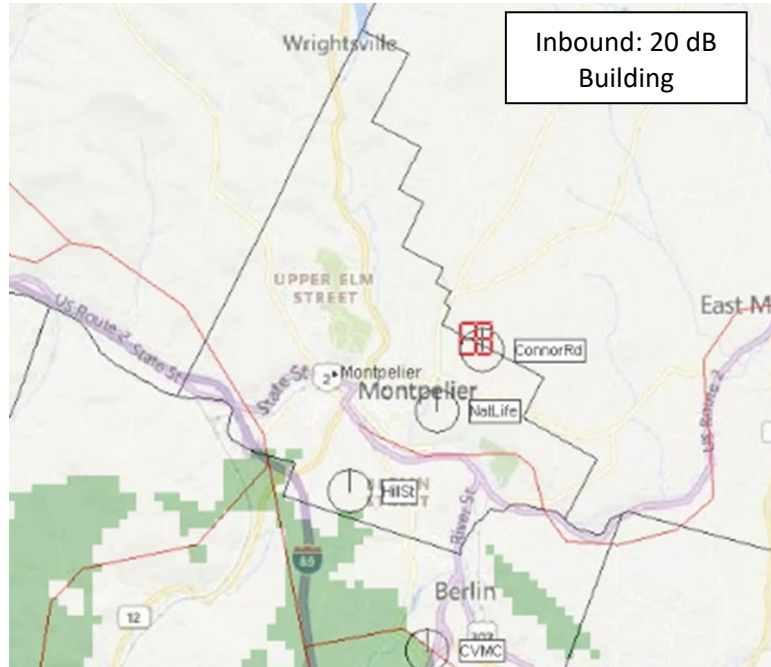


Figure 9: Current CFMAS System Predicted Portable on Hip Inbound Coverage in a Medium Building

4.1.3 Existing System Signal Measurements

During Televate’s visit to Central Vermont to perform site visits, limited signal measurements of the existing system were taken to confirm performance and to use for calibration of the propagation simulation. The scope of the signal measurements included a sampling from the current system and did not require a complete mapping of the entire service area. The area that was covered is displayed in the map in Figure 10 below.

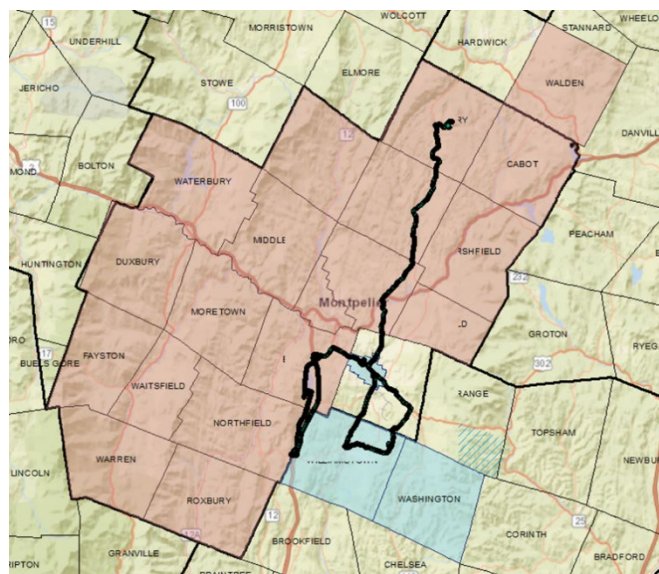


Figure 10: Drive Route where Signal Measurements were Recorded

4.2 Recommended System Improvements

Following Televate's investigation of the current system and extensive discussions with CVPSA stakeholders, there are opportunities for improvements to enhance the communications capabilities of the first responders within the Central Vermont area. The enhancements include radio coverage, system reliability, system and network redundancy, and fail over coverage and operations of radio networks and the dispatch centers.

The following sections provide information on the potential improvement areas that were investigated by Televate.

4.2.1 Recommended System Configuration and Predicted Coverage

Stakeholders within Central Vermont have been considering potential improvements in coverage and had already investigated potential additional sites and coverage solutions. Televate was able to review these initial suggestions and perform additional analysis on their anticipated effectiveness.

In order to improve the coverage in the CFMAS service area, and in-building coverage in the City areas, additional transmit and receive sites will be required, primarily in the southern portions of the service area. Two additional sites identified as Beacon Hill and Lincoln Peak were identified. Televate performed additional simulation in these areas with the inclusion of those sites and determined that coverage would improve with the addition of new sites. Additionally, a weak coverage area in the Town of Roxbury prompted a search for an additional site to improve coverage in this area. Based on discussions with the stakeholders and additional propagation simulation, it was determined that a site on the Norwich University campus would help in this area, as well as improve in-building coverage on the campus.

4.2.1.1 *Recommended System Configuration*

Since Televate recommends separate channels for the City fire departments and the surrounding towns (Barre/Montpelier and CFMAS) and their service areas are different, two separate but interconnected sub-systems are recommended. Central Vermont stakeholders also recommend a similar approach. It is recommended that the operations be configured as one sub-system that focuses on the city areas (Montpelier and Barre) to address the substantial in-building coverage requirement and another that focuses on the surrounding towns. Televate further recommends that while channels can be separate in order to support multiple incidents simultaneously, the overall operations should be integrated to ensure coordination between the entities and to provide for redundancy and backup for each other.

In this recommended configuration, each dispatch facility would have the capability to dispatch for either the City areas or the surrounding Towns, depending on the location of the incident. Additionally, either dispatch center could serve as a backup to the other center in the event that one of the two regional dispatch centers failed. Therefore, both dispatch facilities would have access to the transmit/receive sites for each area and the channels for each. Televate recommends two simulcast and voted sub-systems, one for a proposed three-site City sub-system and one for a proposed nine-site Towns sub-system. Each of these would have separate frequencies to allow for simultaneous support of incidents within their respective area, yet both dispatch facilities must have access to both sub-systems since both facilities service areas within the City and Towns areas. Therefore, Televate recommends implementing a single simulcast/voted infrastructure which would be configured to support both the City and Towns area and also be connected to both dispatch facilities. A concept for this system is shown in Figure 11 below.

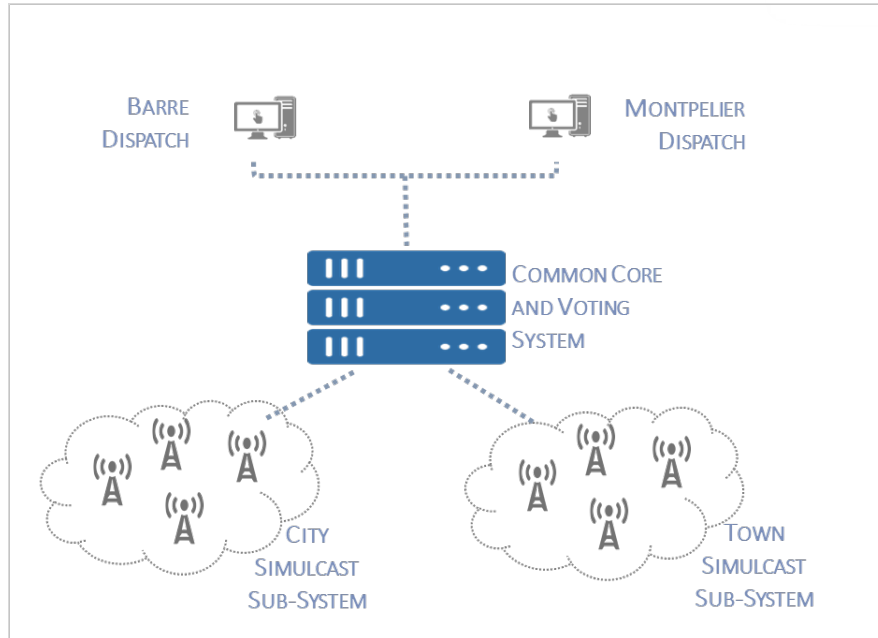


Figure 11: Concept for System with Dual Simulcast Cells and Dual Dispatch Facilities

4.2.1.2 Predicted Coverage

Televate’s recommended configuration includes the following transmit/receive sites for the City areas:

- Barre Auditorium
- Central Vermont Medical Center (CVMC), and
- Either the National Life Building or the Hill St. site.

While the stakeholders have recommended the National Life Building due to its proximity and line of site to the State Capitol buildings, Televate’s analysis indicates that the Hill St. site appears to provide better overall coverage in the City areas. Predicted coverage for each of these site configurations is shown below in Figure 12. The figure below shows the predicted inbound portable (worst case) coverage from inside a “medium” building within the City areas. Televate concludes that this configuration addresses the key in-building coverage requirement within this area.

It should be noted that for this configuration, Televate also evaluated the addition of the Connor Rd. water tank site but found that site did not provide any significant additional coverage in the proposed area. Televate further notes that the addition of new communications sites in the City area could also be used to enhance in-building coverage for the City law enforcement agencies as well, as this was cited as a specific need.

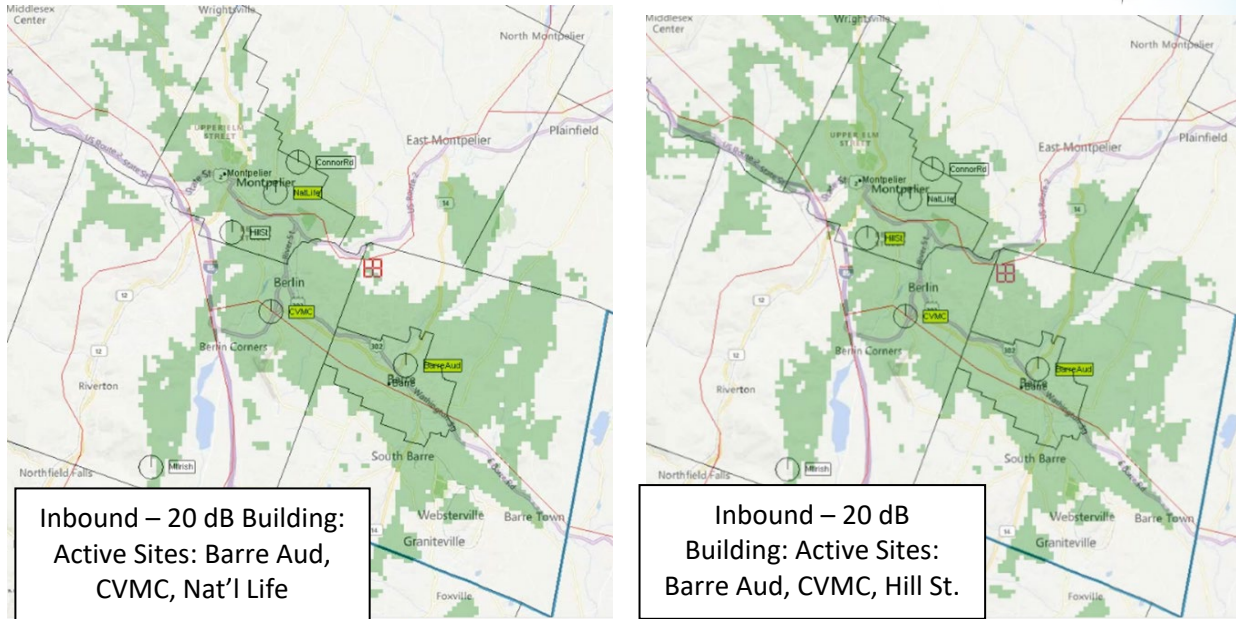


Figure 12: Predicted Proposed System In-Building Coverage in the City Areas

In addition to the City areas, the City of Barre and CFMAS fire departments together service a total of 20 (21 including a portion of Orange dispatched by Barre City) surrounding towns within the Central Vermont area. In order to effectively provide communications in each of these towns, a number of additional transmit/receive sites are required. Televate’s simulation indicates at least nine sites are required to provide effective coverage throughout these areas. The recommended sites include several existing sites, as well as some new sites. The recommended list includes the following sites:

- Beacon Hill (new site)
- Lincoln Peak (new site)
- Mount Irish
- Mount Pleasant
- Norwich University (new site)
- Waitsfield
- Walden
- Waterbury (new site), and
- Woodbury.

The predicted coverage for this site arrangement is shown in Figure 13 for mobile radio coverage. Additionally, predicted coverage for this configuration both to and from a portable radio worn at the hip level is shown in Figure 14. Televate notes that while some coverage holes exist for the inbound portable coverage, the mobile coverage is very robust, and therefore, there will still be areas where mobile repeating of communications to dispatch may be required as discussed below and can be supported due to the strong mobile coverage.

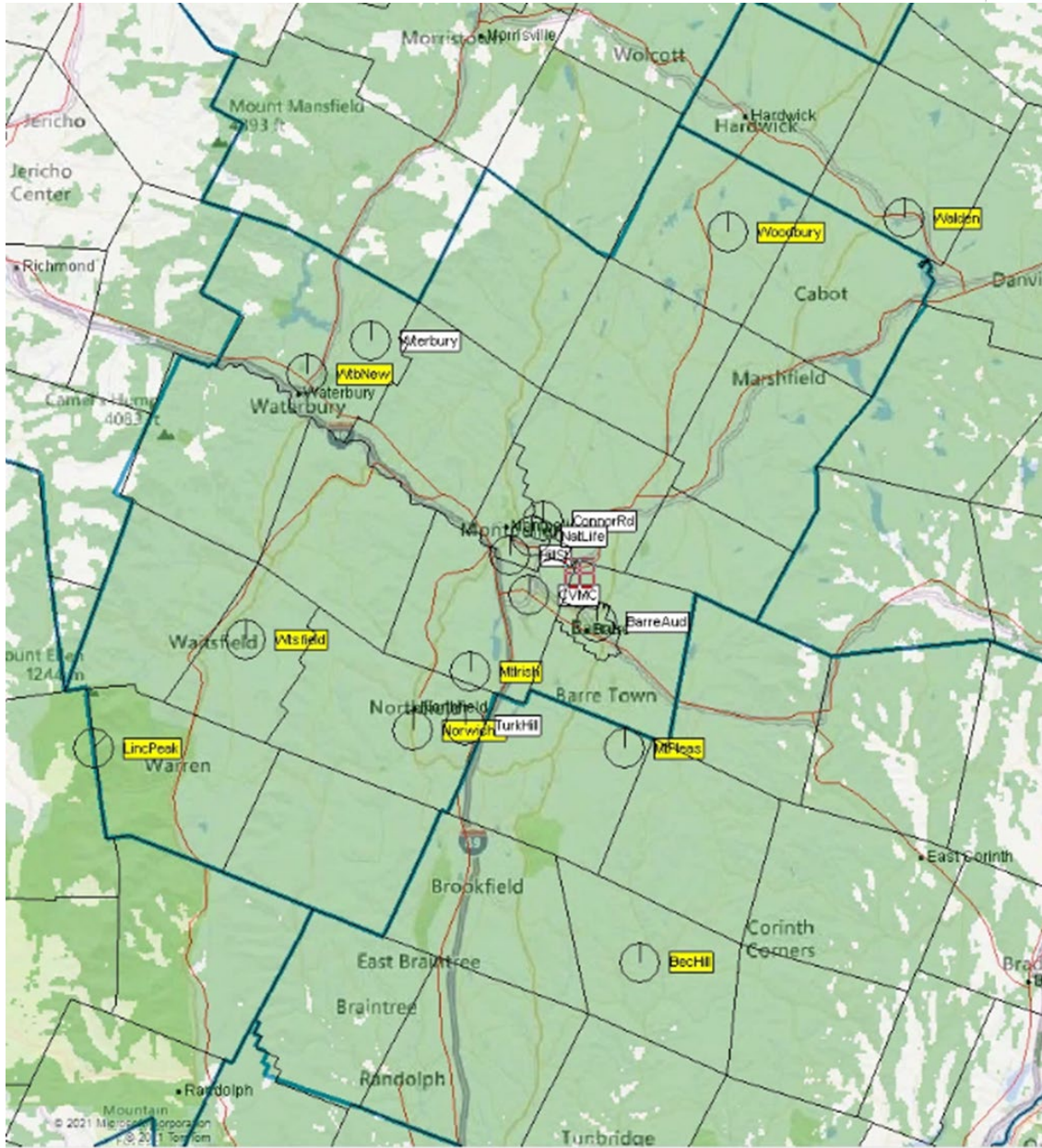


Figure 13: Proposed Towns Sub-System Predicted Mobile Coverage from Simulation

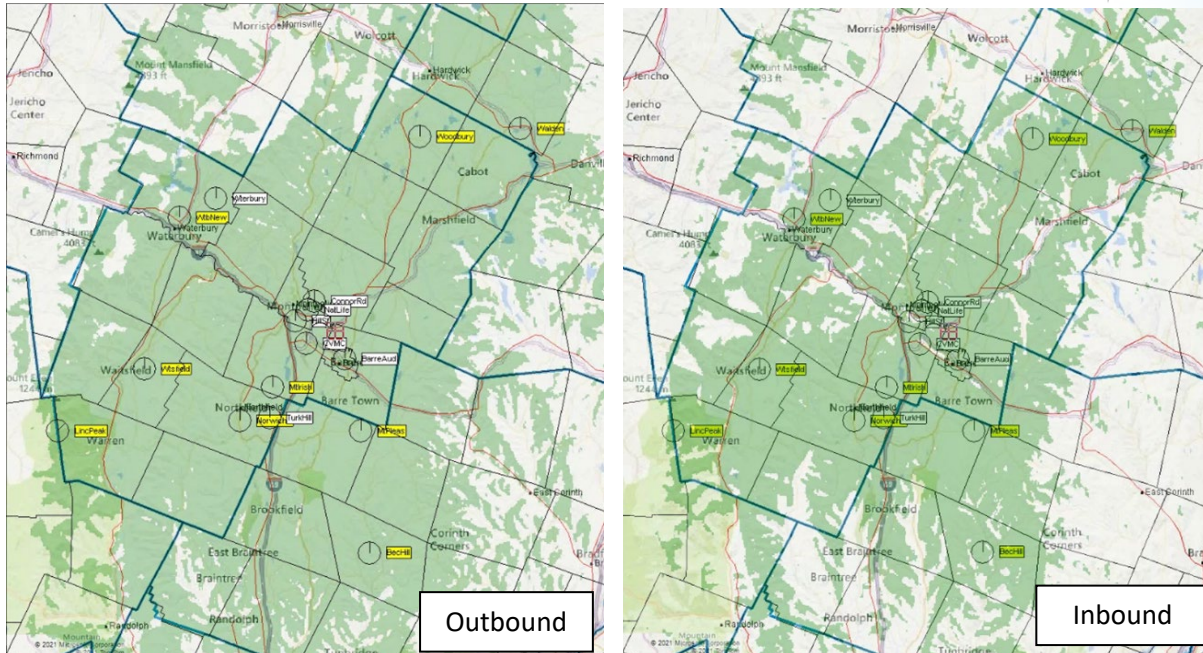


Figure 14: Proposed Towns Sub-System Predicted Portable on Hip Coverage from Simulation

4.2.1.3 In-Building Coverage Gap Areas

One of the key items to address with this recommended system configuration is in-building coverage. The most important section of the region that will require substantial in-building coverage is the City area including Barre City, the City of Montpelier, and parts of the Town of Berlin included in the corridor between the two cities. While in-building coverage is difficult to address with VHF frequencies, the City sub-system attempts to address this and is projected to provide a significant level of in-building coverage (20 dB of margin) throughout this corridor.

In-building coverage in the more remote Towns area is not as critical due to a lower density of structures and generally less dense construction, although there will still be a need for first responders to operate in buildings. Due to the extensive coverage area required for all of the towns to be serviced and the difficult terrain of the Central Vermont area, a region-wide system providing significant in-building coverage throughout the region would likely be cost prohibitive. Therefore, the system concept strives to provide extensive mobile and portable outbound coverage and anticipates fulfilling additional in-building coverage needs through the use of vehicular repeaters.

4.2.1.4 Incorporate vehicular repeaters.

In order to meet the need of field portable radio users and to avoid the manual relaying of messages in areas that do not support portable coverage, Televate recommends Central Vermont responders consider implementing vehicular repeater systems (VRS) in selected vehicles, such as fire department command vehicles. Vehicular repeaters can be used to extend the range of the network infrastructure by creating a link between the repeater and first responders operating locally in the area, where adequate mobile coverage exists. In this way, a higher power mobile radio in the vehicle can stay connected to the network infrastructure and relay communications to and from the portable radio users in the immediate area. This approach can be an effective solution for difficult in-building communications as well as local portable radio coverage holes.

Implementing this approach requires the CVPSA to purchase additional equipment, specifically the vehicular repeaters. Additionally, these repeaters will need to be installed in a sufficient number of vehicles to ensure that they are available on-scene when needed – 20 VRS are assumed. Also, a unique low power frequency or frequency pair, separate from the system frequencies, must be identified for operation with the vehicular repeaters, and it must be licensed and programmed into portable radios in order to be useful. Based on the review of frequencies currently licensed by Central Vermont public safety agencies (see section below), the frequency 159.330 MHz is a potential frequency that could be used for VRS operation, since it has sufficient frequency separation from most other frequencies in use in the region.

4.2.2 Repeated and Additional Channels

One of the key difficulties with the current system that supports the fire departments within Central Vermont is the fact that the City of Barre and CFMAS use the same frequency for fire dispatch and communications. Additionally, the single frequency is used in a simplex mode meaning that both inbound and outbound communications use the same frequency. Both of these situations can lead to congestion on this one frequency.

In order to solve these problems, Televate recommends identifying additional frequencies for use for fire communications, creating frequency pairs for inbound and outbound and using different frequency pairs for Barre and CFMAS. Televate recognizes that identifying VHF frequencies in this part of the Country is difficult and may not be possible. However, if at all possible, this is the recommended approach. Televate is aware that CVPSA stakeholders have identified a potential frequency pair for CFMAS (151.3925/153.8450), which they have begun to license at various sites throughout the service area, and therefore, a second pair would need to be identified to cover the service area for the Cities of Barre and Montpelier. Since the City service area is not as extensive as that of CFMAS, licensing of another frequency pair for this area of operation may be less of a challenge.

