RADIO NETWORK ENHANCEMENTS (RNE) PROJECT

Findings and Recommendations
for Okanogan County, Washington

PRESENTED BY

Susan Ronning, P.E., PMP, Principal Engineer

s.ronning@adcomm911.com | 971-718-7574

February 16, 2022

ADCOMM Engineering LLC

Bridging The Gap Between Operations & Technology®

Who is ADCOMM?

Since 1979, ADCOMM has provided communications consulting engineering and professional project management services to public safety police and fire agencies, 9-1-1 centers, local municipalities, utilities, and other critical infrastructure sectors.

We Bridge The Gap Between Operations & Technology

Ms. Susan E. Ronning, P.E., PMP took over as the new owner and principal of ADCOMM Engineering in January 2020 from Mr. Joe P. Blaschka, Jr., P.E. Ms. Ronning is a United States Navy veteran and registered professional engineer. Ms. Ronning started her career as a systems engineer for Motorola, Inc. then left to lead her client's system implementation at the City of Glendale, CA. She consulted under two different firms then led as Principal Engineer for Tait Communications where she worked closely with Harris Corporation.

ADCOMM Engineering LLC is a single member LLC, registered in the State of Oregon, and certified in both Oregon and Washington as a woman- and minority-owned business. ADCOMM is headquartered in Oregon and has staff located in Washington, Oregon, Pennsylvania, and Virginia

AGENDA

1. Project Purpose and Status
2. Stakeholder Findings
3. Technology Assessment
4. Potential Solutions for Review
5. Next Steps

©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

Project Purpose

AGENDA

- Agenda
- 1. Project Purpose & Status
- 2. Stakeholder Findings

RFP: Project Goals

- OKANOGAN seeks to improve or enhance system efficiencies, increase the number of talk channels, maintain low current and future operating costs, and enhance system capabilities and service where appropriate.
- A part of this project includes planning for the migration of the county wide Public Safety 911 Radio System equipment to a fully integrated P25 voice and data system that is fully redundant with no single point of failure. The… final project solution… includes… infrastructure, console, and subscriber radio migration as needed.

RFP: Key Issues

A. The existing system contains electronic components that are ten (10) years old or older. The likelihood and frequency of component failures is increasing as the system ages.

B. The manufacturer of the older repeaters in production no longer sells or supports some of the critical components utilized in OKANOGAN's radio system.

C. Some geographic areas need improved radio coverage, especially areas that are either remote, difficult to reach, or located in difficult and challenging terrain.

D. Extreme winter conditions limit accessibility to some sites and restrict the duration of time that work can be performed at the site.

Need: Improve System Efficiencies

Need: Improved Channel Capacity

Need: Defined Build and Operating Costs

Need: Reliable-Resilient

Need: Improved Equipment Maintainability

Need: Improved Coverage

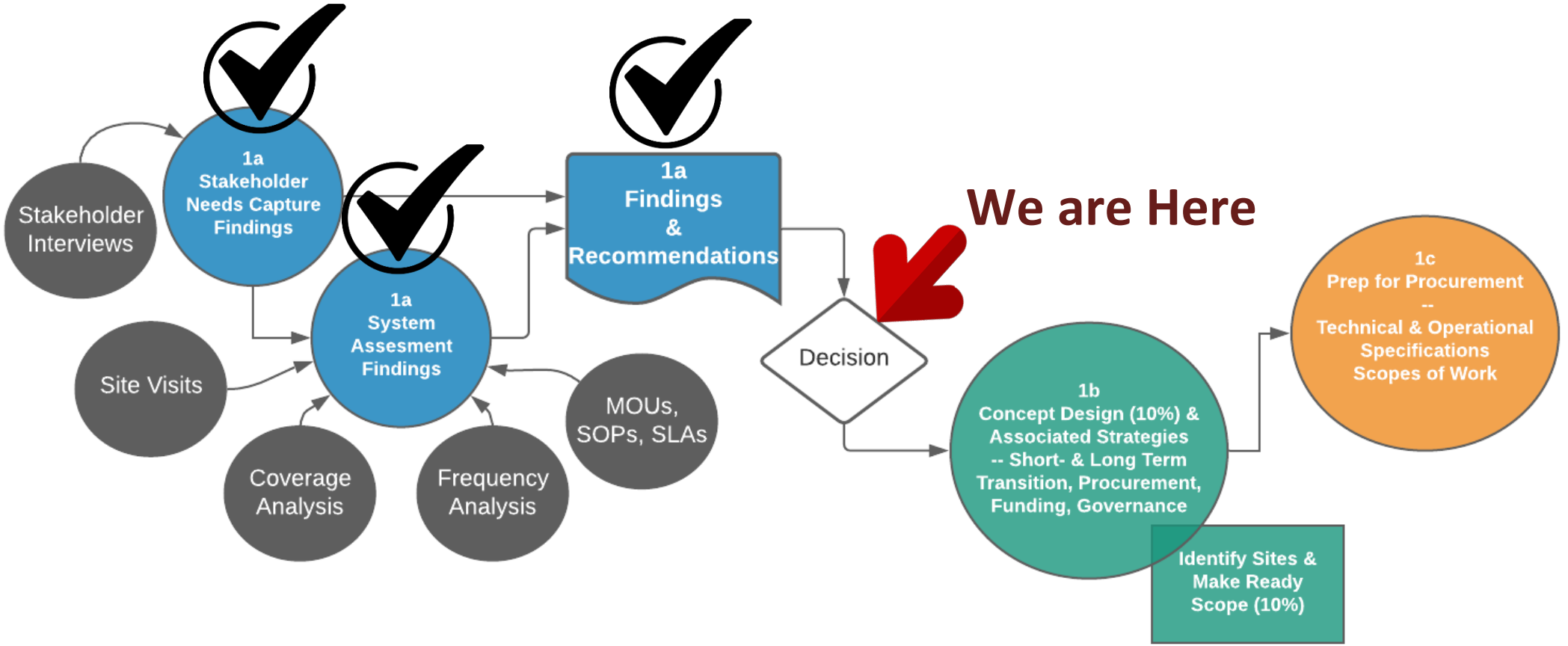
Need: Scalable - Future Proof

©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

Project Status

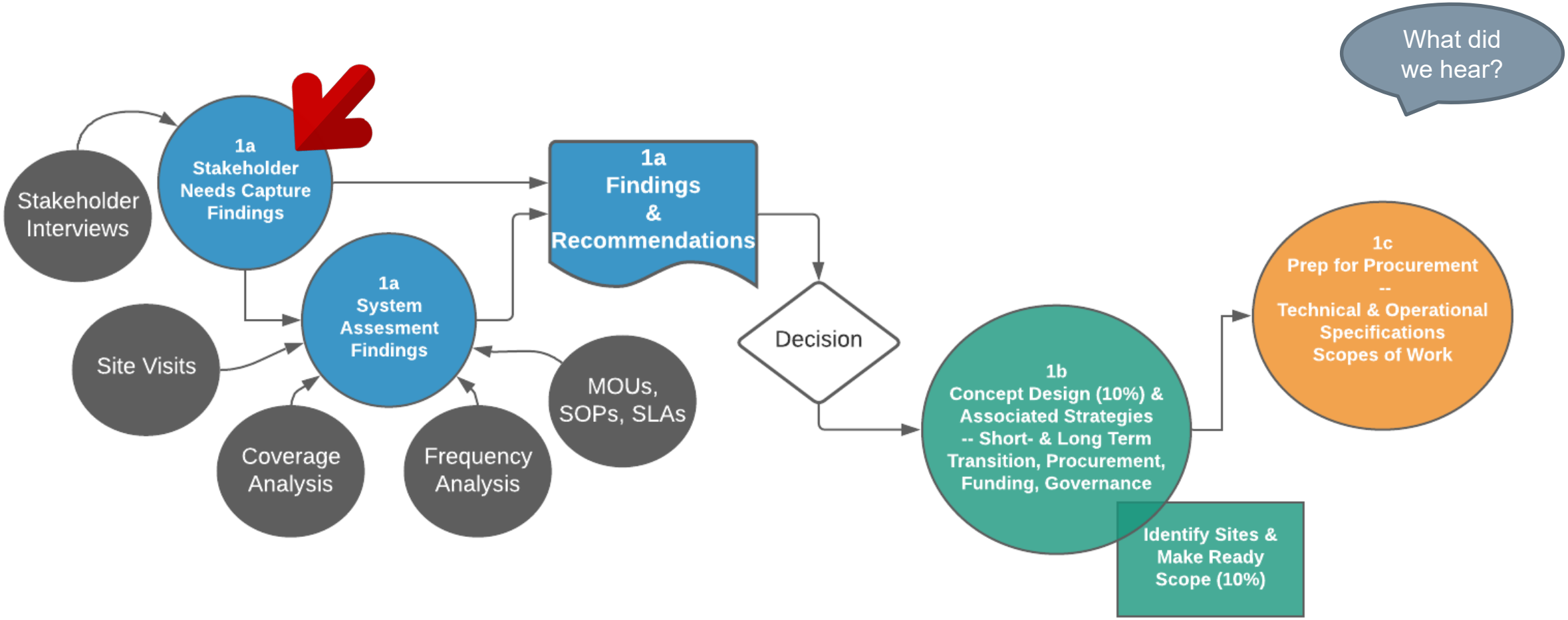
AGENDA

- Agenda
- 1. Project Purpose & Status
- 2. Stakeholder Findings



©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

STAKEHOLDER FINDINGS



©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

OKANOGAN Agencies

AGENDA

1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment

1. Aero Methow
2. Brewster School District
3. City of Brewster
4. City of Okanogan
5. City of Omak
6. City of Oroville
7. City of Pateros
8. City of Tonasket
9. Lake Roosevelt School District
10. Liberty Bell School District
11. Lifeline
12. Mid-Valley Hospital - Omak
13. North Valley Hospital - Tonasket
14. Okanogan Behavioral Health
15. Okanogan Co Assessors Office
16. Okanogan Co Building Dept
17. Okanogan Co Public Works
18. Okanogan County
19. Okanogan County Electrical Coop (Winthrop)
20. Okanogan County Fire District 01
21. Okanogan County Fire District 02
22. Okanogan County Fire District 03
23. Okanogan County Fire District 04
24. Okanogan County Fire District 06
25. Okanogan County Fire District 07
26. Okanogan County Fire District 08
27. Okanogan County Fire District 09
28. Okanogan County Fire District 10
29. Okanogan County Fire District 11
30. Okanogan County Fire District 12
31. Okanogan County Fire District 15