In addition, if possible, Televate recommends the CVPSA attempt to identify a third VHF repeated frequency that could be used by either the City of Barre or CFMAS for additional communications needs.

Further, users have expressed the desire for dispatch to have the capability to monitor users in the field, even when they are using fire ground TAC channels (direct mode/talk around). This will require the addition of receivers for each of these frequencies at every radio site. If these receivers are implemented, Televate recommends using them for the primary fire ground frequency – 154.295 MHz.

4.2.2.1 Potential Frequencies for Use for a New System

Based on Televate’s research and analysis, the frequencies currently licensed in the Central Vermont region and potentially available for development of a new system include the following:

Table 13: Potential Frequencies

Frequency (MHz)	Current/Intended Use
154.190	Current frequency used for paging and fire communications for both Barre City and Capital Fire
151.3925 (Base transmit)/153.845 (Mobile transmit)	Proposed new repeater pair for Capital Fire simulcast sub-system
154.295 (VFIRE23)	Primary fire ground frequency

Frequency (MHz)	Current/Intended Use
153.800	Additional fire ground frequency
153.965	Additional fire ground frequency
159.330	Can be used as a low-power (5W) fire ground frequency or potentially a VRS frequency
158.880	Can be used as a low-power (5W) fire ground frequency and can also be used at a fixed location(base) at a higher power
155.265	Currently used as RF link to Woodbury but once ELAN is working will be used as a fire ground to replace 153.845
154.250	Currently used as RF link to Waitsfield (also used by St. Johnsbury for dispatch, so it cannot be used broadly)
154.010	Licensed by City of Montpelier – candidate for second repeater pair
155.010	Licensed by City of Barre – candidate for second repeater pair
154.370	Town of Williamstown: KTG712 – Channel 3 used as a local operations channel
155.205	HEAR 2 currently used as dispatch frequency for Mad River Valley Ambulance
156.060	Town of Waitsfield on WQWH639 (Highway?)

As a summary, this above list includes the following resources:

- Proposed repeater pair for Capital Fire (Town) simulcast (151.3925/153.845)
- Potential repeater pair for Barre and Montpelier (City) simulcast (154.010/155.010), and
- Five and possibly six fire ground frequencies.

Although outside the scope of Televate’s engagement, Televate does recommend further investigation on the current use and availability of these frequencies be performed to determine the potential of these frequencies to support a new system. Additionally, Televate recommends potentially repurposing some additional frequencies (possibly some of the fire ground frequencies), for a third repeater pair that could be used for additional regional communications.

4.2.3 **Simulcast Operations**

One of the issues complicating communications within the Central Vermont area, primarily for CFMAS, is that the radio system consists of multiple independent towers that are currently not simulcast or voted. As a result, dispatchers must choose the correct tower to transmit from based on the location of the incident and may have to repeat calls for service or critical information multiple times from multiple towers in order to reach all responders involved with the incident. This can create confusion, require repetition, lengthen response times and make it difficult for dispatchers to communicate with responders in the field. These difficulties could be eliminated by connecting the sites together into a simulcast and voted configuration.

Televate recommends implementing any new system for Central Vermont as a simulcast and voted system. Simulcast and voted systems require additional equipment for site synchronization and receive signal voting, which must be included with the system, although Televate’s opinion is that this additional equipment and cost are outweighed by the additional benefits of simulcast technology.

In addition to the benefits of simulcast described above, simulcast systems also provide coverage redundancy, as coverage from the various sites overlap each other. As a result, even if one of the sites is temporarily disabled, the surrounding sites will partially fill in coverage in the affected areas.

4.2.4 Digital Operations

In addition to transitioning to simulcast operations, Televate also recommends equipping any new system infrastructure for P25 digital operations. Most public safety systems are transitioning to digital operations for more consistent voice quality, enhanced coverage performance over narrowband analog, and access to enhanced features such as encryption and radio caller identification. While a complete transition to digital will require the upgrade or replacement of all user radios, which may occur gradually over time, Televate recommends equipping replacement infrastructure with digital capability at the time of installation. Additionally, as will be discussed below, a P25 infrastructure will provide for a more robust interface for integrating a Push-to-Talk over Commercial (PTToC) or Mission Critical Push-to-Talk (MCPTT) cellular network solution.

4.2.5 Site Connectivity

Connectivity to the remote transmit/receive sites is critical for any multiple site communications system, such as that recommended for the Central Vermont area, and especially critical for sites in a simulcast configuration. The current system uses a variety of connectivity methods, including discrete circuits, E-LAN connections, microwave, and Radio Frequency (RF) links. Ideally, for all sites that are connected via telco circuits, they should be served out of two distinct telephone company originating offices to provide greater redundancy and reliability.

Simulcast public safety networks generally use microwave or fiber circuits for site connectivity due to their low latency and high reliability. Therefore, Televate recommends using these types of connections for the proposed network wherever possible. An analysis was performed to determine where these types of links were practical for the proposed system.

4.2.5.1 Potential Microwave Links

Due to the rugged terrain of the Central Vermont area, the opportunity for successful microwave links to many of the proposed sites is minimal. However, based on a desktop study using a terrain database, the following links do appear to be possible:

- Barre Auditorium to Mount Pleasant
- Mount Pleasant to Mount Irish, and
- Mount Irish to CVMC.

The terrain profiles for these potential links are shown in

Appendix A: Potential Microwave Link Terrain Profiles.

Televate recommends that a thorough microwave design must include a physical path survey and signal reliability analysis to confirm feasibility. Additionally, microwave links require tower space and sufficient structural integrity to accommodate the microwave antennas. These considerations must also be taken into account when designing microwave links.

4.2.5.2 Additional Fiber Links

While some E-LAN connections over fiber are in use today within the CFMAS network, additional fiber connections could be useful to connect to the new sites to be added, to provide additional redundancy, or to replace the existing RF links to current sites. Televate encourages the CVPSA to pursue all possible opportunities for fiber connections to the proposed transmit/receive sites.

One potential opportunity for additional fiber links exists with CVFiber. CVFiber is a Communications Union District (CUD) within Central Vermont that is planning to build communications infrastructure to provide Internet access to underserved Central Vermont communities. Televate reviewed CVFiber's buildout plans to identify potential synergies between CVFiber's plans and the needs of CVPSA. The result of this analysis is considered proprietary information of CVFiber and is not included in this report but can be provided separately under non-disclosure.

4.2.6 Hospital Radio Communications

Another area of radio communications that presents difficulty is ambulance to hospital communications. When an ambulance has a patient to transport to the Central Vermont Medical Center (CVMC), they will radio to CVMC to alert them and provide initial information on the patient and their condition. The VHF frequency VMED28 (155.340 MHz) is used for this purpose and the hospital has a base radio with an antenna mounted on the roof of the building for these communications. However, this single location is not sufficient to communicate reliably throughout the entire Capital Fire area, even when considering that the communications is occurring to and from a vehicle with a 100-watt mobile radio. The predicted areas of communications with the single site at CVMC is shown in the Figure 15 below:

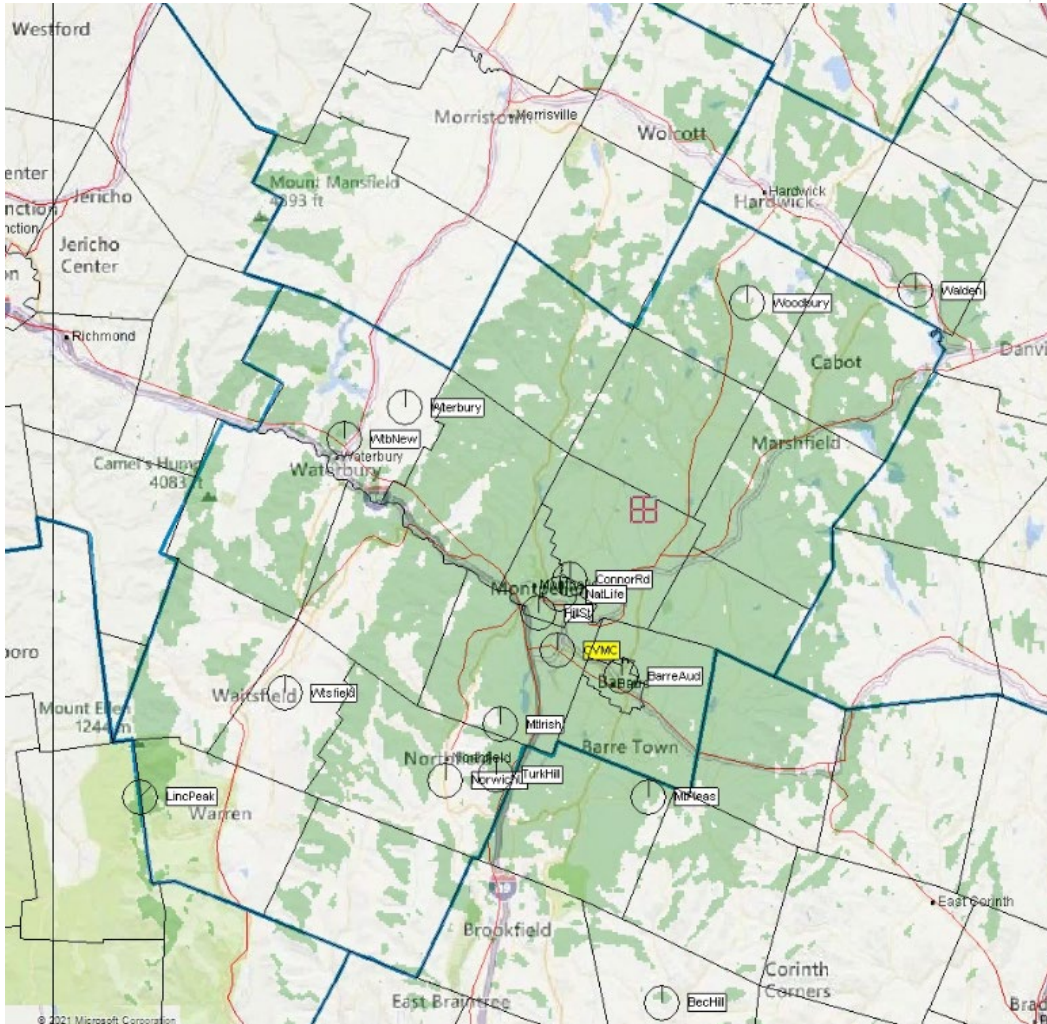


Figure 15: Current Predicted Coverage for Ambulance to Hospital Communications

It is clear that this coverage is very spotty in areas to the north, south and west. In order to enhance this coverage, Televate recommends implementing additional receive sites for this frequency throughout the region. Since this type of communications only requires mobile coverage, Televate concludes that an additional three receive sites are required to substantially cover the Capital Fire region. Figure 16 below shows the predicted inbound coverage, with receive sites added at Woodbury, Waterbury, and the proposed Norwich University site.

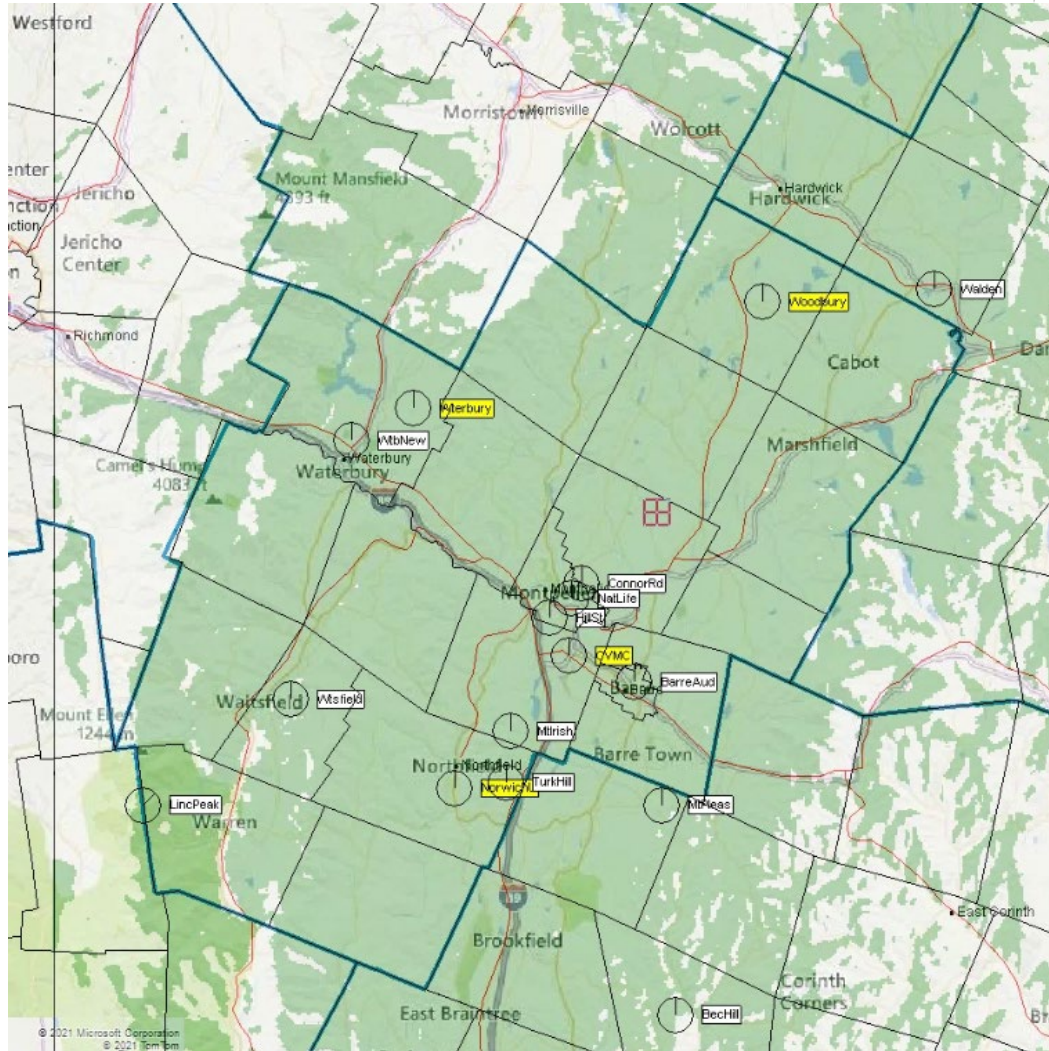


Figure 16: Predicted Coverage for Ambulance to Hospital Communications with Additional Receive Sites

4.2.7 Computer Aided Dispatch (CAD) System

As explained earlier in this report, the Valcour CAD/RMS system currently in use by both dispatch facilities is not a functional CAD system. The current system is primarily suited as a records management system (RMS) for police data recording and management. A CAD system is a key component in modern emergency dispatch operations. CAD systems allow for the capture of critical data related to each call, such as phone number, location, as well as call-related items documenting the incident and the responding units. The system also commonly provides recommendations regarding the responding units, as well as access to preplan information when available.

Televate recommends both the City of Montpelier and Barre City dispatch implement a common CAD system. A common system is recommended to simplify implementation and operations and to facilitate seamless dispatch center backup.

4.3 Enhanced Broadband Data Usage

As Central Vermont seeks to update its public safety communications system, it must also consider opportunities to augment the LMR network with broadband communications. Currently, only a few fire departments utilize broadband communications to transmit EKG information from the ambulance to the hospital. However, commercial cellular coverage in the region is spotty, and the information does not always reach the hospital with sufficient time for the staff to prepare for the patient's arrival. Better broadband coverage is needed to support this EKG capability and to support other services that would enhance patient care. Specifically, representatives indicated that the capability to support video calls between a doctor at the hospital and paramedics in the ambulance would greatly improve patient care and allow the hospital to adequately prepare for the patient, or, if necessary, to arrange for transport to a specialized facility.

Televate recommends the CVPSA accurately map the broadband coverage from the broadband providers in the area¹⁴, identify underserved areas, and work with the providers to enhance their networks. Televate recommends specifically working with broadband providers who support priority service to first responders for the most reliable support of these critical applications. In particular, Televate recommends CVPSA work directly with FirstNet/AT&T and Verizon to understand their buildout plans in Central Vermont, based on FirstNet's State Plan (specifically for AT&T) and to encourage accelerated or further development of their plans. Televate notes that recently, a FirstNet official was quoted as saying FirstNet/AT&T is ahead of their build-out schedule and anticipates being complete with their contractual commitment by March of 2023.¹⁵

In addition to discussions with FirstNet/AT&T and Verizon about the status of their buildout plans, CVPSA may also be able to assist with local arrangements or partnerships, such as with CVFiber, which may help facilitate their continued network development.

4.3.1 Push-To-Talk over Cellular

Televate also recommends the CVPSA develop a plan for incorporating Push-To-Talk over Cellular (PTToC) into their communications plans, although, as most survey respondents point out, this plan will only be realistic once cellular infrastructure improvements are also planned.

In the past five years, PTToC services have made dramatic advancements. The following figure highlights the three basic types of PTToC systems:

¹⁴ See <https://publicservice.vermont.gov/content/mobile-wireless-drive-test> for additional information on carrier broadband testing and mapping performed by the State of Vermont.

¹⁵ Urgent Communications: "FirstNet buildout on pace for March 2023 completion, AT&T official says", June 4, 2021.

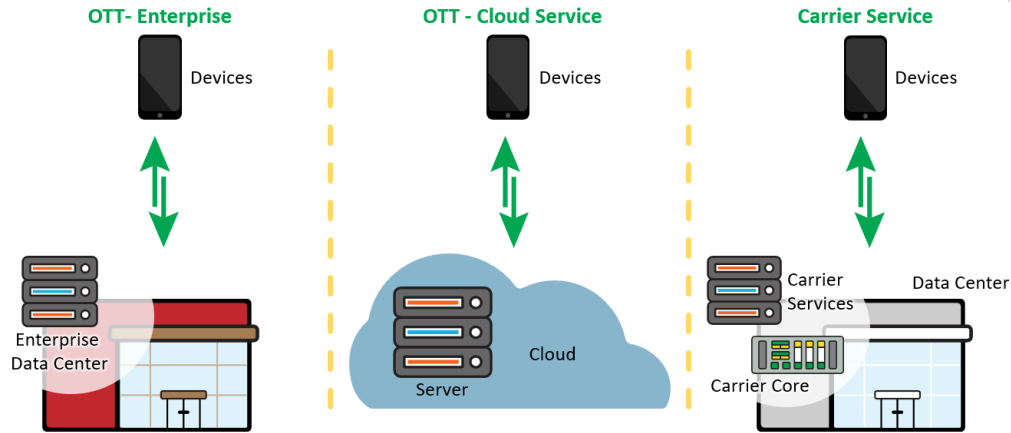


Figure 17: Types of PTT Systems

The major features and benefits of each system are provided in the following table.

Table 14: Benefits and Disadvantages of the Different Types of PTT Systems

PTT Configuration	Benefits	Disadvantages
Carrier Service - FirstNet MCPTT	<ul style="list-style-type: none"> Very high priority level Quicker call setup / lower latency Large group size Expected to include other “mission critical” features over time 	<ul style="list-style-type: none"> No cross-carrier interoperability No text messaging, geo location capabilities, video
Carrier Service – AT&T’s ePTT, Verizon’s Push-to-Talk Responder	<ul style="list-style-type: none"> High priority level Frequently includes other features such as text messaging and real-time geolocation of users 	<ul style="list-style-type: none"> Limited cross-carrier interoperability (loses higher priority)
OTT (Cloud or Enterprise)	<ul style="list-style-type: none"> Interoperable across carriers Frequently includes additional features such as text messaging and real-time geolocation of users 	<ul style="list-style-type: none"> Lower priority levels than carrier offerings

Unfortunately, these different systems are not directly interoperable. For example, ESChat’s OTT platform is not interoperable with AT&T’s ePTT platform. And, even within these categories, different vendor solutions are not directly interoperable. Even AT&T’s ePTT platform is not interoperable with the FirstNet MCPTT platform. As a result, the type of configuration preferred for PTT by the CVPSA may influence the selection of the platform and vendor. For example, if CVPSA prefers a carrier’s solution, even if the agencies all select the same vendor and platform, there could be interoperability challenges to the extent that individual users choose a different cellular carrier. For example, FirstNet’s MCPTT service lacks several features that the AT&T ePTT service offers, including messaging and

geolocation. It also lacks a cross-carrier licensing option available on the ePTT platform¹⁶; however, while direct interoperability may not be possible between some of these user groups, it is possible to leverage the LMR network as an intermediary gateway between the disparate groups. For example, if a cluster of users remained on the ESChat platform while the bulk of CVPSA users operate on the FirstNet MCPTT platform, common talkgroups could be joined between the two systems via the hardware gateways used to interface the two platforms to the common LMR system.

CVPSA’s PTTToC plan must address the type of PTTToC services to implement. At present, AT&T offers both ePTT and MCPTT services in conjunction with FirstNet service. As noted above, it provides important performance and priority gains as well as ease in interoperability with other FirstNet users, but it currently lacks some advanced features. As MCPTT matures, it may offer the robust set of features and capabilities of ePTT; as of mid-2021, MCPTT features are more limited. MCPTT does provide more “radio like” capabilities and offers the highest level of prioritization on the FirstNet network. However, users may prefer some of the features only available on ePTT such as text-based messaging, user geolocation and geofencing. Because these two platforms are not interoperable, CVPSA should decide on the totality of functionality required for PTTToC and may then decide to delay adoption of MCPTT until the FirstNet MCPTT platform supports all the desired functionality.