32. Okanogan County Fire District 15 - EMS
33. Okanogan County Fire District 16
34. Okanogan PUD #1
35. Okanogan School District
36. Okanogan Transportation & Nutrition
37. Omak School District
38. Oroville EMS District
39. Oroville School District
40. Pateros School District
41. Three Rivers Hospital - Brewster
42. Tonasket EMS District
43. Tonasket School District
44. Town of Conconully
45. Town of Coulee Dam
46. Town of Riverside
47. Town of Twisp
48. Town of Winthrop
49. TransGo - Public Transit
50. WADOC

©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

Stakeholder Agencies Interviewed

AGENDA
1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment

Agencies Interviewed[1]:

1. Aero Methow Rescue
2. Coulee Dam Police
3. Fire District No. 1 / Oroville
4. Fire District No. 15
5. Fire District No. 6
6. LifeLine Ambulance
7. North Valley Hospital
8. Okanogan County Dispatch
9. Okanogan County Public Works
10. Okanogan County Sheriff's Office
11. Omak Fire / Fire District No. 3
12. Omak Police
13. Oroville Police
14. Twisp Police
15. Winthrop Marshall's Office

Interoperability Partners[2]:

1. Colville Confederated Tribes
2. Ferry County Sheriff
3. Multi Agency Communications Center (MACC)
4. Washington State Department of Natural Resources (DNR) [3]
5. United States Forest Service (USFS)[3]
6. Washington State Department of Transportation (WSDOT)

Who did we talk to?

"Technology systems exist to support people.

*We must first understand end users' operations – **what (voice or data) information passes between people** – in order to determine the technology(ies) necessary to support those operations."*

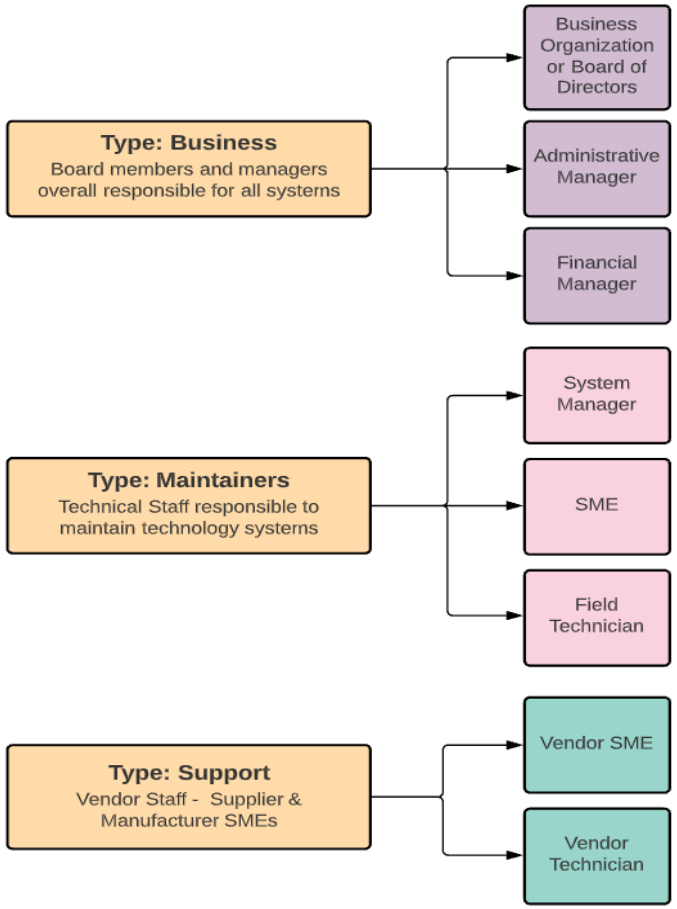
– ADCOMM's philosophy

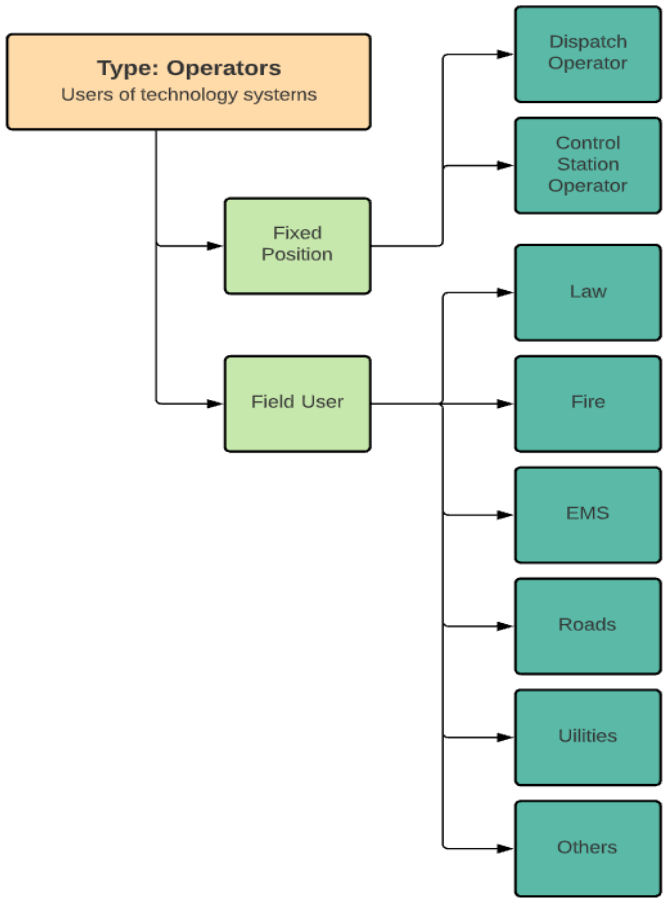
[1] Likely to become partners/users on a new or updated radio system
[2] Own/manage their own radio systems and may interface with the Okanogan system
[3] DNR & USFS were not interviewed

©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

Stakeholder Types

AGENDA
1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment





Who did we talk to?

User Groups

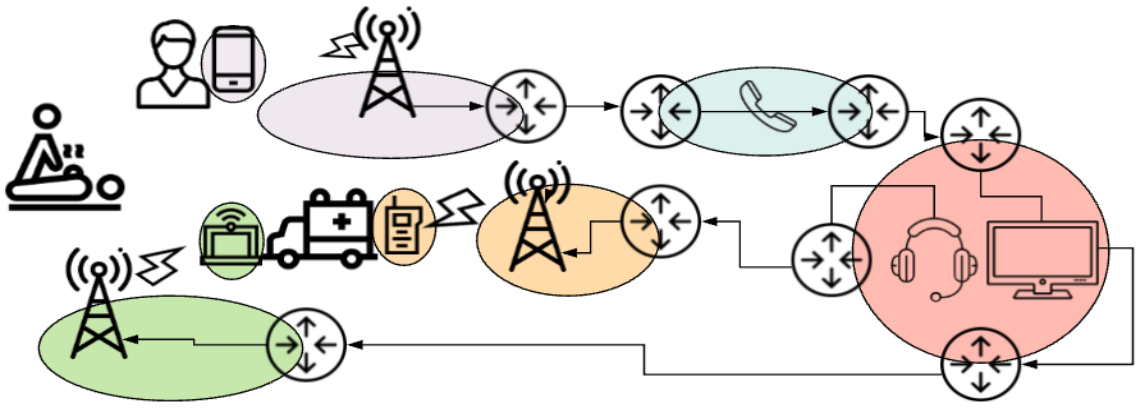
- Administrators
- Dispatchers
- Sheriff
- Police
- Fire
- EMS
- Hospital
- Roads Department
- Maintainers - Technicians

©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

Use Cases & Operational Scenarios

- **Stakeholder Feedback**
  - Who are YOU?
    - Agency – division – department
  - Who do you talk to?
  - When do you talk to them?
  - What information are you conveying?
  - Where are you when you are communicating?

What did we ask?



Emergency Medical Services Communications Network
Manley, Thomas, Susan Ronning, and William Scheible. "Defining Critical Communications Networks: Modelling Networks as Systems."*INSIGHT*23, no. 2 (2020): 36-42

What are ***your*** Unique Operational Challenges?

- Indoors
  - Commercial vs Residential Bldgs
  - Single – Multi – High Rise
- Outside
  - Rural vs Urban areas
  - In-vehicle vs On-foot
- Service area boundaries
  - City – County – District – Other
- Intra- vs Inter- operations
  - Comms with internal vs external agencies/ departments

Radio System Operations

AGENDA
1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment

What are their operating scenarios?