CVPSA’s PTTToC plan must identify the goals for the implementation of PTTToC. For example, do the goals include:

- Providing PTTToC capability where there are currently gaps in LMR coverage
- Providing interoperability with users who do not have access to the Central Vermont LMR network, or
- To offload non-essential LMR traffic to a different platform.

Televate believes that CVPSA’s primary goal is to utilize PTTToC capability to augment coverage where LMR coverage gaps exist. If so, and if current cellular coverage can be shown to fill in critical gaps in LMR coverage, Televate recommends implementing a temporary hardware gateway to the LMR network if no other traditional LMR coverage enhancement alternatives are possible (e.g., in-building distributed antenna systems, vehicular repeaters). The current LMR network would require a hardware gateway to provide the LMR to PTTToC interface. However, ultimately, Televate considers the preferred approach to be an IP interface, which provides enhanced functionality such as the ability to see IDs, emergency alerts, and other capabilities not possible with gateway type interfaces. Based on the current status of LMR to PTTToC interworking technology, the IP interface would require an upgrade of the current LMR network to a P25 capable infrastructure. Therefore, this preferred interface could not be implemented until an LMR network upgrade is complete.

On the device side, there are currently a number of dual-mode LMR and LTE devices that provide push to talk capability over traditional LMR networks, as well as over a broadband LTE network utilizing PTTToC applications. Examples include the L3Harris XL-200P portable radio and the Motorola APX-NEXT “Smart Radio.” In addition to these converged devices that support both LMR and LTE, there are numerous PTTToC applications that can be utilized on standard smartphones or ruggedized devices, such as the Sonim XP8, which can also be used to interoperate with LMR users.

¹⁶ The cross-licensing option allows non-AT&T subscribers to operate on the AT&T ePTT platform, providing direct interoperability between carriers.

4.4 Estimated Cost of Recommended System Enhancements

Televate has recommended various potential system enhancements to address communication gaps identified within Central Vermont. The most comprehensive, and beneficial, system enhancement is development of a regional public safety radio system which addresses many of the key issues identified during the system review and needs assessment. In addition to the regional system, other system improvements are recommended as well. The table below lists the recommended improvements, their anticipated benefits, and the estimated cost to implement, while an additional summary cost table below provides more concise cost estimates.

It is important to note that the cost of additional improvements including generators, HVAC, tower remediation/loading upgrades (if necessary), equipment shelter enhancements (if necessary), and other yet unknown radio site specific cost have not been estimated. While site visits were performed, it was not possible to verify the specific needs for each of these improvements at each site. Depending on the scope of these improvements, an additional few hundred thousand dollars in funding could be required.

Table 15: Recommended Enhancements

Recommended Enhancement	Anticipated Benefits	Estimated Cost
Regional System: <ul style="list-style-type: none"> • Development of a Governance Charter for the entity to manage and oversee the system • System RFP development and support • Frequency search and licensing support • System implementation support • System core • Simulcast timing and voting equipment for 12 sites • New site development (anticipated for five sites) • Site upgrades (anticipated for seven sites) • One repeated channel at nine sites (P25 capable) to support CFMAS • One repeated channel at three sites (P25 capable) to support Montpelier and Barre Cities • Fire ground (“Tac”) channel (primary) receivers at nine sites to support CFMAS • Receivers at 3 additional sites for VMED channel (hospital communications) • Upgraded and compatible dispatch consoles (assume 7) 	<ul style="list-style-type: none"> • Two interference-free VHF frequency pairs • Infrastructure for an interference-free frequency pair for CFMAS • Infrastructure for an interference-free frequency pair for Montpelier and Barre City Fire • Simulcast operation to simplify dispatch and reduce congestion and internal communications interference • Improved coverage throughout the CFMAS service area • Improved in-building coverage within Montpelier and Barre Cities • Capability for dispatch to monitor fire ground operation • Improved coverage for ambulance to hospital communications • Public Safety P25 digital standard capability • Current serviceable equipment 	<p>Total Cost \$4.35M</p> <p>Total includes:</p> <p>Regional System Design, Procurement, Planning, Project Management & Governance: \$430k</p> <p>Dual-Cell Regional System Infrastructure and Construction: \$2.8M</p> <p>New Consoles: \$700k</p> <p>TAC Channel Receivers: \$300k</p> <p>VMED Receivers: \$95k</p>

Recommended Enhancement	Anticipated Benefits	Estimated Cost
Upgraded mobile and portable radios: P25 capable (assume 200)	<ul style="list-style-type: none"> Public Safety P25 digital standard capability Improved coverage Enhanced interoperability Advanced features Current serviceable equipment 	\$700,000
Vehicular Repeaters: <ul style="list-style-type: none"> Vehicular Repeater Equipment (assume 20 units) Vehicle installation Frequency Search and Licensing 	<ul style="list-style-type: none"> Capability to relay portable radio calls through a higher power mobile radio Improved portable coverage in-field and in-building 	\$285,000
Redundant fiber link between dispatch facilities	<ul style="list-style-type: none"> Dispatch operation redundancy 	\$100,000
Implementation of broadband applications to support public safety: <ul style="list-style-type: none"> Situational awareness (Law Enforcement) Building pre-plans (Fire) EMS Charts (EMS) 	<ul style="list-style-type: none"> Improved situational awareness and officer safety Faster and more efficient response to structure fires Enhanced fire-fighter safety Faster communications of patient information to medical personnel 	\$150,000
Implementation of a trial of PTTtoC application: <ul style="list-style-type: none"> Gateway interface to LMR system Five-year PTTtoC subscription for 50 users 	<ul style="list-style-type: none"> Expanded coverage for PTT services Improved interoperability 	\$154,000
Implementation of a modern CAD system in both Montpelier and Barre dispatch facilities, to include: <ul style="list-style-type: none"> Core CAD application Support for six positions 9-1-1 Interface ProQA support CAD Mapping and AVL Response plans 	<ul style="list-style-type: none"> More effective and efficient dispatch operations Capability for mobile dispatch Easy access to preplan information Common platform to facilitate backup dispatch operations 	\$750,000

Table 16: Summary of Public Safety Communications System Estimated Costs

Primary Upgrade	Associated Upgrade Activity / Comments	Estimated Cost
Regional Radio System Infrastructure and Construction	Multi-site, multi-frequency regional analog simulcast land mobile radio network (LMR)	\$2,900,000

Primary Upgrade	Associated Upgrade Activity / Comments	Estimated Cost
	Regional LMR system design, procurement, planning, project management & CVPSA governance modifications	
	Tower upgrades and reinforcement ¹⁷ Radio equipment shelters	\$330,000
	Radio Consoles for Montpelier and Barre City dispatch	\$700,000
	TAC Channel Receivers (supports TAC fire ground radio transmission to dispatch)	\$300,000
	VMED Receivers (expands VMED coverage and interoperability within Central Vermont)	\$95,000
Upgraded mobile and portable radios: P25 capable (assume 200)	New radios required to replace outdated radio	\$700,000
Vehicular Repeater Equipment and installation (20 units)	These repeaters are installed on fire apparatus to improve in-building communications	\$285,000
Redundant fiber link between dispatch facilities	Redundant fiber link to connect the Montpelier and Barre City dispatch centers	\$100,000
Implementation of broadband applications to support public safety	Public safety broadband applications to modernize and enhance data communications for fire, police, EMS	\$150,000
Commercial broadband Push-to-Talk (PTT) or Mission Critical PTT application	Alternative public safety communications over interoperable to LRM broadband (FirstNet and commercial cellular carriers) to improve in-building coverage and provide additional communications options	\$154,000
Implementation of a modern Computer Aided Dispatch (CAD) system in both Montpelier and Barre dispatch facilities	A common CAD system should be implemented in Montpelier and Barre City	\$750,000
TOTAL COST ESTIMATE		\$6,464,000

¹⁷ The specific extent of radio towers upgrades could not be determined during the project. This determination would need to be made through specialized tower loading engineering assessment and if new radio towers are required in the final radio network design. The associated costs stated here are a rough order of magnitude estimate and need further evaluation.

5 CONCLUDING CONSIDERATIONS

The legacy communications systems supporting mission critical public safety emergency dispatch and response are based on outdated technologies, most of which are no longer supported by the original equipment vendors, and they are at risk of failure. They do not provide sufficient coverage and need to be replaced and upgraded. In advancing the Central Vermont strategic plan to address these public safety communications limitations and to meet the key operational requirements detailed by the stakeholder community, primary considerations for CVPSA include the following:

- The documented public safety communications gaps and requirements, particularly those supporting firefighter radio communications, need near-immediate attention. The safety of the regional community, and the first responders who depend on reliable and robust communications to deliver timely, quality emergency services to their respective communities, are at greater risk due to the limitations of the legacy systems.
- The funding of the system upgrades may be challenging to secure; however, the CVPSA and its member entities and jurisdictions, need to explore their options and agree on a viable source of funding.
- There are financial, administrative, and operational benefits to managing the procurement of the regional system as a consolidated purchase through a single Request for Proposal (RFP) vehicle. A decision on how best to facilitate the procurement needs to be determined.
- The opportunities to forge synergistic partnerships with regional and state-based utilities and broadband municipal entities should be further explored and advanced. These opportunities could offer valuable options to share and leverage existing radio tower and backhaul (fiber, microwave) transport assets to the mutual benefit of CVPSA, the potential partners, and the local community.
- Regional public safety communications systems provide efficient and effective system deployment and operational benefits that are best managed through a regional governing organization. CVPSA has an established governing structure that should be leveraged to facilitate decision making, procurement, and ongoing operational support and management of the future regional radio system. Effective governance will also result in the delivery of critical interoperable voice and data communications and associated operational best practices. CVPSA should continue to engage with its members and make whatever structural changes are necessary to continue to best serve their stakeholders.
- However Central Vermont advances the plan and implementation of enhanced public safety communications system, it is important to ensure that adequate annual operational funding is allocated to maintain these mission critical systems.

The dedication and passion of the Central Vermont public safety community and the executive leadership that support their mission to protect and serve their communities and citizens are extraordinary and should be commended. The findings and recommendations documented through the CVPSA Telecommunications Needs Assessment project provide a strong foundation on which an actional strategic plan to enhance Central Vermont public safety communications systems and solutions can be anchored. This important work requires the continued collaboration and partnership of the CVPSA membership to achieve the required objective to provide public safety with the best available communications systems.

6 APPENDIX A: POTENTIAL MICROWAVE LINK TERRAIN PROFILES

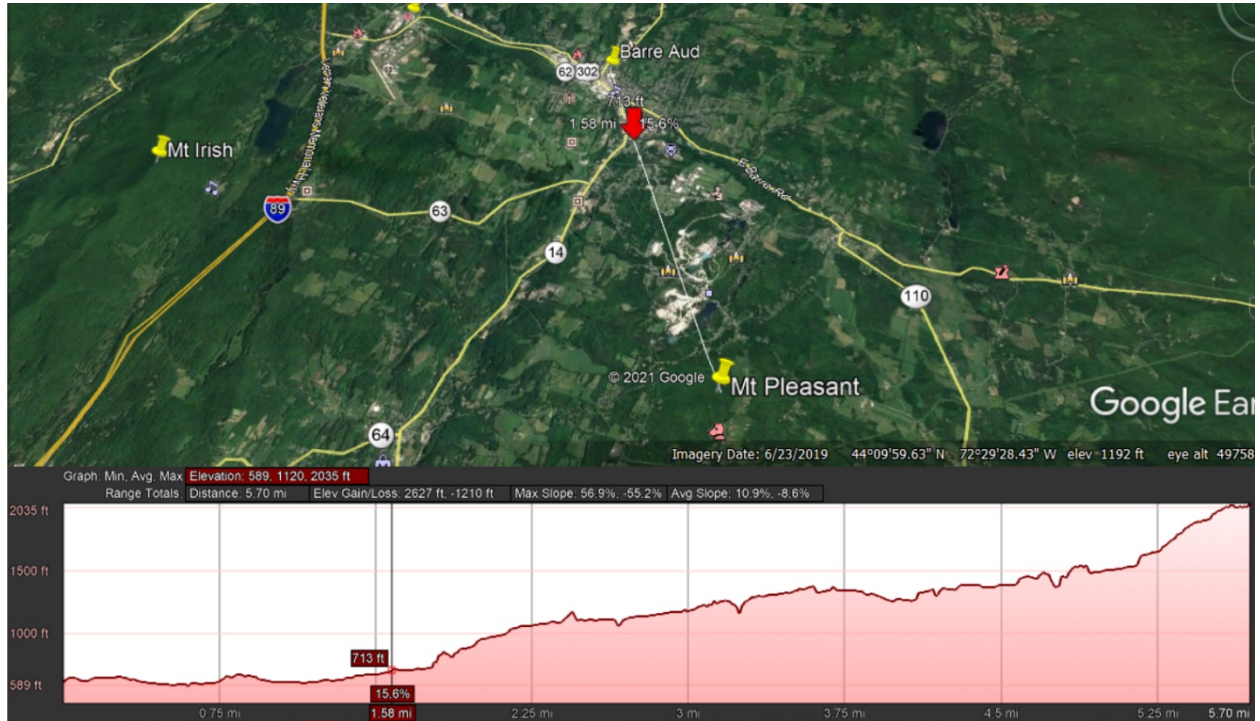


Figure 18: Barre Auditorium to Mount Pleasant Terrain Profile

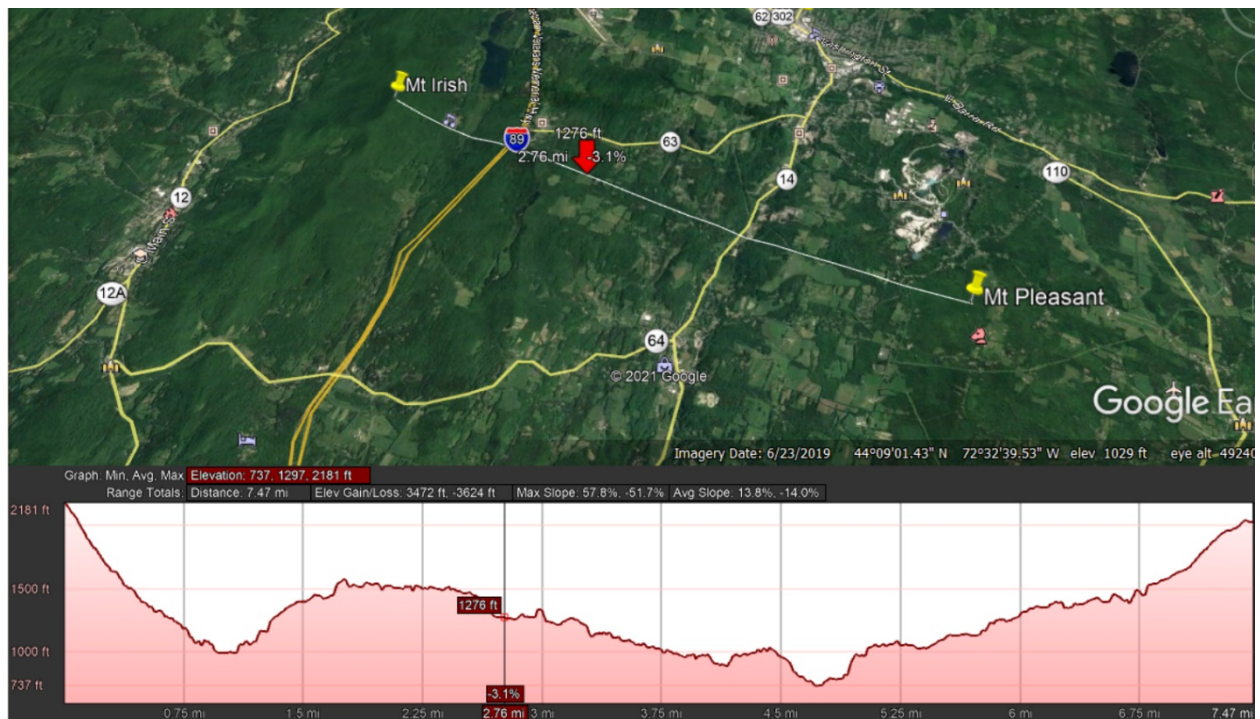


Figure 19: Mount Pleasant to Mount Irish Terrain Profile

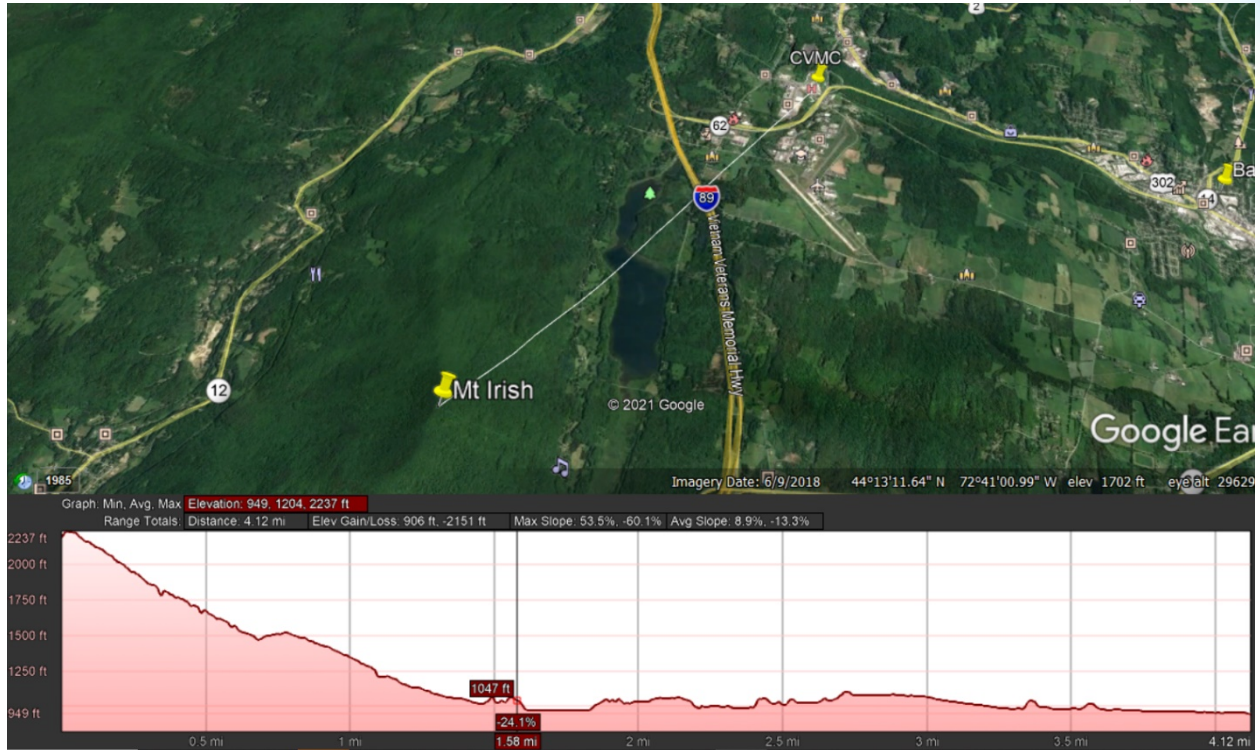


Figure 20: Mount Irish to CVMC Terrain Profile

7 APPENDIX B: CVPSA NEEDS ASSESSMENT QUESTIONNAIRE REPORT

7.1 Survey Introduction

7.1.1 Objective

The purpose of the Central Vermont Public Safety Authority (CVPSA) User Needs Assessment Questionnaire was to obtain specific information regarding public safety radio communications within the service area of Central Vermont. The following sections of this report will explore the results of the survey, including radio inventory, perceptions about and use of other communication tools, communication gaps, and radio system maintenance and infrastructure. By understanding how stakeholders use their existing systems and their gaps in capabilities, CVPSA can advance and prioritize initiatives to enhance communications throughout the region.

7.1.2 About the Data

Throughout this report, the results will generally be measured by the percent of respondents who answered a question (in part or in total), though it may also refer to the number of respondents who answered a question in a certain way (especially when there were very few responses or with multi-select questions). Additionally, participants were only required to provide their contact information, and every other question was optional. Therefore, the number of people who answered each question will vary throughout the survey and percentages refer only to that individual question.

7.2 Response Demographics

The survey received 30 responses from throughout the region. The following table shows the different jurisdictions represented by the survey.

Table 17: Jurisdictions Represented by Survey Responses

Jurisdiction	Number of Responses
Barre City	3
Capital Fire Mutual Aid (CFMAS)	15
Montpelier City	2
Other	6
<ul style="list-style-type: none"> • Cabot Emergency Ambulance (1 response) • Capitol Police/Capitol Police Fast Squad (1 response) • Corinth/Topsham (1 response) • Mad River Valley Ambulance (private service) (1 response) • Town of Worcester (1 response) • Waterbury Ambulance Service (1 response) 	
Other Municipality	4
<ul style="list-style-type: none"> • Town of Woodbury (1 response) • Washington Fire Department (1 response) • Williamstown (2 responses) 	

The following figure shows the disciplines represented in the survey responses. These categories were self-reported, and participants were able to select multiple categories. The survey received no responses from public works, public utilities or schools so those are not shown in the figure; however, the one response indicated “Other” reported being “Appointed By City Council.”