- **Field User & Dispatch Operator interactions (operability vs interoperability needs)**
  - "Blue sky" or typical day
  - Pre-planned events (i.e. County Fair, Omak Stampede, etc.)
  - Unplanned incidents (i.e. Wildfires, Floods, etc.)
  - Emergency Button use
- **Where – When – Who – How – Why**
  - Equipment: Mobile, in vehicle; Portable, on street – urban/ rural/ campus/ in-building (i.e. hospital, jail)
  - Within vs. Outside of Service area (SA)
  - Operations along borders – adjacent cities / counties; other systems: 700MHz trunked, conventional UHF, conventional VHF, direct simplex

Police, Fire, and EMS Station Locations

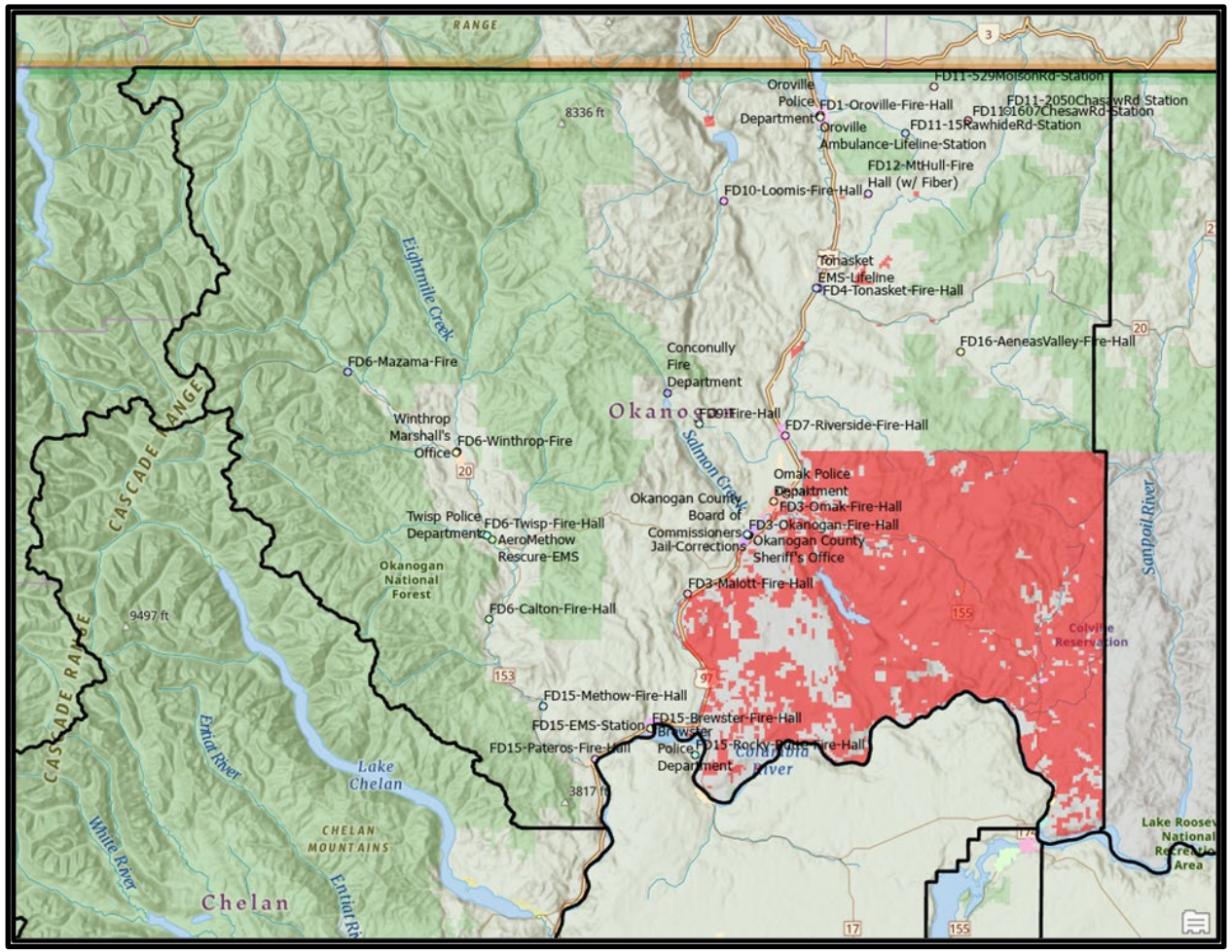
AGENDA

1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment

Law enforcement service areas match **municipal boundaries**

Sheriff = County
Police = City

Red indicates Tribal owned land parcels



Where do Sheriff & Police work?

Service Area (SA) – Fire District Boundaries

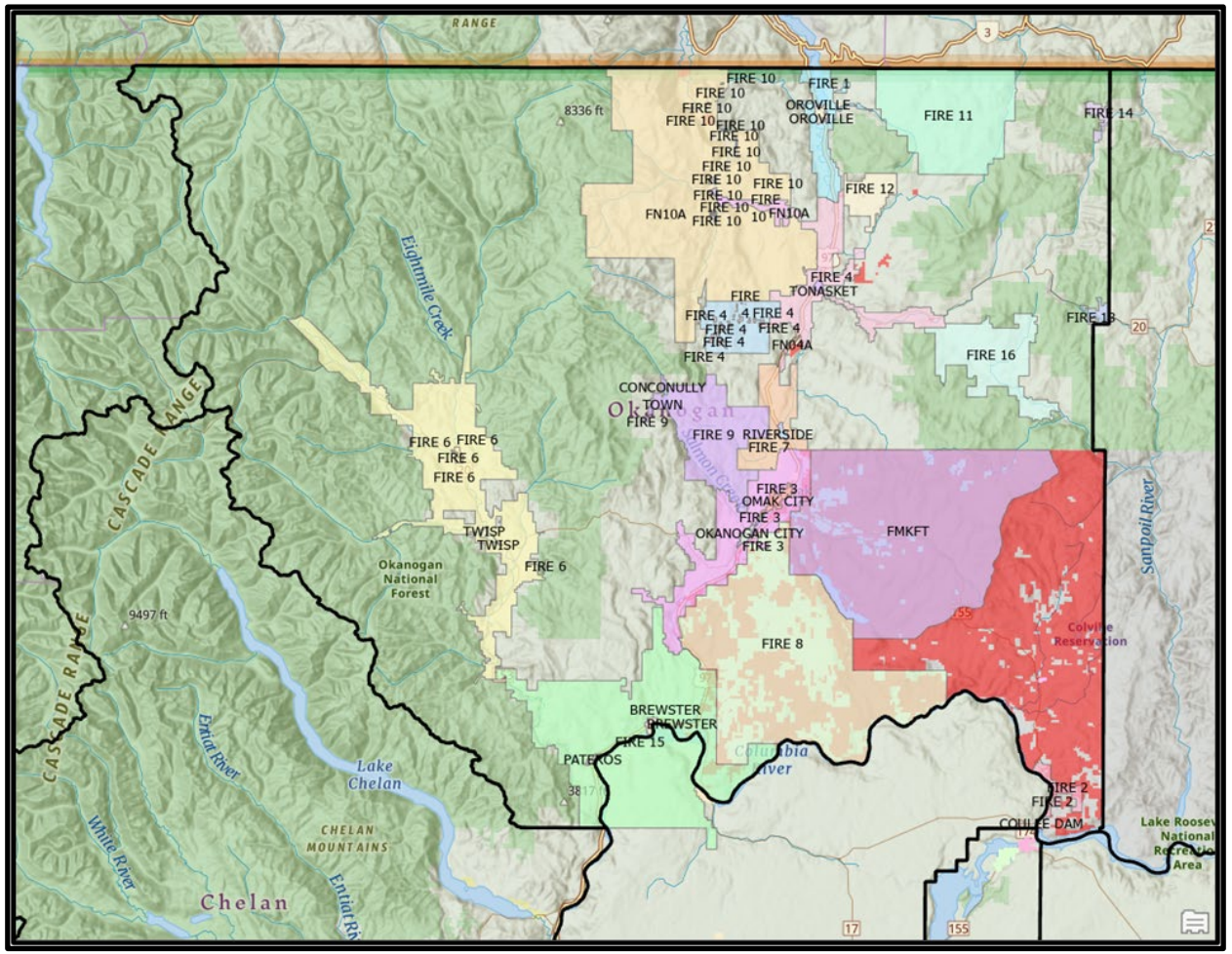
AGENDA

1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment

Where does Fire work?