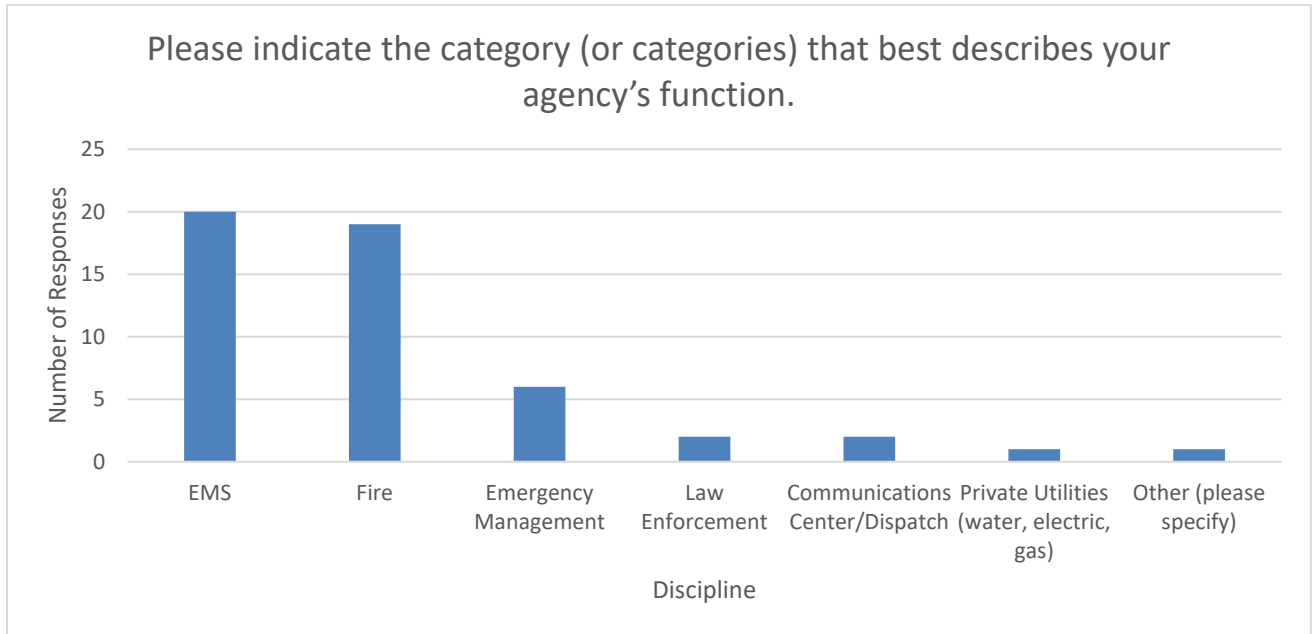


Figure 21: Agency Discipline

Within each agency, participants were asked to identify their roles as they pertain to radio communications. Fifty percent (50%) reported representing agency leadership. That means a majority of responses came from individuals who are likely authorized to make decisions and influence purchases within their agencies.

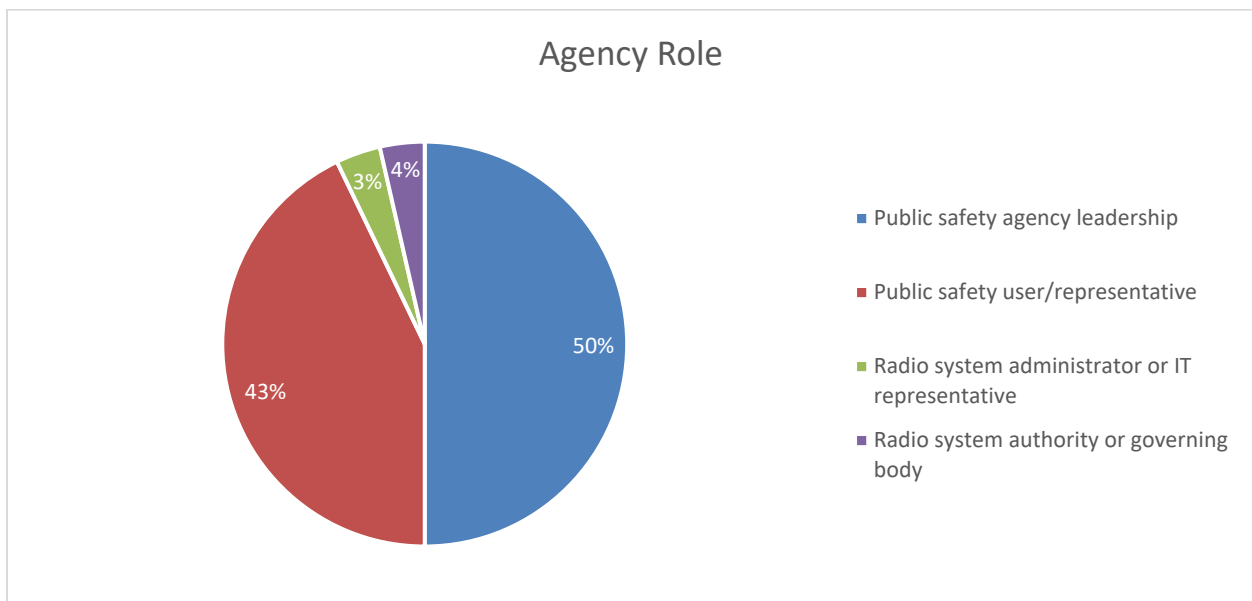


Figure 22: Participant Roles within their Agencies

7.3 Radio Communications

7.3.1 Voice Communications

Asked about their agencies' primary form of public safety voice communications, a small majority (53%) pointed to the regional radio system. While the use of agency or jurisdictional radio systems/channels was spread across all disciplines, only Fire, EMS and Emergency Management reported using the regional radio system.

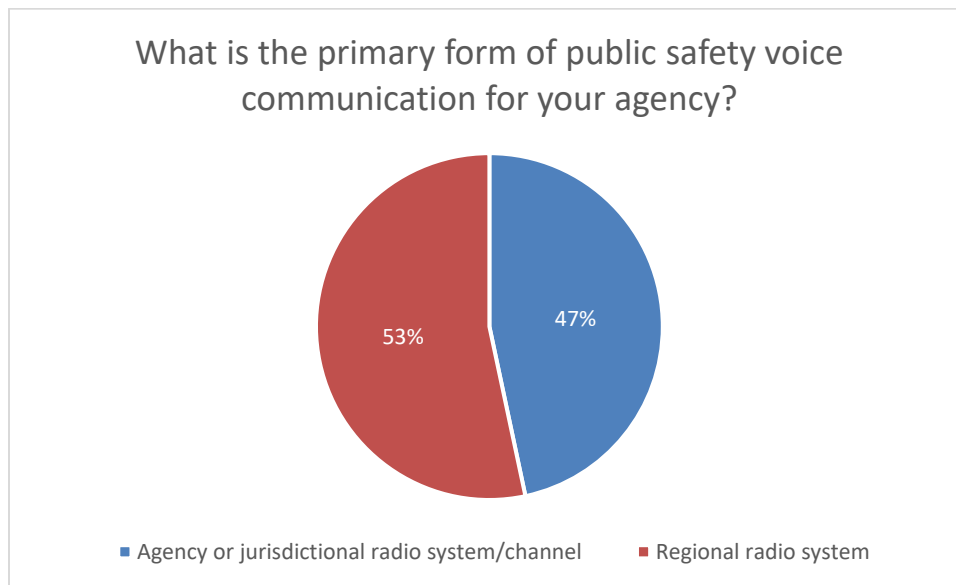


Figure 23: Primary Form of Voice Communication

Participants had the opportunity to identify strengths and weaknesses of their existing radio system. Although they had a variety of insights, dispatching was a recurring strength, while coverage was an oft-mentioned weakness.

The word-for-word, unedited responses are provided below:

- Solid dispatching week signal, several dead spots
- Weaknesses: Channel Congestion, poor Receive/Transmit signals, lack of policies/guidelines for users and dispatch, no operations/fireground monitoring, minimal dispatch staffing. Strengths: Majority of fire/ems agencies on one dispatch channel
- Ability to reach some of our outlying areas.
- S - great dispatchers W - reception
- Spotty
- Good depending on where you are. There a many " dead spots" with little or no reception.
- Poor coverage areas. Still the most convenient way to communicate.
- Our volunteer dispatchers are very familiar with our service area. They work for free; costs are limited to equipment. Scheduling [sic]/coverage can be a challenge sometimes.
- Challenged to hear off the Irish Tower They don't always tone of Woodbury tower
- Strengths: Single channel allows easy interoperability for users. Analog radio channels allow for easy use with volunteers who may provide there on personal radio gear. Weaknesses [sic]: Major interference from neighboring counties/dispatch agencies. While CFMA has extra tactical channels they do not have pre determined uses. IE water supply, Traffic control etc. Dispatch

centers should be assigning tactical channels for all operations leaving the primary dispatch channel air time available. Little to no RF coverage for portable radios in the west Berlin and Montpelier junction area.

- We have dead zones throughout our coverage area making it unable to communicate with portable radios. Capital West is a fantastic dispatch agency.
- Don't always get pages. Dispatcher using wrong antennae
- The dispatch system works pretty well for the most part, the only trouble we seem to have is reaching dispatch with our hand held devices
- Most mutual aid agencies on it is great the spotty coverage in Moretown is a weakness
- We have excellent dispatch service. The current radio system using multiple towers creates a challenge as the dispatchers have to switch between towners for different agencies and we have to have our dispatch and communications on more than one tower to get all of our members. We can't hear members that are being dispatched on other towers so we end up talking over each other [sic].
- Fair to good radio coverage, Can't hear what other agencies are doing
- Our police channel is pretty robust. The biggest challenges we have are when officers are in large buildings or near power lines. The sheriff's channel covers a very wide area and we have challenges hearing officers in some locations in the Mad River Valley. The fire channel is a huge weakness. There are so many agencies on the frequency that when we have area-wide emergencies or even two independent emergencies happening at once, we have to jostle for air time. We have problems with units in the field not being able to hear each other from different incidents, so they walk on each other, and the strongest signal wins. Sometimes I can't hear a firefighter on a portable standing in front of the Barre City Fire station, and we are in the same building. Sometimes we dispatchers can not hear responding units from other agencies, for example, here in Barre, I can not hear response units in Northfield talking to Capital West, so if we have an emergency here in one of the areas we dispatch for, we will cover traffic from Northfield responders without knowing it. Our radio system has a channel guard on it, so we don't hear a lot of traffic from outside of our immediate area, however, there is some, and when we have it, it is disruptive to operations. We have intermittent problems with carryover traffic on the radio frequency from users in Quebec. We also have intermittent problems with carryover traffic from Seacoast Dispatch in New Hampshire.
- Parts are aging
- Strengths: Professional Organization Timely and driven Good relationship Areas for improvement: Some dead spots Too much interference from northern agencies operating on the same frequency.
- STRENGTHS: SHARD FREQUENCY WITH MUTUAL AID PARTNERS AND THE ABILITY TO HAVE THE DISPATCHER COMMUNICATE WITH LEO, IN HOUSE DISPATCHING POINT OF CONTACTS
WEAKNESSES: AGE OF SYSTEM, IN BUILDING COVERAGE DEFICIENCIES, LACK OF REGIONAL WIDE DISPATCHING PROTOCOLS, TERRAIN, OUTSIDE INTERFERENCE, MASS GLASS AND DISTANCE. ECONOMIC CONSTRAINTS, DISPATCHER RECRUITMENT AND RETENTION.
- Small Footprint (Doesn't work well beyond City Limits) Dispatchers Can be overloaded Limited channels for tactical operations etc.
- Excellent service Poor radio communications in the Wells River And Connecticut river valleys
- We need a system that minimizes other agencies and businesses that use the same frequency.
- Since moving to narrow band digital, reception has decreased in range with more dead spots

- The dispatch center is unable to handle multiple calls at once and constantly struggle with air time Capital West. The tower owned by Barre City on Mt Pleasant only covers roughly 75% of Washington
- Some coverage issues
- Coverage could be better
- We have no problem with strengths.

7.3.2 Mobile and Portable Radios

The following two figures show the number of mobile and portable radios within participants’ departments. The responses were grouped to show ranges rather than individual numbers for each agency. While a majority of agencies (75%) have 10 or fewer mobile radios, the number of portable radios is more variable.

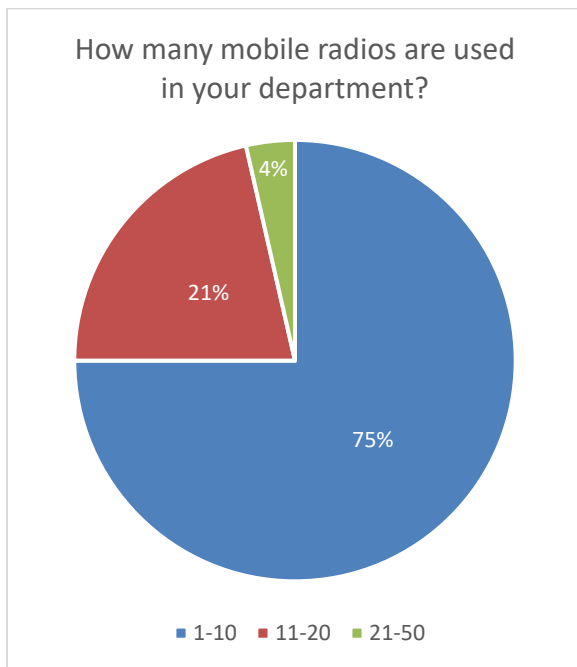


Figure 24: Number of Mobile Radios

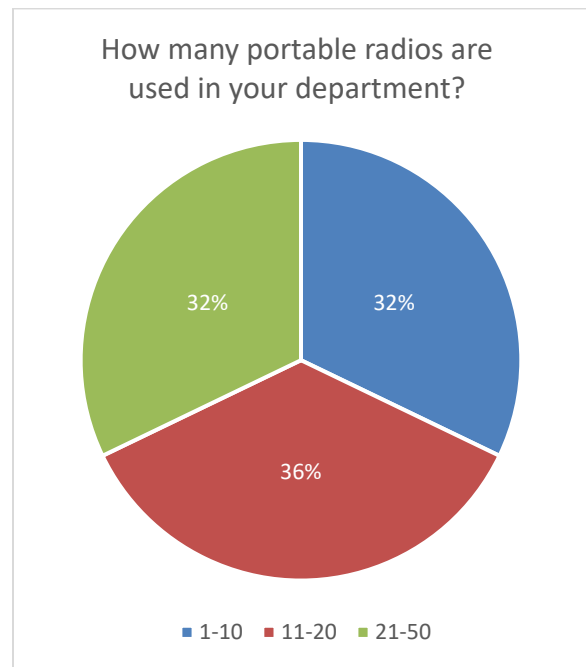


Figure 25: Number of Portable Radios

The respondents largely reported using Kenwood radios, followed closely by Motorola.

7.3.3 Lapel Microphones

Only 25% of the 20 participants who answered the question reported using lapel microphones with antennas. The use of portable radios with a lapel antenna does provide limited coverage improvements which may be sufficient to deliver coverage at the edge of current coverage limited areas. Note, however, that since most respondents use portable radios mounted on the hip with the antenna on the radio, coverage predictions in *Section 4: Radio System Analysis and Recommendations* were modeled with that configuration.

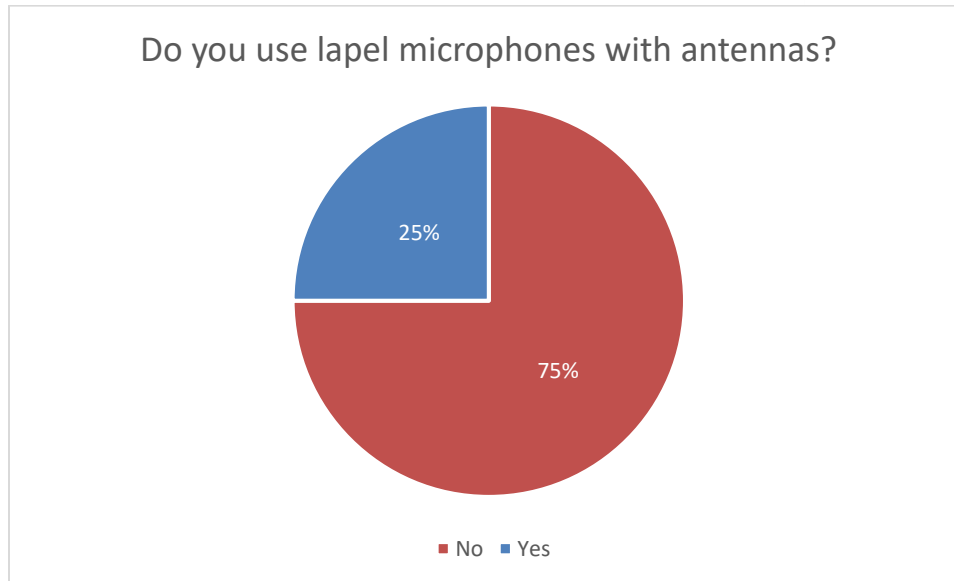


Figure 26: Lapel Microphones

7.3.4 Coverage

Participants were asked whether they used radio-to-radio (talk-around) communications where coverage is lacking, and if so, under what circumstances, and which tac channels are used. They provided the following responses, which are unedited from the survey:

- Fire Ground Tac-4
- Yes if we can not reach dispatch we will communicate to our base on Fire ground or our town munciple [sic] repeater
- In Calais we go to the Woodbury repeater or have to use mobile radios.
- Tac 4- DHART;
- Yes we do and we use mostly CFMAS fire ground
- We mostly use the CFMAS fire ground channels
- The system currently is simplex so there is no "talk around" On scene we will use channel 2 (154.295) or on a larger incident we will use several of the CFMAS TAC channels
- Fire scenes go to "fire ground", but do not do that just because dispatch communications are lacking; they do it to get off the main dispatch channel.
- Waterbury's private channel
- WE USE THE FIRE GROUND CHANNELS AS OPERATIONS CHANNELS TO FREE UP AIR TIME FOR OTHER REAL TIME EMERGENCIES WITHIN THE AREA ON THE MAIN DISPATCH FREQUENCY AND TO PREVENT BEING WALKED OVER.
- Yes - we also have a Department Owned repeater that reaches the basements and throughout state buildings - but Dispatch doesn't have it
- We use fireground and tactical channels during most large scale incidents and sometimes stage apparatus in locations to be able the relay between dispatch and the fire scene.
- Yes

- Everything goes thru a repeater for communications with dispatch¹⁸

The survey asked whether participants experience radio interference issues from other users/systems, whether they could identify the users, and in where this takes place. The following responses are unedited from the survey:

- Alburg, VT
- On structure fires or large scale mva
- Yes bleed over and interference from Shelburne dispatch when dispatching alburg or south hero, north hero agencies. The majority of this is caused by all users having access to the 200 watt repeater. Portables and mobiles utilize the repeater to communicate. These users also have complete disregard for the use of tactical [sic] channels. Most incidents are allowed to continue on the primary dispatch channel this includes units performing traffic control on the dispatch channel while using the repeater on the mountain top, instead of talk-around or simplex operations
- Yes, Typically northern Vermont and Canada
- Rutland county off of Killington
- No
- Shelburne dispatch walks over our radios often and anywhere in downtown our radios squelch non stop
- Frequently. Canada, St Albans dispatch, Shelburne Dispatch
- Yes from the Islands on 154.190, and sometimes coordination issues from Barre City
- Taxi or trash service in Quebec, CA; SeaCoast Dispatch [sic] in New Hampshire
- These users are located in the Northern part of the state. Primarily, Shelburne dispatch. interference occurs all over our coverage area
- GRAND ISLE EMERGENCY SERVICES, CANADIAN CAB COMPANIES AND CANADIAN GARBAGE COMPANIES
- Lots of issues on the Fire Channel
- No
- Constantly. Elevation is high enough that we pick up Shelburne dispatch communicating with grand Isle county. There is also radio skip that is usually from Canada.
- No

Asked how often they experience radio/system congestion and on what channels, respondents provided the following answers:

- Congestion and bleed over frequently in the evening on 154.190mhz CFMA Tac 4 & 7 have lots of congestion from ski resorts, electrical contractors etc
- Primary channel can be congested at times 154.190
- Once in a while, the dispatch channel Capitol West dispatches on
- I would say often on congestion and mostly on capital west and fire ground
- Daily on dispatch channel
- 10 per cent [sic] 154.190
- Daily on the main fire frequency for the area; worse when there is a major weather event that requires dispatch of fire and ems to help with traffic accidents or trees down
- Daily.

¹⁸ Although this was the perception of the respondent, this is actually incorrect.

- DAILY ON THE MAIN DISPATCH FREQUENCY 154.190
- Any time there is a fire. (Too many tones, coverage tones, different towers etc)
- On occasion during large scale weather incidents on the dispatch channel.
- Usually only on Capital West

Open-ended responses repeatedly mentioned coverage as an impediment to communications. As a possible remedy to these issues, the survey inquired into participants' willingness to consider using vehicular repeaters to extend coverage, and most (82%) of the 17 respondents who answered this question were open to the possibility.