Areas outside of Fire District boundaries rely on

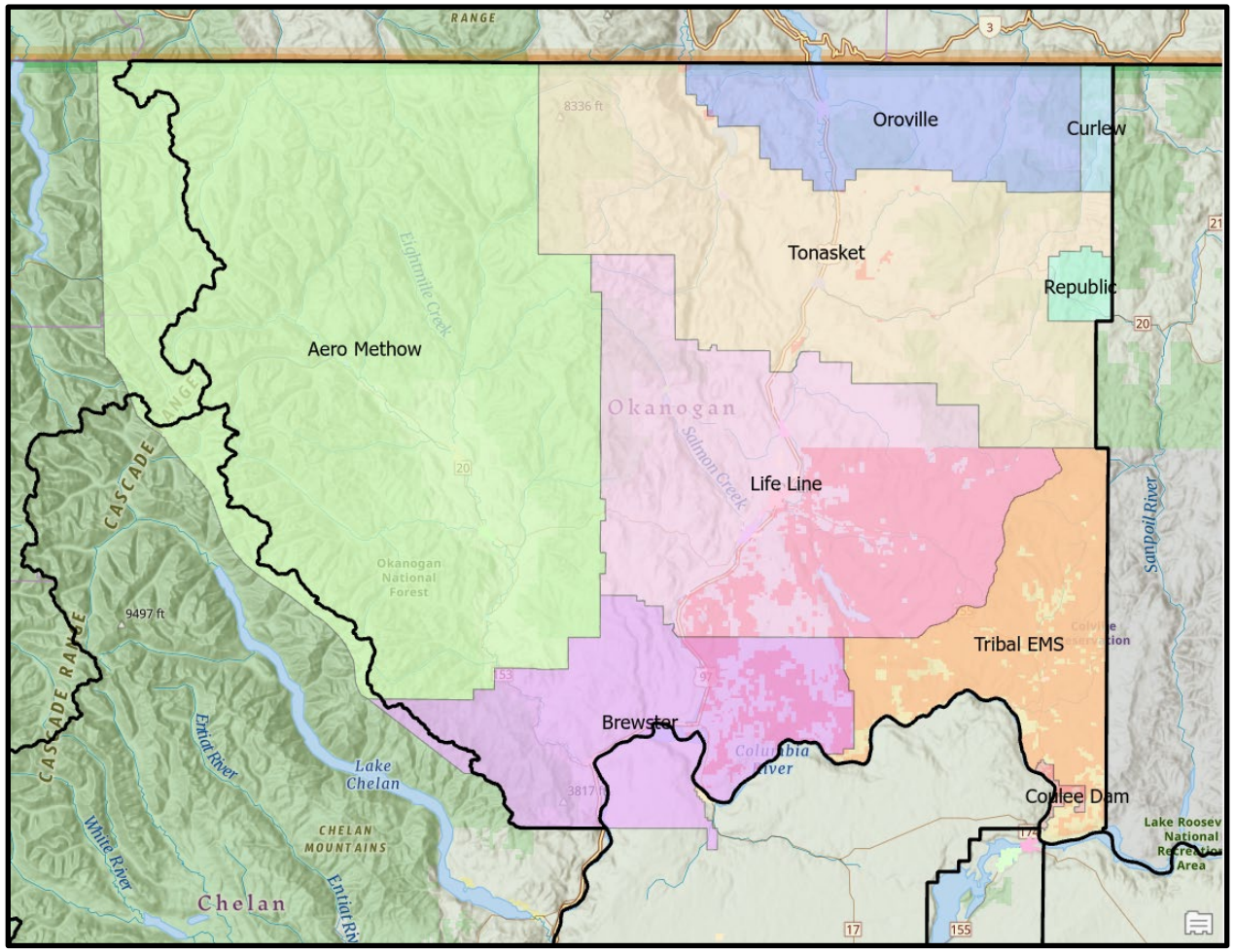
- **DNR**: Department of Natural Resources
  - **USFS**: US Forest Service



Service Area (SA) – EMS Agency Response Areas

Where does EMS work?

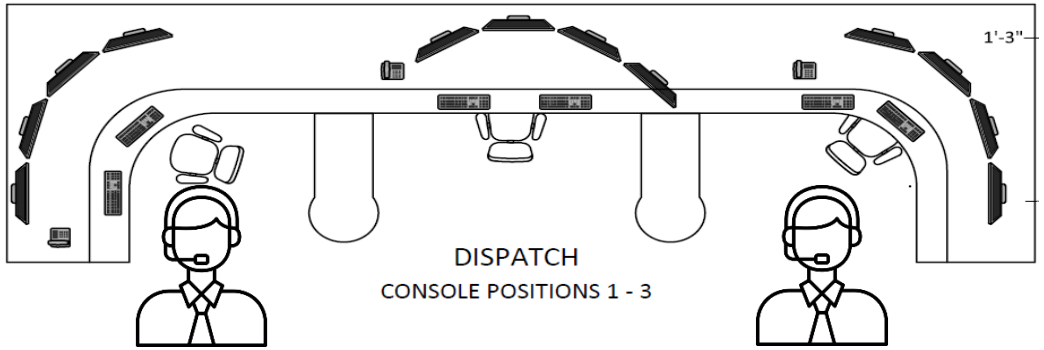
EMS response areas exceed County boundaries



Radio Systems - CURRENT STATE
Channels based on LOCATION

How are channels allocated?

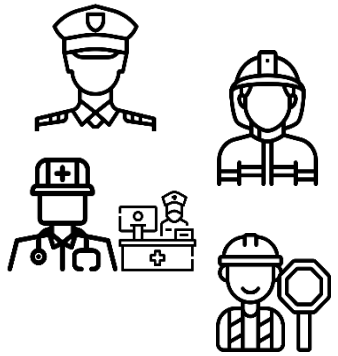
AGENDA
1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment



Dispatchers and users must switch between sites; not all sites are accessible by dispatch

In most cases one channel serves a region for all user types

Only one site in a region can be used at a time



Frequencies of similar color CANNOT broadcast at the same time, only 1 per color can broadcast at a time

BU=backup Radio on Jail roof.
JA=Jackass Butte, Okanogan
Pi=Pitcher Mtn, Okanogan
Gt=Goat Mtn
Mc=McClure
Tk=Tunk Mtn
Tx=Transmit
Rx=Receive