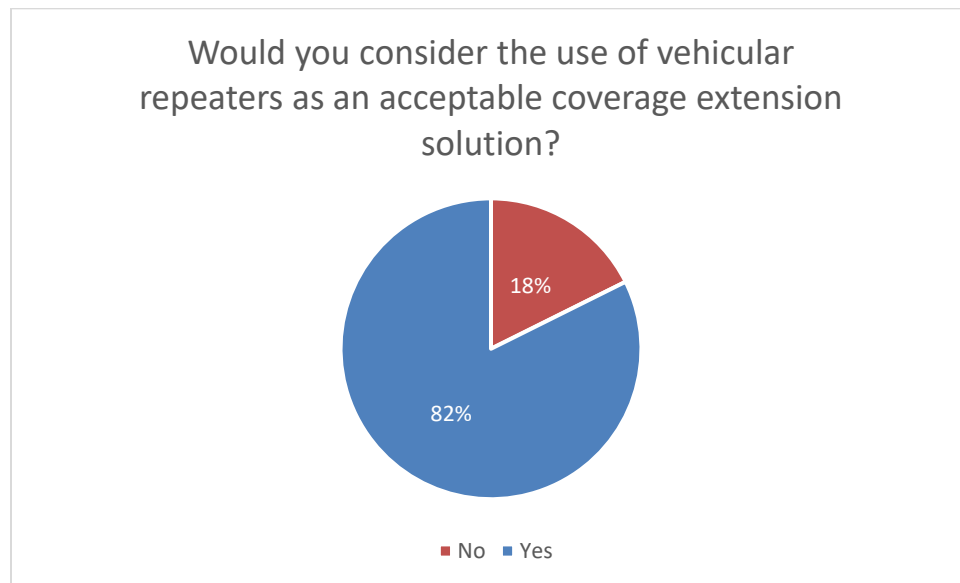


Figure 27: Vehicular Repeaters

Participants were asked whether there are gaps or issues with the paging system, and for an explanation of their responses. They provided the following answers:

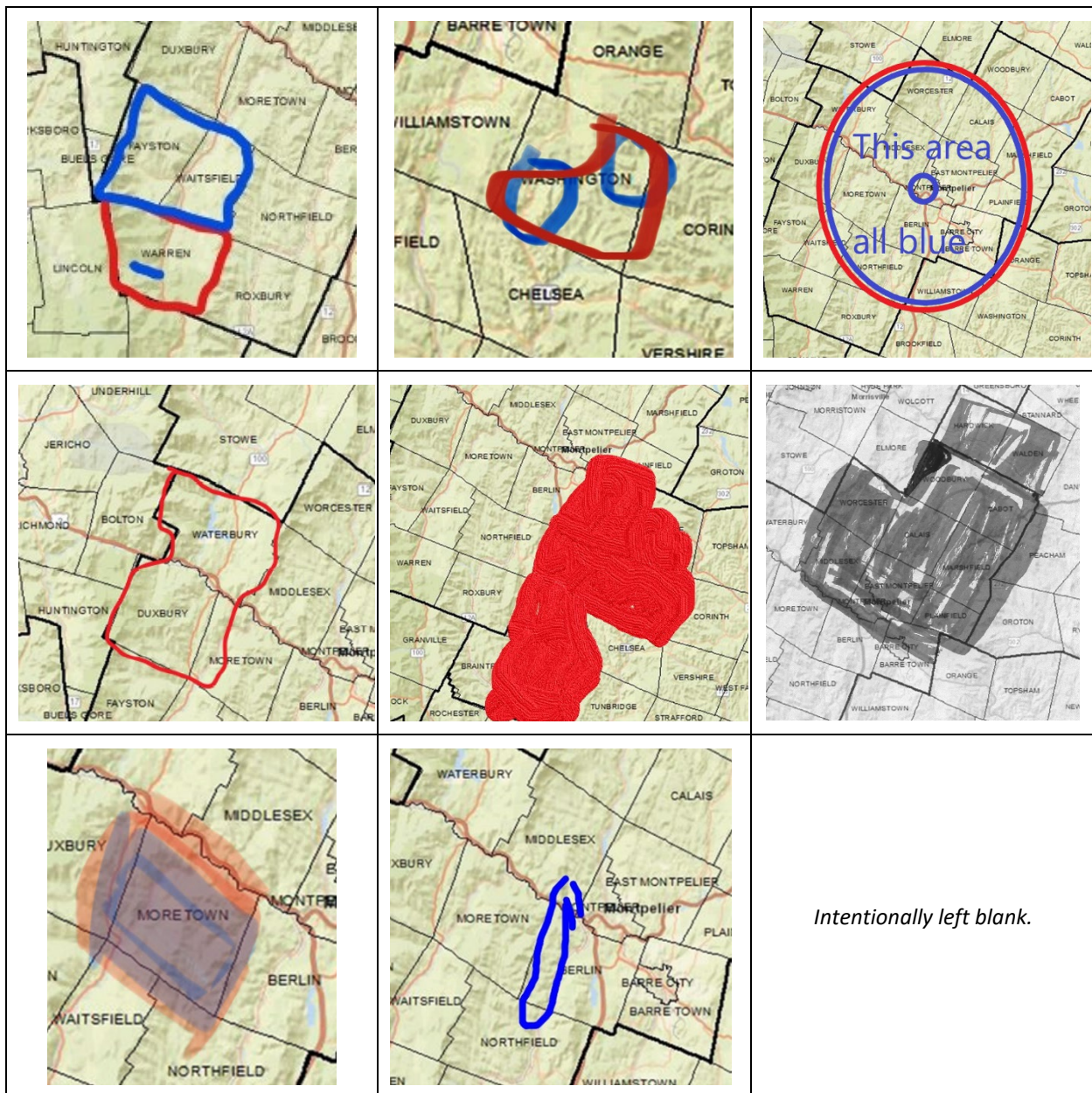
- Frequent missed weekly test tones.
- No
- Paging is not too bad. Sometimes the recording part is static.
- YES!!!!
- No
- We mostly use active 911 because the paging is so spotty in Moretown
- Just the need to do our tones on two towers to reach all members
- About 5 per cent of the town has pagers coverage issues outside and about 30 percent indoors but vastly better than the cell coverage using active 911 30 outside and 50 percent indoors
- No
- NO IT MEETS OUR DEPARTMENTS NEEDS.
- Oh God Yes. "The way we've always done it" rules the day. Fire Unions have also mandated certain paging requirements (ridiculous).
- No
- Yes. FFRS currently
- Coverage doesn't allow for all members to receive a page from their homes

Participants were also asked to identify gaps or issues with their paging systems. Six (6) of the fourteen (14) respondents stated they had no or few issues. Other respondents reported poor and spotty coverage.

Eighteen (18) respondents said their agencies used a supplemental form of alerting. Of those, 13 use Active911. Two (2) additional respondents use FFRS, which has been acquired by Active911, though the FFRS apps will continue working through 2021.

7.3.4.1 Required Dispatch Radio Coverage Areas

The following eight maps were developed by participants as part of the survey. They show areas where users require dispatch radio coverage (depicted in red) and high-priority areas where users experience coverage problems when talking back to dispatch (depicted in blue). In order to show more clearly the areas that have been indicated, unmarked areas in some of these maps have been removed.



7.3.5 Inter-Agency Communications

Most of the 17 respondents (82%) are currently capable of communicating directly with the required user agencies.

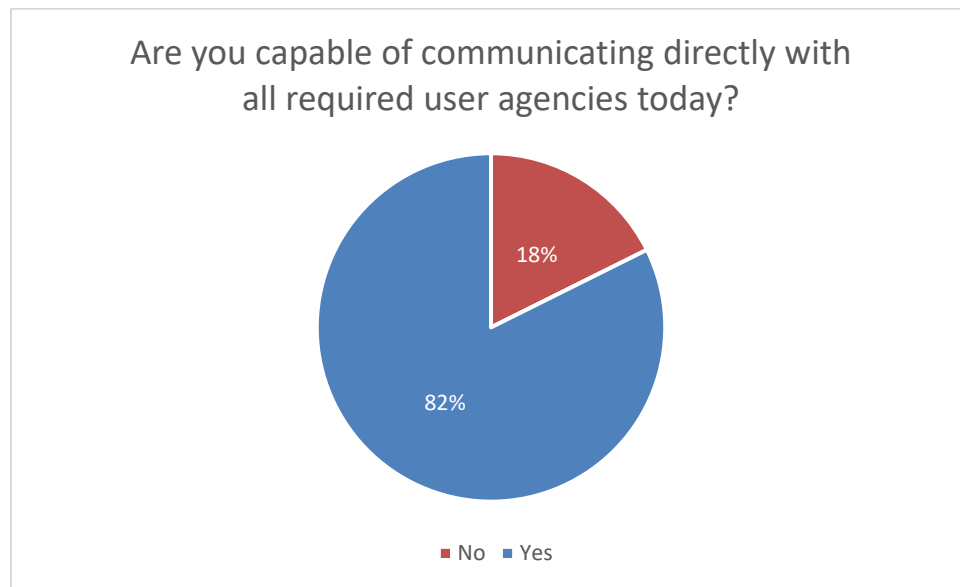


Figure 28: Inter-Agency Communications

Two of the three respondents who indicated they lacked the necessary inter-agency communications identified agencies with which they needed to communicate. Those included State Patrol, Fish and Wildlife and a variety of mutual aid departments. Barre City specifically reported that “Mutual aid departments like Brookfield, Randolph, East Randolph, Randolph Center, Chelsea and Topsham are dispatch by other agencies. They require a phone call to their dispatch for a response, but they can talk to us once they get into our area, on our channel.”

Asked how they interoperate with users/systems when working in their own service areas, participants provided a variety of answers. The following answers are unedited, word-for-word responses from the survey.

- Mobile radio
- Utilize their radio channel
- Frequency coordination
- Phone
- Contact their dispatch or have them come onto CFMAS when in our area
- We switch to the other services channel or use VTAC frequencies
- Various channel and UHF radios for State Police
- Once notified of a mutual aid request, and in our area, they call dispatch on our frequency as a courtesy so we can talk to them.
- Mutual aid only
- CURRENTLY OUR MUTUAL AID IS DISPATCHED ALL AT ONCE ON A SECOND ALARM STRUCTURE FIRE ASSIGNMENT. THOSE THAT ARE NOT ON OUR MAIN FREQUENCY ARE DISPATCHED AND THEY CHANGE TO OUR FREQUENCY TO COMMUNICATE.
- Yes. It is not easy though.
- Most agencies have multiple channels in their radios to communicate with us

- Whenever we respond mutual aid

Next, participants were asked how they interoperate with these users/systems today when working in the neighboring service area. Their responses included the following:

- Mobile radio
- Fire ground channels or vtac
- Somebody has to switch provider platform
- Phone
- Switch to their dispatch channel
- We use their channel or use VTAC frequencies
- Radios are programed for such communication
- WHEN WE ARE DISPATCHED TO ASSIST ANOTHER COMMUNITY THAT IS NOT ON OUR CURRENT FREQUENCY IF WE SHOULD HAVE TO RESPOND TO ANOTHER AREA ON A DIFFERENT DISPATCHED FREQUENCY WE GENERALLY SWITCH OVER TO THEIR FREQUENCY AND SHARE THEIR OPERATIONS CHANNELS
- Switching to their channel or State 2
- We have over 30 channels to communicate with other agencies
- Thru CapWest once we get within range

Additionally, to respond to this question, one participant referred to their previous answer, which was that they used “various channel and UHF radios for State Police.”

7.3.6 National Mutual Aid Channels

Most of the 17 respondents (65%) do not use national mutual aid channels. Specific national mutual aid channels have been designated in every public safety frequency band, including VHF, which can be used for interagency communications, when no other common communications channel is shared between the agencies that need to interoperate. An updated regional communications plan may be necessary to encourage more frequent use of these resources. It is additionally important to prepare a common radio template and to program national mutual aid channels into every radio.

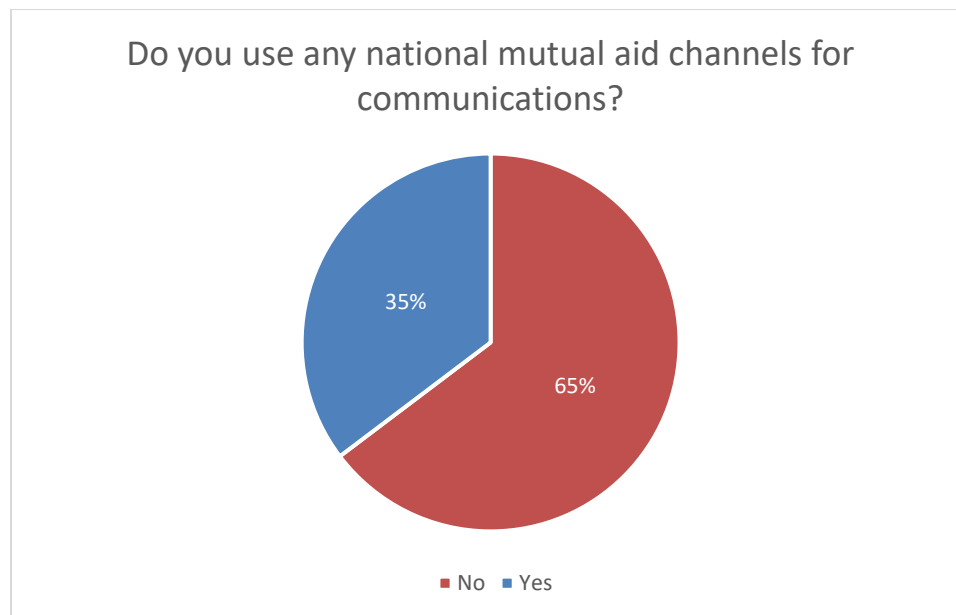


Figure 29: Use of National Mutual Aid Channels

7.3.7 Cellular Communications

Participants were most likely to use only a personal device in support of incident response. This was followed by 24% of respondents who indicated they did not use an agency-provided cell phone *or* a personal device. The remaining participants were split evenly between those who used only an agency-provided device and those who used both an agency-provided device and a personal device.

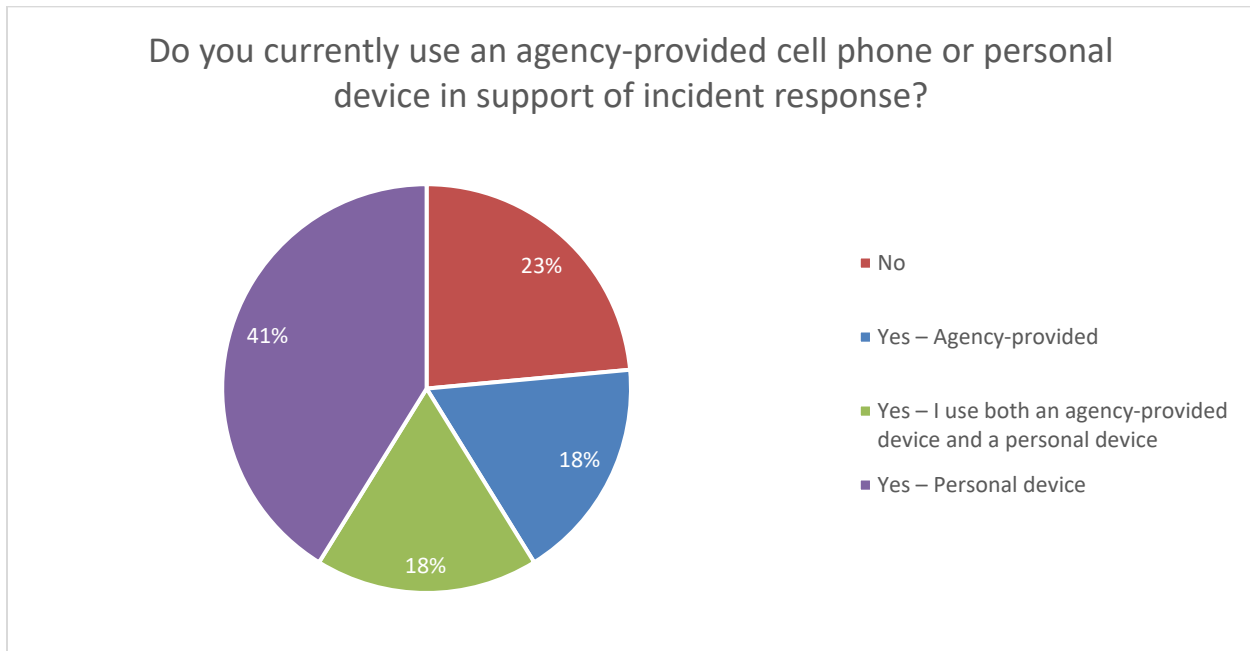


Figure 30: Agency-Provided and Personal Cell Phone Use for Incident Response

Participants also identified the provider(s) they use for cellular communications. Although one participant reported using no cell carrier, Verizon was the most commonly used, followed by FirstNet, then AT&T. Of note, three responses (corresponding to three different fire departments) reported using AT&T but not FirstNet. Televate recommends that first responders using AT&T for their cellular communications should take advantage of FirstNet service. If these users “switch” to FirstNet, they will experience at least the same and likely better coverage in areas where Band 14 has been deployed and enjoy the benefit of priority service over commercial users, while not paying any more than what their AT&T charges are today.

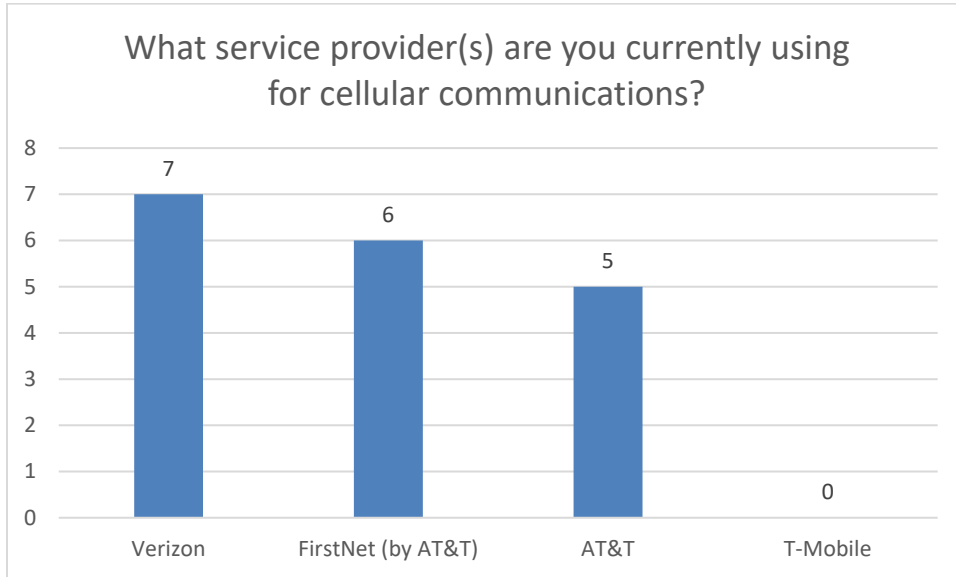
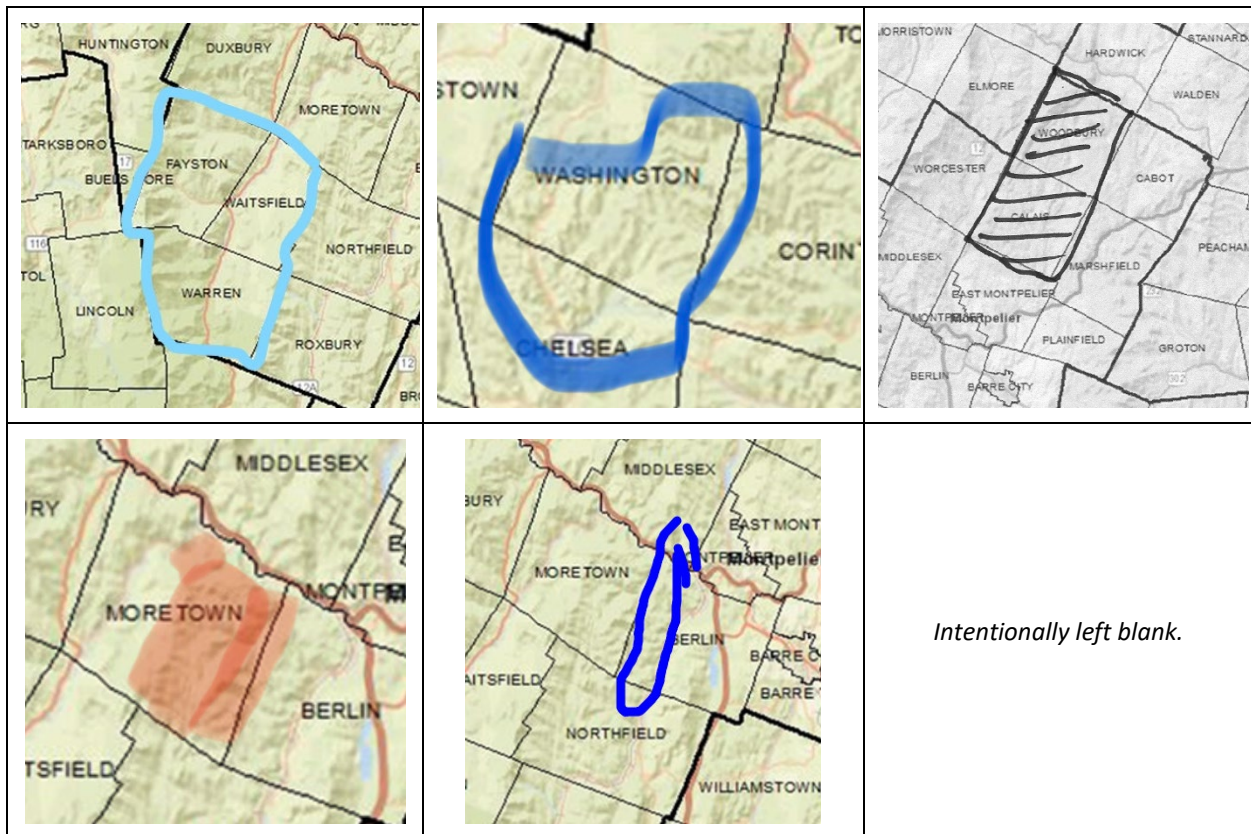


Figure 31: Cellular Providers

7.3.7.1 Coverage Issues on the Cellular Network

The following five maps were provided by participants to show the high-priority areas where they have experienced coverage problems on their cellular networks. Unmarked areas have been removed from the images.



7.3.8 Push to Talk

A majority (57%) of respondents were not interested in using a PTTToC or MCPTT application on a cellular smartphone to support and be integrated into land mobile radio communications.

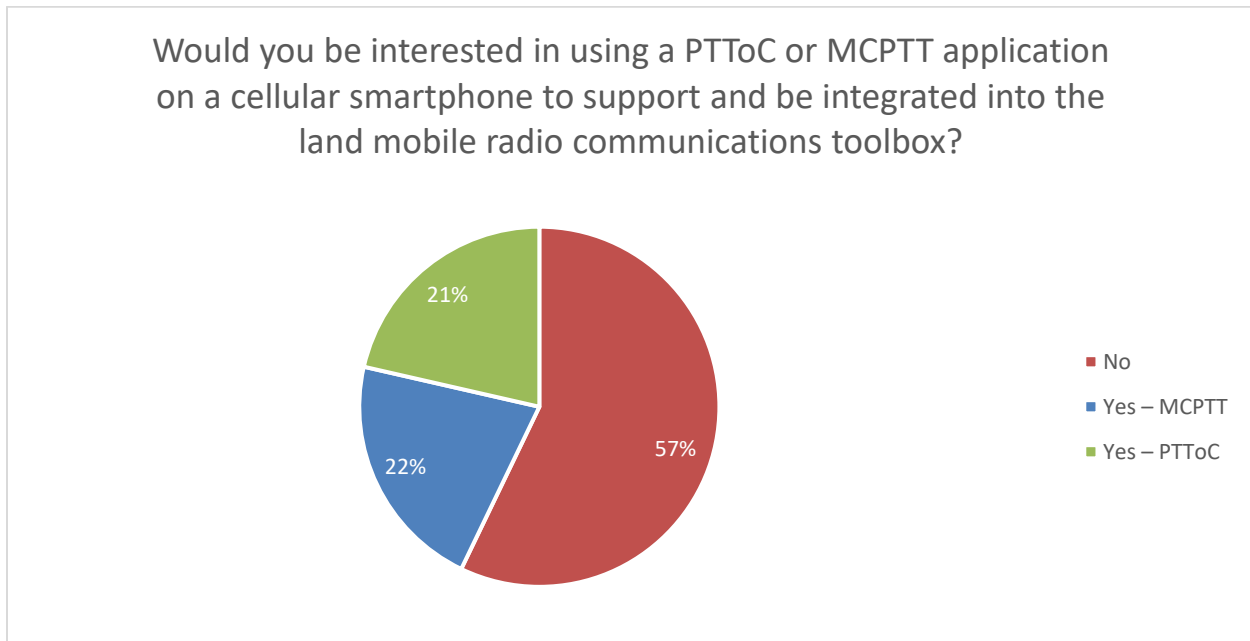


Figure 32: Interest in PTTToC or MCPTT

Many of those who responded negatively pointed to poor coverage as the reason. The following responses were provided:

- Poor coverage service
- Answer is not no, would need more information on what is proposed
- NO CELL COVERAGE!!!!
- We don't have cell service
- Other than [sic] it will probably never cover out town (lack of population and lots of forest), the systems will become over loaded in a major incident and not be able to be available, no matter how much "priority" is given
- WE NEED TO ADDRESS THE BASIC INFRASTRUCTURE THAT IS CURRENTLY IN PLACE AND ENHANCE THAT SYSTEM BEFORE INTRODUCING NEW TECHNOLOGY THAT HAS NOT BEEN TESTED HERE IN VERMONT AND THE CURRENT INFRASTRUCTURE DOES NOT EXIST TO SUPPORT. ESPECIALLY ON THE OUTSIDE FRINGES OF OUR MUTUAL AID PARTNERS WHICH WE ARE CALLED ON FREQUENTLY TO SUPPORT ON A DAY TO DAY BASIS.
- We have tried it, and found it clunky and not reliable.
- Washington has very little cell phone service

Televate concludes that cellular coverage within Central Vermont must be significantly improved before a broad deployment of a PTTToC application should be considered.

7.3.9 Applications

Despite the poor cellular coverage, some broadband applications are currently in use in the region. The most commonly used application on commercial devices was field reporting, followed by database lookups, AVL/GPS, then mobile dispatch/CAD. The participant who replied "Other" named Active911.

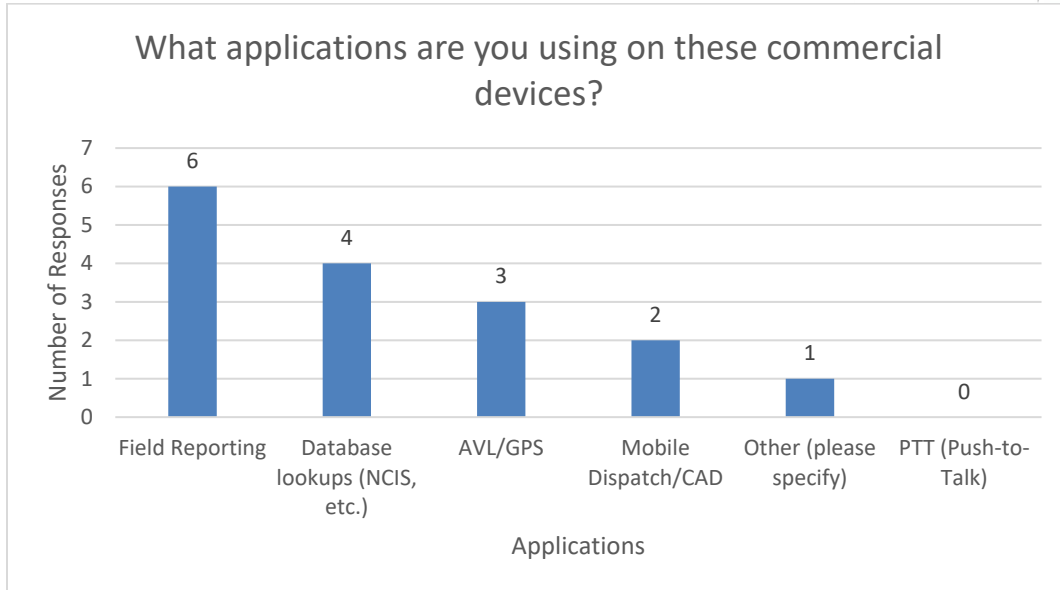


Figure 33: Applications on Commercial Devices

Other public safety communication functions for which participants use cellular communications include:

- Receiving calls from fire investigators
- Communicating with emergency response agencies. However on most incidents we do not have good cell coverage or no coverage at all.
- Active 911 fire permit requests
- TEXT / PHOTO MESSAGING, MAPPING, GENERAL INFORMATION RESEARCH.
- Mobile Hot Spot

7.3.10 Support and Maintenance

Most participants (71%) reported being satisfied with the level of maintenance and support on the current system.

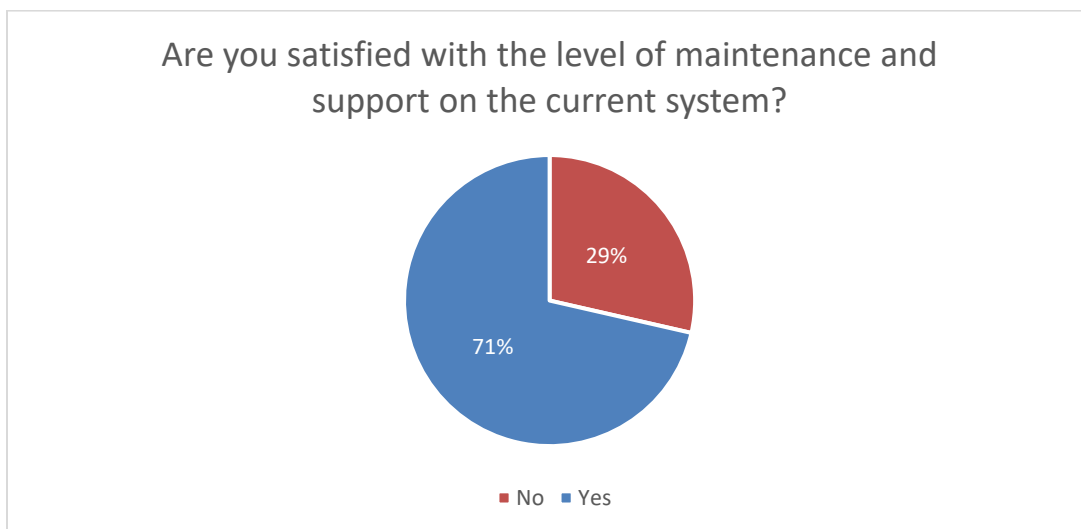


Figure 34: Maintenance and Support Satisfaction

Some additional services they **required** include:

- Better coverage area
- Better cellular coverage
- Better coverage
- Fix the fire channel, add tac channels that Dispatch can monitor and access.
- Full mobile coverage in our service area
- Better working relationship with State Radio shop

Desired services included:

- Better radio coverage
- PTT over cellular in conjunction with mobile radios
- I think it would be great to have one dispatch frequency for fire and EMS responses, with multiple tactical channels that we could assign incidents to for scene operations. There are just too many users on the current fire channel, and airtime is a big problem when multiple incidents are going on.
- Change the paging system
- CAD
- Greater coverage area

It is interesting to note that most of the responses to the comment portion of this question regarding additional services referred back to the primary core issues affecting first responders in the region: poor coverage and a lack of available channels.

Few respondents identified what maintenance contracts are in place for the upkeep of the current radio system. Those who provided a response identified Radio North and DPS Radio. However, most (77%) of the 13 participants who responded to the question indicated that their agencies were responsible for some radio system maintenance.

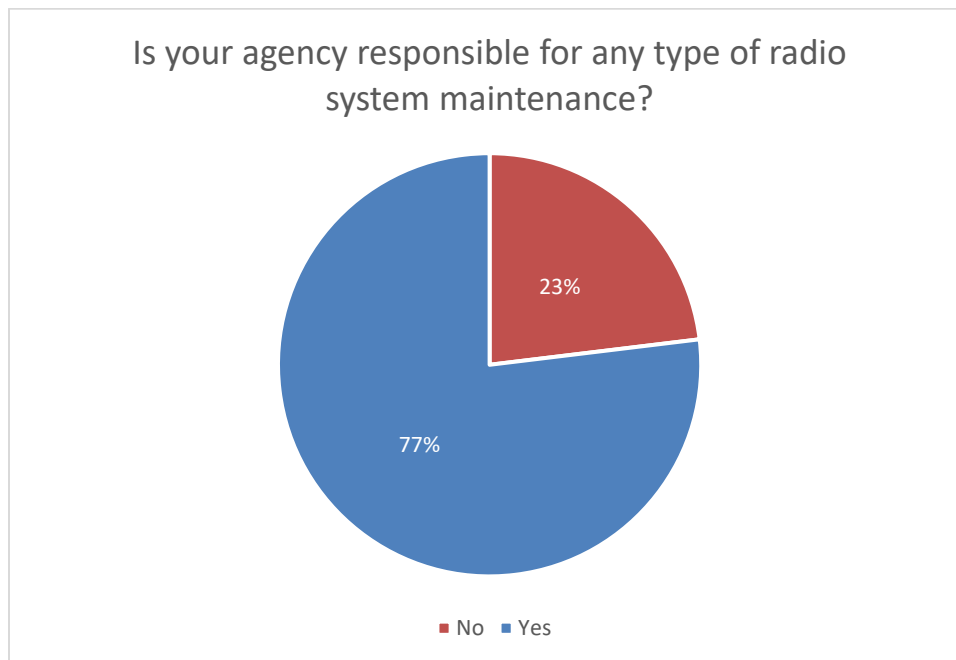


Figure 35: Agency Responsibility for Radio System Maintenance

Those whose agencies were responsible for radio system maintenance listed their funding sources, which included:

- Town budget
- Our budget
- Budget
- Dues to TSFMA; Fees to Grafton County
- Tax payers
- Through our taxpayer funded budget
- Budgeted
- LINE ITEM BUDGET, FUNDED BYUT [sic] THE CITY OF BARRE TAX PAYERS
- Allocated tax dollars
- Operating or Capital Budget

These respondents all reported that, on average, their agencies spent six (6) or fewer hours per month on their maintenance obligations, with a majority spending two (2) or fewer.

Most respondents (91%) also answered that all infrastructure and backhaul equipment in their radio system was owned by a public safety agency or entity.

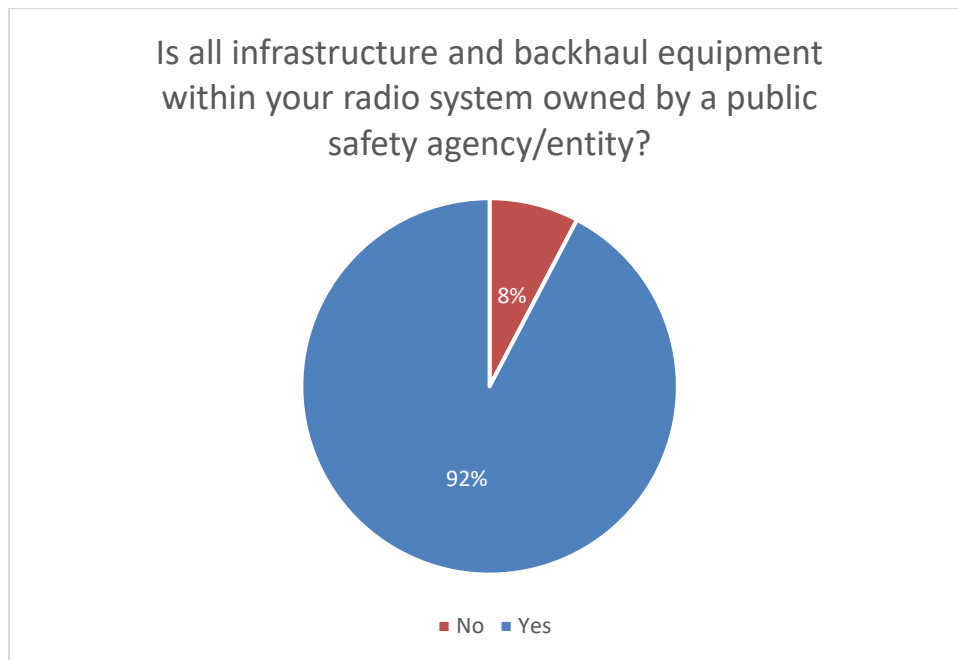


Figure 36: Infrastructure and Backhaul Equipment Ownership

Only one (1) of the thirteen (13) answered “no,” and explained that the agency leases tower space for \$2,500 annually.

8 APPENDIX C: STAKEHOLDER INTERVIEW MEETING NOTES

The following pages provide a summary of the various stakeholder meeting notes that were conducted during the project.

8.1 Joe Aldsworth Deputy Fire Chief, Barre City Fire Department

(w) 802 476-0254

(C) 802 522-8524

Email: joseph.aldsworth@vermont.gov

15 Fourth Street, Barre VT 05641

March 14, 2021

Basic Information and Radio System

- Location of the fire department and the dispatch center
 - 15 Fourth Street, Barre VT 05641
- Barre City dispatches for City of Barre Fire and Police by the Police Department, Washington Fire, Washington EMS, Williamstown Fire, Washington County Sheriff's department
- Link from Barre to radio tower (Mt. Pleasant)
- Single station license: 25 Auditorium Hill, Mt. Pleasant, Old Central Location,
- RF link 453.950 used to link Auditorium Hill to Mt. Pleasant
- Fire alerting: Two alerting solutions: 1) Master box active in the city, fire dispatch and the fire station, 2) at the fire station the alarm is tripped by the tone (Flextron, new version) – tripped by dispatch
- Dispatch Frequency 154.190 share with Capital Fire – very cluttered channel – experience radio interference with Canadian interference, and Grande Isle (Burlington County)
 - Does not trip paging
 - Constant noise, in French from cab companies and trash companies
 - Cannot hear portable communications
- 154.295 talk around/Tac channel
- City channel 6: maybe 155.01 – shared with DOT
- Vehicular repeaters use 154.190 but we are not licensed for that channel
 - Not friendly to use the repeater?
 - concerns about “man Down” feature – emergency button
 - In-band repeater purchased via a grant, but we do not use
- Auditorium Tower was added to improve communications – voted receiver
 - City is in a bowl and difficult to communicate
 - Often use a relay over a Tac or the dispatch channel
 - Auditorium tower was added during narrow banding – helped, but they still have issues talking back with portables – sometimes someone may have to sit at a mobile to communicate with dispatch

- Issues with basement granite which is what most basements are constructed of in Vermont
- Distance communications is a problem for us
- Tunnel via fiber between Barre City and Montpelier to allow either dispatch center to back up the other (Randolph, Village of Randolph, East Randolph and others) and to hear what each is doing
 - Continuity of operations plan between Montpelier and Barre City – they generally respond to each other’s fires
 - Dispatch centers connected between Montpelier and Barre City
 - Zetron toning capabilities in the communications vehicle – no tower, RF link to Mt Pleasant
 - Lease tower space from American Tower at Mt Pleasant with the antenna mounted at 120 feet
 - Consolidated Fiber implemented the fiber link

How many total mobile and portable users will be active in the field on a typical day in five years? 10 years?

- Licensed for 200 Watts, current using 110 watt mobile
- PD has 6-cruisers
- 3-positions at dispatch positions in both Barre City and Montpelier
- State wants to get out of dispatching (?)
- Beacon Hill tower being considered in Washington County which could increase requirements
- Lost the dispatch contract with Barre Town and the annual \$200,000 fees - had to cut a dispatcher
- Parts of Orange, a third on the South side, dispatched by Barre City
- Barre City proper geographic area of 4 sq mi
- Lost the dispatch support of the towns of Randolph and Brookfield

How many total mobile and portable users will be active in the field during an emergency or incident in five years? 10 years?

Are there gaps or issues with these systems? Please explain.

- Good cellular coverage in Barre City but not reliable out of the City
- Rural towns not well covered
- Montpelier does not have the ability to receive the emergency button in Barre and can hear Barre if activated

Coverage and Capacity

- Prior to the fiber tunnel, there are even more coverage issues
- We can hear where the dispatch is delivered from Montpelier PD dispatch center
- Dispatch centers communication with one another over the fiber tunnel
- There are issues when only one dispatcher is active and that dispatcher is busy

- Need to use coverage tones; do we need to hear select communications?
- Two people during the week on first shift, two during the second shift and only one dispatcher during the graveyard shift
- Having the tunnel allows each dispatch facility to support one another
- Only main channel is recorded
- No ability to hear tactical channel communications when on fire ground
 - Joe uses two radios, one tactical, one on the main channel
- Vehicle location is a good feature but if dispatch cannot see the location, what good is it
- Use Active 911 which is very useful as long as it is turned on by end users
- Use eDispatch as well, which is very useful for responders who are out of the region
- Cellular subscriptions are paid by the department
- Contract with eDispatch through CFMA
- Mobile Eye is also used which provides insight into building
- Barre City uses the fire code and enforces it where appropriate
- Montpelier can enforce the fire code, all other towns do not have that capability to enforce the code – talked about the Town of Berlin with no officials to enforce fire building code; the state will not enforce the code, and there must be an MOA with the state to get the state involved
- Using FirstNet as the preferred service provider
- Joe (Verizon – booster at his home) and the Chief (FirstNet) have phones
- All MiFi devices are with FirstNet
- Town of Berlin, less than two miles away and could not be heard (mass, glass and distance are killing us)
- We have mutual aid with the entire state, we could be anywhere within the state providing mutual aid. We support volunteers throughout the region
- Use relay from the incident to the dispatch whenever we cannot communicate from one location or the other
- On the fire ground, we may need to use air, water supply, fire ground tactical channels if and when needed – channels are licensed by the state – 154.25, 15308, 153.?? licensed by Capital Fire
 - Not all in the radio due to licensing issues 151.3925
 - Joe is first VP of Capital Fire
 - New dispatch channel to use 151.3925 but do not know the RX paired channel
 - Todd from Burlington Comm can share insight
 - The plan is to use the channel but there is also interest to use a new frequency, which has now been licensed in an extended area – this is conceptual and could be considered for the future 8-site simulcast system of Capital Fire
 - In concept, we see the command frequency tower
- Network operations
 - Use Radio North on an on-call basis and do not have a maintenance agreement
 - Availability of Burlington Communications can be an issue
 - Do not have the budget for a maintenance agreement, would prefer one but no money

- No local interest to raise taxes on visitors – would not be supported by the chamber of commerce
- Joe pushed the concept of the regional simulcast radio network
- Supportive of the radio network and we have unique coverage challenges
- Capital Fire radio etiquette and they have distance coverage issues, Lock Lake coverage issues
- How far are you going to go to solve the coverage issues?
- Could cost \$50 a call so where are the funds to extend the coverage of now
- Coverage in all commercial buildings are poor
 - 95 % coverage would be great
 - Having line of sight to primary towers would work
 - 10-year life span – really need 15, a scalable system would be preferred
- Dispatch console nearing end of life
- \$20,000 capital upgrade budget
- Dispatching maintenance budget of \$3,000 a year and \$25,000 for capital transfer for equipment replacement
- Equipment is 7-9 years old
- We do not receive 911 fees for supplemental fees, not a primary PSAP – Williston County is where the local is received and then transferred to Barre and Montpelier
- CVPSA tried to implement a local PSAP but ran into labor issues and challenged Barre City and Montpelier dispatch facilities
 - St Johnsbury used for local lock-up and did implement local lock-up in Montpelier
 - PSAP has benefits but is not supported
 - VGS – Villages and Grounds of the state issues regarding building a local PSAP
 - Free dispatching would be prudent but not achievable
- We do not receive 911 calls from the local community – need to get the local police chiefs to support a PSAP center
- No competition between Barre City and Montpelier for towns to pay for dispatching services
- Competing with local county sheriff depts for dispatching

8.2 Todd Goad, Burlington Communications

March 16, 2021

Attendees

Todd Goad: General Manager, Burlington Communications
 Televate: Rick Burke, Dom Arcuri

- Burlington Communications provided the CVPSA a radio gateway bridge in consideration of a regional dispatch facility
 - 4-wire connection to allow Barre City and Montpellier dispatch connectivity
- Capital Fire upgraded to Harris Master III among other projects performed for Capital Fire by Burlington Communications (BC)
- The Capital Fire 154.190 dispatch is a simplex channel

- Wireline control from dispatch, tone control
- Not simulcasted, not voted
- Steerable operations
- BC has the 154.190 and includes a voted receiver configuration – uses an old Harris voter
- BC uses Mt. Pleasant and Auditorium to dispatch to BC, Williamstown, Washington and part of Orange
 - The Barre City Auditorium site is a listening (remote receive) site to pick up dead spots
 - There is another site at the Barre City police station
- A number of sites that we thought were in service are not in service and were never constructed/implemented
- There is a new site if sites that are included in the simulcast system proposal
 - Need to add the Waitsfield site
- There may be an issue with frequency licensing for call sign WNWZ946 – this list of frequencies mentioned by Dom, some are new, some may not be in service
 - 154.250
 - 153.800
 - 153.8450
 - 153.9650
 - 155.2650
 - 154.2500
 - 151.3925 is the primary simulcast base transmit channel – paired with 153.800 (need to confirm the mobile transmit pair) new output for all of the simulcast sites
- The new channel would only be used for dispatch, and emergency call back
 - Many local communities have local tactical channels
 - The licensed pair is split among
- What about interference issue analysis?
 - Not much to investigate
 - Grand Isle ([Grand Isle vt - Bing](#)) and Canada appears to be the source of the interference
 - According to Todd Operating within the license operations
 - Repeater is positioned on the Canadian border
 - The Grand Isle VHF 154.190 license is not listed in Radio Reference but does list the facility as Grand Isle FDD, Base Mobile, 100.0 PL. Grande Isles operates an 800 MHz system operating off of one site located at 44.80278, -73.04833
 - On further research, the Grand Isle VHF license expired in 2013 so if they are still operating that facility, they are doing so illegally ([ULS License - Public Safety Pool, Conventional License - WPXL488 - GRAND ISLE COUNTY MUTUAL AID ASSOCIATION INC. \(fcc.gov\)](#))
 - A list of all active and expired facilities in VT operating on 154.190 is available here: [License Search - Search Results \(fcc.gov\)](#)
 - Todd stated that the interference is not solvable?
 - Capital Fire needs to maintain squelch on the mountaintops – not able to use channel guard
 - BC is using channel guard – Mt Pleasant is better shielded from the interference
 - It has been a 5-year project to identify usable frequencies

- There could still be an issue with Walden due to co-channel licensing in New Hampshire
- The FCC has not yet approved this site for the simulcast network and is therefore still at risk

8.3 Fred Cummings

March 19, 2021

- Capital Fire has a broken radio network – may need to communication over 3-different radio towers to talk with them
- Recommended a simulcast radio network
- Harris provided a fair bid; the Moto quote was much too high (\$1.6M)
- Through affiliation with APCO was able to identify analog simulcast option
 - I’m from Hanover and know how it works
- Harris submitted a proposal that added antenna sites (Hill Street and Beacon Hill)
- If Beacon Hill goes down, there would still be coverage somewhere
- Voted simulcast system
- Working on an RFP, that includes the duel city (Barre and Montpelier)
 - Barre received a proposal from Moto to address Barre City in-building coverage
 - Montpelier needs to replace radio consoles
 - Have the Moto 5500 radio console and supports ends this year
 - Hugh benefit for Barre and Montpelier to have the same radio consoles
 - Working to advance both systems together and need an RFP
 - Joe has identified some money
 - Propagation maps illustrate radio coverage that would be 98 percent better than what we have now
- What issues are trying to be resolved
 - Coverage is the most important – communicating over 3-towers to talk with responders
 - New frequency will address interference issues
 - All the Capital fire equipment is old
 - Having experience with voted simulcast is critical to affecting coverage limitations
 - Repeated channel is important
 - Fire chief in the town I live in and I can communicate 7-towns away
 - Capital fire talks over one another all of the time, they cannot hear one another
 - Monumental improvement in coverage with the simulcast network
 - Long overdue to fix the radio network
 - Cannot hear units up North due to Canadian interference
 - Simulcast along with effective TAC channel use will work
 - Barre City continue toning coverage and we have to wait for them
 - Every time they go out for coverage they tone for coverage – an 8-second tone and if they do not hear from the scene, they tone again

- Fred worked in Hanover, NH where Dartmouth is located and became familiar with simulcast radio
- Digital is not going to work well in VT, terrain in VT not conducive to digital
 - No coverage along the river – digital squawk – not a fan of digital, it’s all or nothing, analog may be scratchy, but you can pick-up pieces of conversation out of the noise – not an ideal system unless it is setup properly
- Where does the new Simulcast network leave Barre City?
 - Barre City would be in the new simulcast network, that is my understanding
 - Everyone in the system will be dispatching over the same network
 - Barre City would eventually expand onto another radio channel in Phase 2
 - Barre City and Montpelier would have a separate dispatch channel
 - Dispatch can assign TAC channels; some are repeated and others are talk around
 - Could assign TAC channels from dispatch
 - Barre City would have an independent repeated channel – shared operations channel
 - Doug Hoyt is working on that design
 - \$750,000 cost for that upgrade
 - Need to identify another frequency
 - Dispatch would monitor that channel as well
 - Big fan of vehicular repeaters but they have limitations
 - Lot of egos and personalities at play in the region – like banging heads against the wall
 - VT is 10 years behind everyone else
 - Too many roadblocks
- Procurement process not yet being properly followed
 - Have not received a formal bid
 - Trying to make it better, and not violate the procurement rules, all involved have good intentions

8.4 Matthew Romei, Capital Police Chief

March 19, 2021

- Chief of Capital Police dept and also serves as VFD firefighter and ems
- We have big events here regularly
 - A normal event for Capital includes State, Montpelier, HAZMAT team, Fire and EMS, visiting county responders
 - An incident could double the radio traffic
- We have a repeater within the Capital dome and Capital complex
 - 6-story building houses the repeater
 - Underground tunnels connecting two facilities

- There was a report of a person with a long gun in the tunnel and could not hear radio communications
 - Had to default to the default Channel Tac 2
- We operate over the Montpelier radio network
- **Local responders do not have the Capital repeater channel**
- **Fire units are using VHF and do not have connectivity**
- Works with a licensed EMS agency
- We operate a dual band VHF and UHF channel
- Interference with Canada and Shelter Island
- We use vehicle repeaters systems (VRS) where appropriate – some fire fighters have VRS units
- Tie in UHF and VHF radios into a radio gateway to enhance interoperability
 - Applied for a grant – state homeland security grant
 - Need about \$200,000 to achieve interop objectives
- Legislatively owned entity
- UHF freq and are dispatched over UHF by Montpelier police
- Washington County has a mutual aid agreement with Capital Police
 - Many regional police operate over UHF in the region
- Matt is comfortable switching zones and channels and all key channels are programmed into zone 1
- Getting out of the home geography can create radio operational issues
- **Matt's fire radio needs repair**
- First week of January we hold key VT government events
 - Every other year a rotating event, but every year there are major events
 - Dozens of other events held annually
- Incident event plans and follow ICS and have developed a Form 205
 - General public safety IAP
 - AOT is also engaged in many of the events
- There are a few ACU-1000 units available throughout the state and they could be used
 - The ACU-1000 creates another target
 - We prefer to use our command facility
- There are only 6-LE officers working after 2am in Washington County
- Fire Radio
 - Capital fire on VHF
 - There is a cross band link, thinks it is operated out of Barre City
 - Unless we use dual band radios, we cannot talk with fire from the Capital police
 - Matt uses a Kenwood radio
 - Based on where the ambulance/fire response needs to respond on the capital campus, the radio communications
 - **Barre City fire tone is 8-seconds long and is too long, and is repeated twice**
 - Get the coverage tones off the air

- Difference dispatch centers doing dispatch over similar aspects of the same event – too much unnecessary communications
- Barre City relies on the Montpelier radios at the dispatch center
- Mount Irish is the primary dispatch facilities and is the single point of failure
- Networked console system would be better
- The biggest thing that would benefit the Fire communications is a single dispatch center
- There previously was 4-dispatch facilities dispatching over one channel, what a mess
- Call the hospital over an open VHF system that is shared
- Fred Cummings says based on a major head-on collision and he locked down the channel

8.5 Chief Frank Frievalt and Deputy Chief Bob Rooks, Mammoth Lakes Fire Protection District

March 29, 2021

Commercial Push to Talk (PTT) Options for Integration into Public Safety Communications

Overview: A meeting was conducted between members of the Mammoth Lakes Fire District (MLFD), public safety leadership of Barre City and the City of Montpelier, representatives of the CVPSA, and Televate project staff. The objective of the meeting was to gain insight into how Mammoth is integrating Push-to-Talk over Commercial (PTToC) and Mission Critical Push to Talk (MCPTT) into their public safety communications platform.

- Meeting attendee introductions
 - Mammoth Lakes Fire Protection District (“MLFD”)
 - Chief Frank Frievalt
 - Deputy Chief Bob Rooks
 - Barre City
 - Fire Chief Doug Brent
 - Deputy Chief Joe Aldsworth
 - Montpelier
 - Police Chief Brian Peete
 - CVPSA
 - Kim Cheney
 - Francis (Paco) Aumand
 - Televate
 - Rick Burke
 - Dom Arcuri

Opening statements of Chief Frank Frievalt

- The Chief thinks we will need LMR and commercial broadband including PTT now and more into the future
- LTE broadband wireless coverage is king; coverage is essential to migrating and using commercial wireless broadband, including FirstNet

- The commercial PTT clarity is exceptional; fire command staff regularly communicate to fire fighters who are using the LMR network
 - Mammoth is a conventional VHF network
- Redundant systems
- The Mission Critical Push to Talk (MCPTT) server is operated by FirstNet
- Harris deployed the first LMR and LTE radio
- Use of the MSI Kodiak PTT application
- The Harris BeOn product only works on the Harris platform
 - The voice quality is very good
- Cubic Locality Gateway – required to “connect” the commercial PTT to the LMR network
 - Cost of \$8,000 for the gateway
 - Great voice quality
 - Only works on a few devices
- The MCPTT system works with the LMR and can be configured to select the best option
- Other end users could be invited into the mission critical communications event
- ESChat is also a viable PTT application
- Chief Peete
 - What about coverage?
 - We had reasonably good FirstNet coverage and they are improving the FirstNet coverage – we are high visitor area due to our ski resort
 - We provided access to FirstNet to our existing radio sites for them to expand the coverage footprint
 - It’s important to know what percentage of your agency calls occur within the FirstNet coverage area
 - The MLFD wrote a few nasty grams when we lost coverage
- Kim Cheney Questions
 - In building coverage capabilities?
 - It depends on the location of the call and the cellular and LMR antenna placement
 - We discovered where we have poor LMR coverage, and where the LTE was better, such as in local hospitals, large supermarkets
 - One of our mountain lodges was not working for LMR but did for LTE
 - HPUE (High Power User Equipment) will be available for FirstNet subscribers (one-watt smartphone, vs. the typical .25 watt unit)
- Chief from Barre City
 - Does PTT represent another tool in our toolbox?
 - Answers: A bit of both, MLFD has to build out a new radio network which will require a bond. The LTE network is already here, and we are using it and it may become our primary future communications option. The business case for LTE is attractive
 - Using MCPTT for a very small percentage of our service calls
 - We would likely use it for 95% of our mission critical communications
 - The VT Chief says that we only have 40% of our service area covered by FirstNet – we only have a limited budget – what is the cost of FirstNet service

- \$15.00 per device / per month for FirstNet MCPTT on top of your regular monthly service
 - ESChat would cost \$7.50 per month / per device
 - The County is paying for the MLFD LMR network service, however, that will change in the future and the agencies will have responsibility for LMR network costs
 - MLFD people are balking at the price, and we are working with AT&T to streamline the cost, so it is more affordable, but we need to investigate our options
 - The cost of integrating LTE into the LMR communications landscape is coming down. You could add in the gateway now and allow end users to migrate over time
 - PD could integrate a variety of broadband applications now
- How many of your LTE sites are hardened?
 - We took pictures and pushed for additional generator backup power – the state of CA also passed legislation helping push for backup power
 - Expect to see additional backup power in the future based on FN and AT&T negotiations
- Would you use FirstNet MCPTT as your frontline comms?
 - No, not yet, we’re only using it for the command staff, they can communicate with fire fighters over the LMR network via they smartphones with the PTT application
 - Technology is changing so fast, so we are expecting additional future expansion
- We are planning to implement a simulcast system as a comms improvement
 - We have a manual convention radio system today, so we have to select the best radio site, which does create operational challenges
 - Unless you are in a voted trunked system, you cannot move from LMR to LTE
 - In a digital system, Harris can switch from LMR-to-LTE and vice versa in 10 seconds
 - FN is also integrating the Z-Axis (height) to determine location within the building
- Mass, glass and distance rule in Vermont
 - The feds had funds, so we implemented Digital 395, a rural fiber including a mesh network that allowed us to tap into Wi-Fi for LMR communications
 - Cubic Locality Gateway
- Deputy Chief Joe Aldsworth questions
 - Do you have simulcast network
 - No
 - The county has a large fiber pipe and some radio sites could have access to the fiber
 - We do not use microwave, sites are connected via land line
 - Did you have to make enhancements at the dispatch center?
 - We upgraded the radio console due to end of life requirements
 - Did you have issues coordinated with Canada

- No, not an issue
 - We do have to coordinate with CalFire where we also have to coordinate the simplex channels
 - There are options to use tactical channels
 - What is the cost for an LMR/LTE radio?
 - Everything including the extra battery and charger is about \$3,000 – we see the investment as a toolbox item
 - The FirstNet subscriber service cost could be \$60-70 per month
 - We want the option to use LTE into the comms enterprise
 - Are you talking about using LTE for mission critical use?
 - We think it could be a viable option, a dispatch option is available from ESChat – it is a priority to maintain LMR to be interoperable with CalFire and other mutual aid responder to forest fires
 - We have successfully used LTE as a fire ground comms solution – there are possible challenging with the end user knowing how best to use the LTE device – we use cellular now to communicate
 - In VT, 99% of fire fighters are volunteers and use a pager
 - As cellular coverage has improved, the bulk of our fire fighters are using apps like Active 911 and eDispatch
 - Our responders were on LMR and we were using LTE and they did not know the difference
 - Article written about fire responders using the cell phones and being asked while on the LMR radio to move the discussion to a cell phone
- What about the operational communications process?
 - We are not yet there but the interoperability to communications over LMR, WiFi, LTE
 - I’m comfortable to communicate with the line staff from the command level
 - Not comfortable using LTE only at this time
 - As we have tested MCPTT with Samsung FieldPro devices
 - Our area is the 3rd largest ski are in the US and they operate an end of life Moto radio system and we cannot communicate with them
 - The ability to conduct interop over the LTE provides many benefits – the ski mountain could use LTE completely due to the coverage now available
 - Use LTE for backhaul as well
- What about back-up power on the FirstNet broadband system?
 - The state is supporting backup power through legislation
 - We also wrote nasty grams
 - Verizon chose not to participate in FirstNet
 - We informed the FirstNet Authority that the AT&T FirstNet broadband does not have the coverage where we need it, so we said that we would use Verizon and AT&T supported that decision
 - We want to have choices and we need to have the option to have access to data – how to make them mesh-able
- Chief Brent

- We will not likely have cellular broadband coverage for 10 years so we will push to invest in LMR along with providing us capabilities to have equipment that can use LTE
 - Make some investments to leverage LTE for the future
 - Might have the option to put in future mountain radio sites where LMR and LTE can co-habitat
 - If you have access to old long-distance microwave sites, could be usable for LMR and LTE
 - It befuddles me that we still cannot communicate with one another over our radio networks – there are LMR vendors that do not want you to communicate over cellular, and vice versa, no replacement to ground truth which comms systems works best for our requirements – take time to study the options – it has to work at 2am for a new firefighter or it does not work
- Chief says that we only have two radio shops in the entire state, both sell Moto and one of them sells Harris as well
 - If your chiefs are similar to ours, the chiefs have to focus on vehicle gas, power to light the fire station – where do you want to be in 3-years
 - We need to upgrade the radio network, it old, it's simplex
 - The PD have upgraded systems, fire does not, Dispatch can hear PD but cannot hear fire
 - Have you used AFG (Assistance to Firefighter grants)?
 - Yes
 - We have been told to not even try to get access to funding to enhance our radio network
 - Frank says he has written grants and also evaluated them, the people evaluating them may not know – you should be in an ideal position to obtain support – what is your political position
 - No help from the state
 - See if you can get help from the Emergency Management side of the state
 - We have less leverage with Emergency Management
 - Time to pump up the volume on the state government
 - Yes, but it is likely to not move the boulder
 - Once you become a user of the FirstNet system, FirstNet provides help and mentions Deployables – we requested and used a SatCOLT to support an incident
 - ESChat is also a viable option; we liked the BeOn solution and Harris were very supportive
 - What about the utility companies?
 - We have approached utilities to partner with them on a radio network
 - PD on UHF and others on VHF
 - Do you have the ability to migrate to the UHF system?
 - Yes, it's a high jump due to the cost of migrating to a new band

8.6 Ken Jones, CVFiber

March 30, 2021

Meeting Attendees

Ken Jones, CVFiber, a Municipal Authority: Ken is an Economic Research Analyst, a member of the CVFiber board of directors

Paco Aumand, CVPSA Project Manager

Rick Burke, Dom Arcuri, Televate

- Opportunities for collaboration between CVFiber, CVPSA and Central Fire
 - Community development
 - Broadband and cellular expansion
 - Central Vermont broadband expansion program
 - Extend fiber to the home, wherever Comcast and other commercial carriers do not cover, is where CVFiber will cover
 - Washington Electric Coop has also received, or is pursuing federal funding, to use their poles to install fiber to pull fiber to the home
 - Heading to USDA for funding to pull fiber over all of their poles to homes
 - In discussions to work with CVFiber to collaborate on the build
 - In partnership with Washington Electric Coop, the cost would be split between the two entities
 - Goal is to deploy more fiber in the community
 - How can CVPSA benefit from this buildout?
 - CVPSA needs to talk with us and to inform us where they need fiber
 - CVFiber would consider and perhaps prioritize fiber buildouts
 - VELCO, the other electric company, will house the fiber headend, they have a significant fiber network in the state now
 - FirstLight ([Vermont-Sovernet - Firstlight.Net](#)) was named along with ECFiber ([ECFiber – Vermont's Wicked-Fast Internet](#)) (that are a municipality created through state statute)
 - We have a weak county government structure, so the state legislature created municipalities, who can tax citizens. Communications Union District cannot tax.
 - The CVPSA is a municipality created by state statute
 - VTEL is the largest fixed wireless
 - Michael Birenbaum has towers, and perhaps could make them availability based on CVFiber support
 - Michele Vitae is the person to speak with at VTEL, he manages the towers
 - Should CVPSA reach out to Michele?
- Dom requests info on the fiber routes
 - We need to make a formal request for the routes
 - Televate requests for the information on behalf of CVPSA
 - An NDA will be required
 - Make the requests directly to Ken Jones – Ken actually made the request later in the day

- Washington Fiber Coop might own the fiber and would provide access to CVFiber
- Question regarding fiber pricing
 - Consolidated Communications is a VT phone company
 - RDOF (Rural Digital Opportunity Program)(<https://www.fcc.gov/implementing-rural-digital-opportunity-fund-rdof-auction>): Reverse auction from the FCC to
 - \$40M to central VT
 - Many other areas received FCC funding
 - Anyone who won the bids, may be required to provide phone service as a recipient of the RDOF grant
 - Goal is to provide service at cost, pricing will be challenging; price modeling is not a strength of CVFiber
 - Might we be required to be service provider of last resort due to FCC funding
 - Might be over our head
 - Can we partner with commercial carriers?
 - Not sure, VT is supportive of helping carriers to improve their services
 - The state could mandate that CVFiber support the commercial carriers
 - The state is conducting road surveys of the commercial carrier providers
 - Televate: do you have access to the maps
- Paco: Identifies a collaborative effort needed between CVFiber and Capital Fire
 - How:
 - Televate: What about fiber access to the fire station?
 - Televate: Can the fiber support WiFi comms in other public safety buildings and others
 - CVFiber: Small cells on light poles do not need fed approval
 - CVFiber: Another pot of fed money is to support telehealth, which benefits public safety
 - CVFiber: Mike Shearling is the commissioner for VTSP, Terry's boss
 - Not sure that Mike has a staff to support state initiatives

8.7 Paul Cerutti, Capital Fire Mutual Aid Systems, Chairman of the Dispatch Committee

March 30, 2021

- Dom provides an overview of the CVPSA-Televate project, need your input to support the ongoing project
- Paul is the Fire Chief of Woodbury and the Chairman of the Dispatch Committee of the Capital Fire Mutual Aid Systems (CFMAS)
 - CFMAS is dispatched by Montpelier
 - Simplex network dispatched over 154.190
 - Seven towers currently being used over the past 20 years
 - The system works okay, one of the short comings is that the dispatcher needs to select the tower associated with the fire dept being dispatched

- Talked about Woodbury and Waterbury concurrently being dispatched and the challenge of being simultaneously dispatched and communicating over the same frequency and towers when the incident responders cannot hear that one another are communicating over a tower to dispatch, or within their responding team over the repeated channel, that is blocked by the mountains to the other responding VFD
- Dom displays service maps based on the town borders and is advised that the towns of Warren, Calais, Duxbury need to be added to the map; these towns do not have fire fighter depts and have agreements with neighboring towns to provide service. Warren will soon be active. These town are dispatched by Montpelier and supported by Central Fire members.
- Some towns need to be dispatched over multiple towers due to geography
 - Dispatchers may not hear us due to the limited talk-back range
 - Fire fighters may not hear the dispatch
- Dom comments
 - Todd of Burlington Comms says that only 3-sites are active
 - There are 6-towers on the license, and 6-towers are live – Joe A
 - Dom recorded the in-service sites
- Dispatch will dispatch over multiple towers when required to notify VFDs that are served by multiple towers to ensure that the notification is received
- We page over the 154.190 frequency as well, and then also use direct mode/talk around TAC channels
 - 20 pagers per town is a good average
 - Most if not all have portable radios
 - Most fire apparatus have mobiles; Woodbury has 8-mobile radios
 - Barre City license: 30 mobiles, 1 base station, 30 pagers
- We provide mutual aid into Wolcott, Elmore
 - We can communicate over the State of Vermont V-Comm channels when on mutual aid to support on scene interoperability if and when needed
 - **V-Comm channels are programmed into all radio**
 - **They are supposed to be programmed into all Central Fire member radios but not sure if they are?**
 - Capital Fire has **7 TAC channels** that can be used – it’s a 5w channel, but **not sure that all channels are programmed into all radios**
 - Needs to be highlighted that all channels need to common in all radios
 - A preferred radio template has been accepted 15 years ago by Capital Fire Chiefs, but it has not been instituted
 - **Televate comment: Capital Fire needs to reach agreement on a common radio template/fleetmap**
 - Joe mentions that there are so many radio and pager brands, some are not upgradable, **not sure if they could all be programmed with the same template**
 - **Not every town can afford to have their equipment programmed**
 - Paul mentions that we need to figure out the what, and the next discussion is how to achieve it

- **All agencies are responsible for programming their radios, may have local talent, or may not, and may not have the funds to pay for the programming**
 - Radio North, Pike Comm, Burlington Comm are the local radio shops
- There are some isolated areas where we serve in our geography that are not well covered by the existing radio network, and will be challenging to serve in the future network
 - Coverage gaps areas noted
 - Stakeholders identified specific coverage gap areas in the User Needs Assessment Questionnaire
 - Paul uses a 100w Motorola mobile radio that expands the talkback coverage; he uses this radio to relay portable radio comms back to dispatch when need
 - We have areas where we cannot communicate over the repeated channel on portable, need to adjust the on scene comms to use the mobile
 - **Roxbury on the border of Warren – cannot hear anything there**
 - **Televate comment: we may need additional voted receive sites**
 - Tower in Wolcott owned by the police dept
 - There may be an opportunity to place an antenna there
 - **New Waitsfield tower being installed – Joe sent the tower details to Dom so Televate will plot the site**
 - New tower was squashed by the local community
 - New Woodbury tower was supported by Woodbury fire
 - Need to have access to FirstNet towers
 - There is a tower in Groton that the local fire uses
 - Hardwick tower that is privately owned and would not likely be available at no cost
 - Central Dispatch was created by – Karl Rinker
 - Would be an awesome tower
 - Perhaps Carl would provide access to his tower
 - Joe contacted Carl during the meeting and Karl is willing to talk with us, there is room at the top of the tower today (Karl’s email address is lazykarl@aol.com)
 - Bridge Hill Road in Hardwick – near Hazen Union HS
 - Bridge Hill and Tower Road in Hardwick
 - In a field to the East of the Road
 - Beacon Hill, Hardwick, Warren Tower, Chelsea
- No real issue with in-building comms for Paul, most of his building are wooden houses structures
 - We have a vehicular repeater - in-band repeater
 - Radio North installed that VRS, it’s a Pyramid VRS
 - We recommend that towns use a VRS
- Once we are dispatched, we communicate on scene over the direct mode/talk around TAC channel on scene

- Fire fighters tend to use the dispatch channel to communicate in route and on scene
- **No comms policies and procedures with dispatch**
- Fire chiefs (P99 newbies like to hear themselves over the air waves)
- **Need to develop policies to manage radio traffic**
- We might be talking over one another since we cannot hear one another
- **Capital could hear us but we can't hear them, we need policies**
- What about cellular comms – do you use
 - Very little, I have a personal home repeater unit
 - Can use WiFi, using Xfinity
 - Issue with accessing WiFi due to password issues at various facilities
 - **Televate recommend that regional governments share passwords with public safety**
 - Cell coverage is extremely poor for all carriers; if you are not in urban areas, the cell service is awful; 60% of our geography does not have coverage
 - Cell coverage is spotted between towns, not reliable, would objective to use of cell coverage
 - Paul works for the state of VT and has a FirstNet and an AT&T phone
 - Verizon service was okay, maybe a little better, but AT&T is better in some areas
- Hospitals communications questions
 - Central Vermont Hospital is served by a radio tower that serves the local EMS support
 - Located at 130 Fisher Road, Barre, VT 05641
 - Copley Hospital
 - Located at 528 Washington Hwy, Morrisville, VT 05661
 - We need comms in the hospitals
 - Will call with patient info, we may need to call in via cell, we drive through dead areas, and
 - Typical routes to the hospitals:
 - Route 14 to RT 2 (South and East) to Central VT Hospital
 - To Copley, we drive 15 West
 - Joe states that they transmit EKG in the city over MyFi, but once we get outside the city, no comms – Paul says that he does not even try to use MyFi due to poor service
- Regarding building new towers to support cellular and public safety
 - Carriers cannot get access to the towers
 - **The state should get more involved to advance tower buildouts – coverage is required, but if towers cannot be constructed, the coverage issues for cellular and public safety will not improve**
 - VT development law- see Act 250 that allows anyone who can see the tower to have a say in its construction
- VELCO – Vermont Electric Power Company has a radio network – Paul not familiar with it and not sure if they would be interested in a partnership
 - A mention of a broadband initiative with VELCO, but no details

- Televate: Should VELCO be contacted?
- What is the single most important outcome of this project?
 - Paul: We need to get the current infrastructure working, we put a lot of effort into the work to advance the simulcast network and need regional support
 - Do you need broadband data: we would think about it, but we do not have access to a reliable broadband network so data is not now our priority; app would be great, but we need to improve the radio network
 - Paul Idiom: ***Work with the things that you have, and not with what you do not have***
 - Vermont State Police (VSP) – received funds to upgrade the state police comms but local funds are not available, why not?
 - Paul could not get access to fed funds to upgrade – argued that the funds are for public safety but not, hire telecom lawyer for \$10,000 to get the license, how can we afford that level of support
 - Examined NEPA requirements when receiving fed money
- Question from Joe about tower site visits
 - Televate states that tower visits we not included in our scope of work but that we would visit some
 - Advised to hold off on the visit until the end of April/early May
 - Recommend we stay at the Firehouse Inn
 - We need to know what towers to visit – suggest the tower that need the most support (tower structure, shelters, generator, HVAC
 - Joe and Paul state that ***we do not have an inventory of the current sites*** – Joe and Paul to visit, Televate to help
 - ***It is not clear what additional equipment may need to be installed or replaced or if the shelters can accommodate additional questions***
 - Paul indicated that the ***Woodbury site only has batteries and not a generator. There may be a generator on site, that is not owned to Capital Fire. The site batteries may need to be replaced.***
 - ***There are also a number of sites that do not have air conditioning, not sure if needed?***
- Questions regarding radio network facility maintenance
 - Who pays for maintenance or who will pay? Paul and Joe discuss splitting the cost between the dispatch facilities
 - We have towns in Capital Fire that have figured out how much it will cost to upgrade and maintain the future simulcast system based on the number of 911 calls now being replaced. This may not be a fair method to determine the cost share so says Paul and Joe
 - Not one radio system has cooling, systems runs off batteries
 - Woodbury tower has battery backup, no generator
 - ***Televate: Recommend that the operating cost of the radio network be quantified and funded to ensure the continuity of operations of the radio network***

8.8 Chief Brent and Deputy Chief Joe Aldsworth

April 1, 2021

Motorola Proposal Review

- We are familiar with the Capital Fire analog simulcast network
- Dual cities (Barre City and Montpelier) solicited a planning proposal to improve in-building coverage within their respective cities, separate from the Central Fire radio project
- The Barre City fire chiefs understand the full scope of the radio project(s)
- The fire chiefs are the most important stakeholders in the effort
- Our people cannot communicate over their radio network, their lives are at risk
- The city councils support the effort but have issues with a common dispatch center
- Barre City and Montpelier share common public safety responses and communications needs - thousands of calls per year
- Chief Brent has experience in two prior radio network implementations
 - The chief returned to Barre City and nothing had changed/improved on the radio communications level
 - We need to do something, CVPSA was taking too long to advance our needs
- They have and continue to meet with the leadership of the two cities to advance the dual cities radio program
- The fire fighters have the greatest needs and issues now
- If there is an incident in the governor's office, we do not have adequate communications to support the incident over the repeated radio network
- Vermont is the granite capital of the world and the granite used in building construction directly impedes radio communications
- We currently operate multiple receive sites and one transmit sites – all voted – and the chief was pushing this capability for the central region
- We need inbuilding comms
- We may need a new frequency, we need a new radio network, we need to communicate with the responders over the repeated channel – the other fire department do not need to hear our radio traffic
- Chief Brent brought these needs to the city and discussed the needs with Scott Brookshank (sp.?) of Motorola, is the regional sales manager in the region
 - The proposal that Motorola provided is proprietary
 - This is not rocket science, but we needed to know the cost and the only way to know was to obtain the proposal
 - I know Motorola and they are good at what they do, they guarantee their work
 - They provided a propagation map, including in-building coverage
 - We cannot afford a firm like Televate to assist us with the procurement
- There would be 4-simulcast sites, 2-sites in Barre City and 2-sites in Montpelier
 - Hospital sites
 - All sites would be voted
 - Upgrade of one site in Montpelier, Connor Road up on the hill, near the water tower
 - Large telephone pole on a hill that now holds microwave

- Another National Life Building site in Montpelier
 - Central Hospital – Berlin
 - Barre City Municipal Auditorium
 - COVID halted the project
 - 4- components to the dual cities project
 - The network
 - Radio
 - PM and engineering
 - Construction (Radio North) / tower upgrade (new self-supporting
 - \$722,000 cost estimate
 - Frequencies
 - Separate dispatch channel
 - Separate repeated tactical channel
 - We have a pair of frequencies
 - Barre City and Montpelier have a separate tac channel(s)
 - New channel frequencies pairs identified:
 - 154.010 Barre City
 - 155.010 Montpelier
 - Perhaps the state of VT has extra frequencies, but Terry LaValley said they do not available frequencies
 - Currently use these frequencies for talk around
 - **We have not confirmed that these channels could be licensed**
 - We only need these channels to cover our cities – do not need high sites
 - We currently monitor these channels and do not hear radio traffic on the channels
 - Robust radio network – allow us to shop for new town customers
- While investigating the dual city proposal, Capital Fire put their simulcast project on the table, and then they included the radio console project
 - All key fire fighters support the three initiatives (Capital Fire radio network, the Dual Cities project, upgrading all dispatch radio consoles)
 - City manager says why not combine the two radio projects into a single procurement
 - Why not roll the police needs into the project
 - We would be willing to extend our capital resources into the common project
 - Why not include the state and surrounding jurisdictions into the project
 - We do not want to spoil the opportunity
- If the two cities had separate frequencies
 - Capital radio channels would continue to be supported by dispatch
 - We currently have the radio channels programed in our radios
 - The comms info is not important to all fire departments
 - All towns do not need to hear what’s happening in Barre City and Montpelier, and we do not need to hear their info, but we need to hear one another in Barre City and Montpelier
 - City of Barre and Montpelier responders would still have CFMAS frequency in their radios for coordination

- We are merging the three projects into one RFP
 - Consoles for Barre City and Montpelier – common sense to have common radio consoles
 - Chief Brent and Joe Aldsworth are developing the RFP
 - The Capital Fire radio network
- Cutting bodies in the dispatch center is not going to happen, the volume of calls remains the same – (Rick: and will continue to grow)
- Ultimately trying to save money
 - Adding on new customers to offset the investment
- The effort to identify available new towers is beneficial and could address coverage gaps
- How confidential is the 3-task proposal
 - City managers know of and support the project
 - Federal partners know about the project, we are on a first name basis, and they are interested in working with us on a regional basis
 - Kim Cheney is advancing a strategy and will determine the CVPSA strategy
 - It is a risk to have two voices
 - CVPSA needs to determine their role
 - Chief Brent says we need to know who will carry the football; this is an issue for the citizens, and the dispatch customers
 - CVPSA could be a governance structure that could support the regional efforts
 - CVPSA can support tax and other fees but it has to include additional public safety leadership
 - Chief indicates that Kim Cheney listens to the public safety leadership
 - Good to have Televate, but it is important that Televate validates the work that has been undertaken
 - Supporting our program will validate for the feds as well
- Check Shelburne for the co-channel
- 4 of the 7 sites have been approved for the capital fire
- The VT state police have been eliminating dispatch customers who may be available to solicit as customers to Central Vermont
 - UHF is primary frequency for police

8.9 Brian Peete, Montpelier PD Chief

April 14, 2021

- Dispatched by: City of Montpelier – updating radio consoles – funding tied in with body worn cameras
- Type of system: How many channels? P25 system – primarily one channel, they do have channel 2 but do not use that much – refers to Fred about technical details
- How many radios? About 15 portables, mobiles in 6 cruisers
- What works well: decent communications in most parts of the system
- Coverage areas: primary service area is City – problems in certain areas with portables – older buildings with Granite constructions – in capital area and in parking garages – not sure if they currently use capital repeater – also have problems in surrounding areas Marshfield – most

mutual aid to Berlin, Barre Town, City of Barre on a weekly basis – coverage in these areas is pretty good – need coverage in Northfield and Middlesex – coverage holes with radio correspond with cellular holes

- In-building coverage: that is a problem in many buildings – also has problems in hospital ER
- Radio on hip: yes
- How do you deal with coverage issues: go to mobile, or cell phone, or wait until we have coverage over the radio network
- Use talk-around? Not really
- Use vehicular repeater? Yes, and will be adding more vehicular repeaters in the future
- Talk to capital police? How? They monitor capital police with their freqs, they can communicate with Vermont State Police on channel 2
- Talk to fire? How? He believes they do have capability to listen to fire – with multi-band radio? – can't, but would love to
 - Need to understand dispatch radio patching for PD and FD
- Other agencies? Communications with Barre and others is touch and go.
- Do you use CAD? – Valcour (Crosswinds Technologies) (along with the state) records management systems – working to build in CAD functionality
 - Valcour is not a CAD, it is similar to a records management system (RMS)
- Do you use cell communications or data? PTT? Very interested – would like to pilot – looking at body worn cameras – looking at visual labs with FirstNet – can we include it in report
- Strategic plan – crisis intervention team - would need to be able to communicate with fire/ems – extend mutual aid to Middlesex and Northfield – mobile command vehicle with a interoperability bridge and mobile dispatch
- Do have tablets with Verizon, but not in-car MDTs – would love MDTs and LPRs – would help keep the airways clear – and mobile fingerprints – license and registration checks are through dispatch right now
- Report should also note how they are protecting the state capital and need state of the art technology
- Need continuity of operations and regionalized tactical force – have to be able to talk to each other
- Most important issue? Any area that would stop the needed infrastructure for coming into place
 - Supports the regionalization of resources
 - Dispatch chief complaint – lack of trust in what will happened next – of CVPSA?
 - Capital West is his partner and he stands with them
 - Listen to PS, plan for the future, but put actionable plans in place for today.

8.10 Russell Schauer

April 29, 2021

- Meeting Participants
 - Russell Schauer – City of Barre Dispatcher
 - Dominick Arcuri – Televate
- Russell is currently a dispatcher with the City of Barre (via Barre PD) and he dispatches police, fire, and EMS. His experience includes: 20 years with a volunteer fire department, 5 years with EMS, 20-21 dispatching

- Type of system: Police system works well, but limited in coverage area, can't go very far outside of City, but don't too often – if they need to, they go to other UHF channels – work with Montpelier sometimes – they have Barre's channel – use single repeated channel – don't generally work with capitol police – dispatch for Wash County sheriff after hours on their single channel – some interop with the state (using their channel)
- Fire/EMS: piecemeal system, they make it work, but room for improvement, Montpelier and Barre on same frequency, simplex, problems with congestion, talking at the same time, interference from other users as well, Barre uses primarily Mount Pleasant, can transmit on auditorium as well, and the two are voted.
- How many radios? Barre PD maintains 8 mobiles and 20-25 portables - reliable
- What areas of improvement: Police have no real issues
- Coverage is an issue for fire: for towns they dispatch for they do have some dead spots, not too bad but can be a nuisance, so they have to do a relay, also have in-building challenges and have to relay.
- In-building coverage: schools or City Hall sometimes are a problem for PD and fire
- Radio on hip: yes
- How do you deal with coverage issues: use a relay
- Use talk-around? No
- Talk to capital police or Montpelier? They use same frequency as Montpelier for fire, so they try not to step on each other and try to keep transmission short, has not used the bridge between dispatches much because they can hear traffic over the RF channel – there are some pluses to having the same channel
- Fire departments generally respond to others calls – When PD and fire need to speak with each other and they are not on scene together, dispatch generally relays the message
- Other agencies? Where they do need to speak with other agencies, they normally switch to their channel
- Do you use CAD? – use Valcour for logging – share data via that platform throughout the State with others on Valcour – only on the PD – fire does not have access
- Do you use cell communications or data? PTT? Officers do use them for phone calls when they have things they don't want to send over the air – do not use PTT – coverage only in the Cities
- What should project address? Use separate frequencies for Montpelier and Barre or use a single dispatch – biggest hurdle is the Town of Berlin who doesn't want to participate – Town of Barre is different dispatch also.

8.11 Central Vermont Medical Center Meeting (On-site)

May 17, 2021

- Meeting Participants
 - Kim Cheney – CVPSA Board Chair
 - Paco Aumand – CVPSA Project Manager
 - Joe Aldsworth – City of Barre Deputy Fire Chief
 - Jessica Cullen, Terri Lynn, Mike Wolf – CVMC
 - Scott Baggs (via phone) – Capitol West dispatcher, former Capitol Fire Communications Committee Chair

- Dominick Arcuri – Televate
- What communications does the medical center have today with fire/ems?-
 - Ambulances call in and it is difficult to hear them, mostly from the Mad River area and Waterbury
 - The hospital uses two handsets at the emergency desk that are connected to a 100W control station radio in the penthouse on a 25 ft. antenna
 - If communications were better, they would have more time for preparation for incoming patients: having beds ready, staff, medications, security if needed
 - Sometimes patients had to wait in the ER lobby until a room or a bed could be made available because they did not have enough time to prepare due to lack of communications - They may be treated on the cart or delayed getting a bed
 - Generally, the charge nurse will operate the radio – if they can't get all of the necessary information initially, they may not have the time to get back to the radio
 - The nurse does not know when the responders are hearing them as well
 - Communications is happening (ambulances are trying to talk in with a 100W radio in the ambulance) on 155.34 (VMED28 (Hear), KNEY982, CENTRAL VERMONT HOSPITAL AIRPORT RD, BERLIN, VT WASHINGTON County, 44-13-14.2 N, 072-33-37.4 W) – can talk out about 20-25 miles, need about 45-50
- What additional capability would be helpful?
 - EMSCharts? Do not use
 - Patient Records? - Four departments can transmit EKG
 - Transmitted from a device that is connected to a MyFi or tablet and it goes to a computer screen and a fax machine
 - Video conferencing has not been used but could be useful for determining where to transfer the patient or to have treatment prepared in advance
 - Medication orders could be done and filled earlier if communications was better
 - If Doc needs to talk to an ambulance, they call dispatch and then dispatch tells the ambulance to call in
- Motorola has identified the Hospital as a great site for the new system – Mike Wolf says they can locate an antenna – suggests the CVPSA draft an agreement for CVMC to sign – we went up to inspect
- Voice, EKGs, Video all would be helpful
- Cell phones are used for longer reports – probably personal cell phones

8.12 Barre Dispatch Tour

May 19, 2021

- Barre PD – Larry Eastman and Sabrina ? (on-site)
 - One dispatcher had a family emergency and only one (Sabrina) was working and was quite busy
 - They use Zetron consoles, which have reached end of life
 - They dispatch for police and Barre Fire
 - They record communications for all departments they dispatch for, although Sabrina indicated they may not all be recorded

- In their service area, they normally can hear the fire responders, except for some difficult areas in Williamstown
- Police communications is generally very good, they rarely have problems, except for some buildings
 - Police use UHF, analog repeated, although Televate is having difficulty confirming the license information – site was verbally identified as Mill Hill (?), but has not yet not verified
 - Their coverage area is mostly limited to the City, which is much narrower than fire
 - Police generally don't go beyond the City
- When they need to talk to Montpelier, they normally use the phone
- They have back-up cell phones in dispatch
- They have a moderate amount of equipment space, but it is still fairly crowded

8.13 Montpelier Dispatch Tour

May 19, 2021

- Montpelier PD – Carrie McCool (on-site)
 - They use MCC5500 consoles, which have reached end of life
 - They dispatch for police and Capitol Fire
 - Dispatching for Capitol Fire is difficult when multiple tones are required for some departments or multiple departments – they have to select the tower they want to dispatch from and then select the fire department
 - They don't always hear the users in the field due to poor coverage
 - They do like to use Active911 for the responders to indicate they are responding and to see their location – they also use Active911 for databases such as fire hydrants, building plans, etc.
 - They record communications for all departments they dispatch for
 - When they need to talk to Barre, they use radio since they are on the same fire channel
 - The fiber (“tunnel”) connection to the City of Barre allows them to serve as backup dispatch for them as they can dispatch off of Mount Pleasant
 - They only use cell phones when absolutely necessary
 - They have very little equipment space and would not be a good candidate for housing the prime site