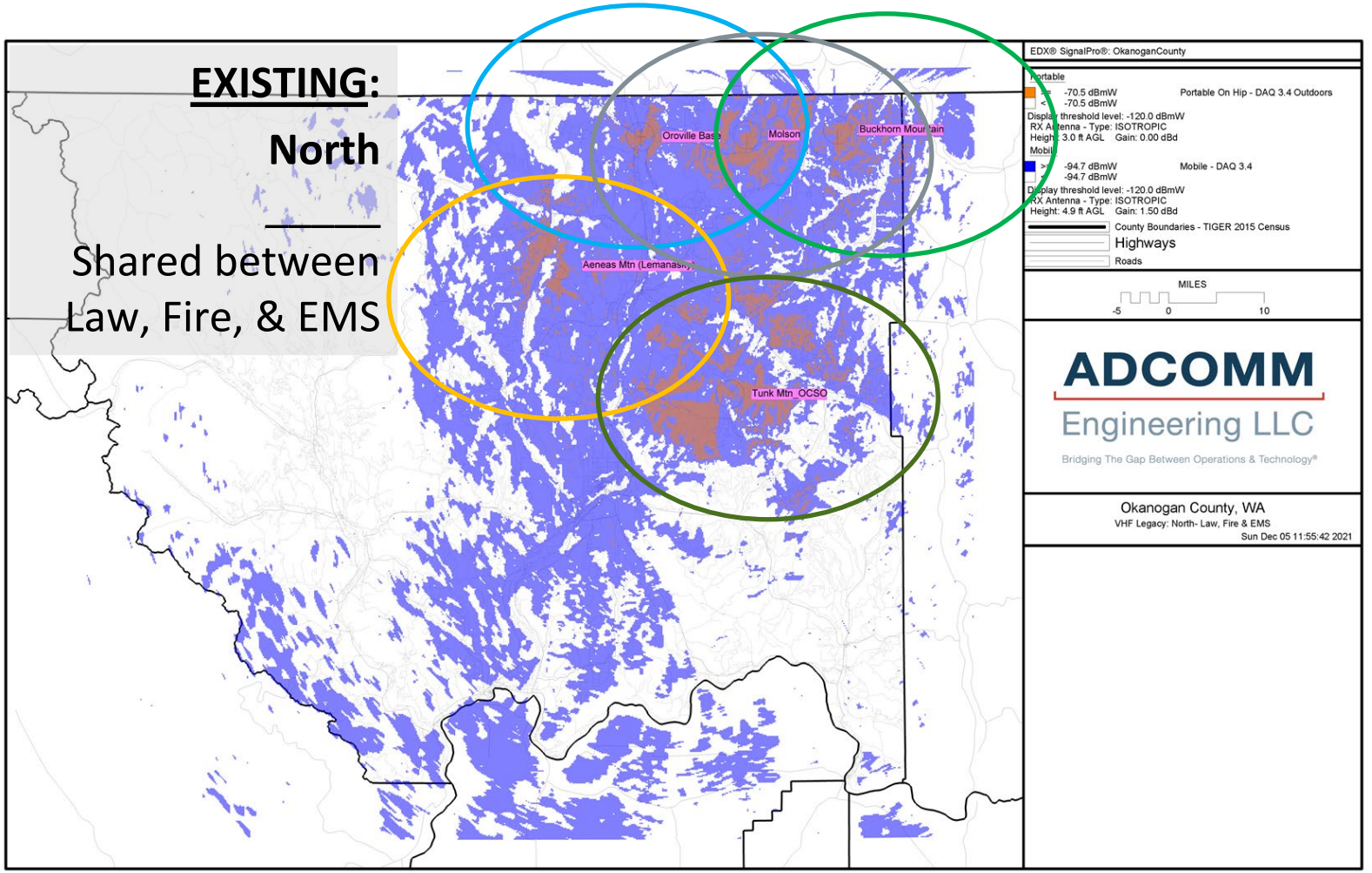
		North						East			South		
		Tunk	Lemanasky	Oroville Base	Molson	Buckhorn	Mid-Valley (JA)	East Co Fire (Pi)	West Co Fire	Moses	Coulee Dam	Command (JA)	Monse	Pearl Hill	Goat
North	Tunk												1 South		
	Lemanasky												1 South		
	Oroville Base									1 East			1 South		
	Molson												1 South		
	Buckhorn												1 South		
	Mid-Valley (JA)	1 North								1 East			1 South		
Future	Pitcher (Pi) (channel name to be determined)	1 North								1 East			1 South		
	East Co Fire (Pi)	1 North								1 East			1 South		
	West Co Fire (Mc)	1 North								1 East			1 South		
	North Co Fire (Tk)														
East	Moses	1 North											1 South		
	Coulee Dam	1 North											1 South		
	Command (JA)	1 North								1 East			1 South		
	LERN (Tk Rx/Tx, Jail)	1 North								1 East			1 South		
Future Future	LERN (Gt Tx,Rx)	1 North								1 East			1 South		
Future Future	LERN (Mc Tx,Rx)	1 North								1 East			1 South		
South	Monse	1 North								1 East					
	Pearl Hill	1 North								1 East					
	Goat	1 North								1 East					
West	McClure	1 North								1 East			1 South		
	Little Buck	1 North								1 East			1 South		
	Flagg	1 North								1 East			1 South		

North

West

Central

Existing Radio System –Each Channel* has UNIQUE Coverage



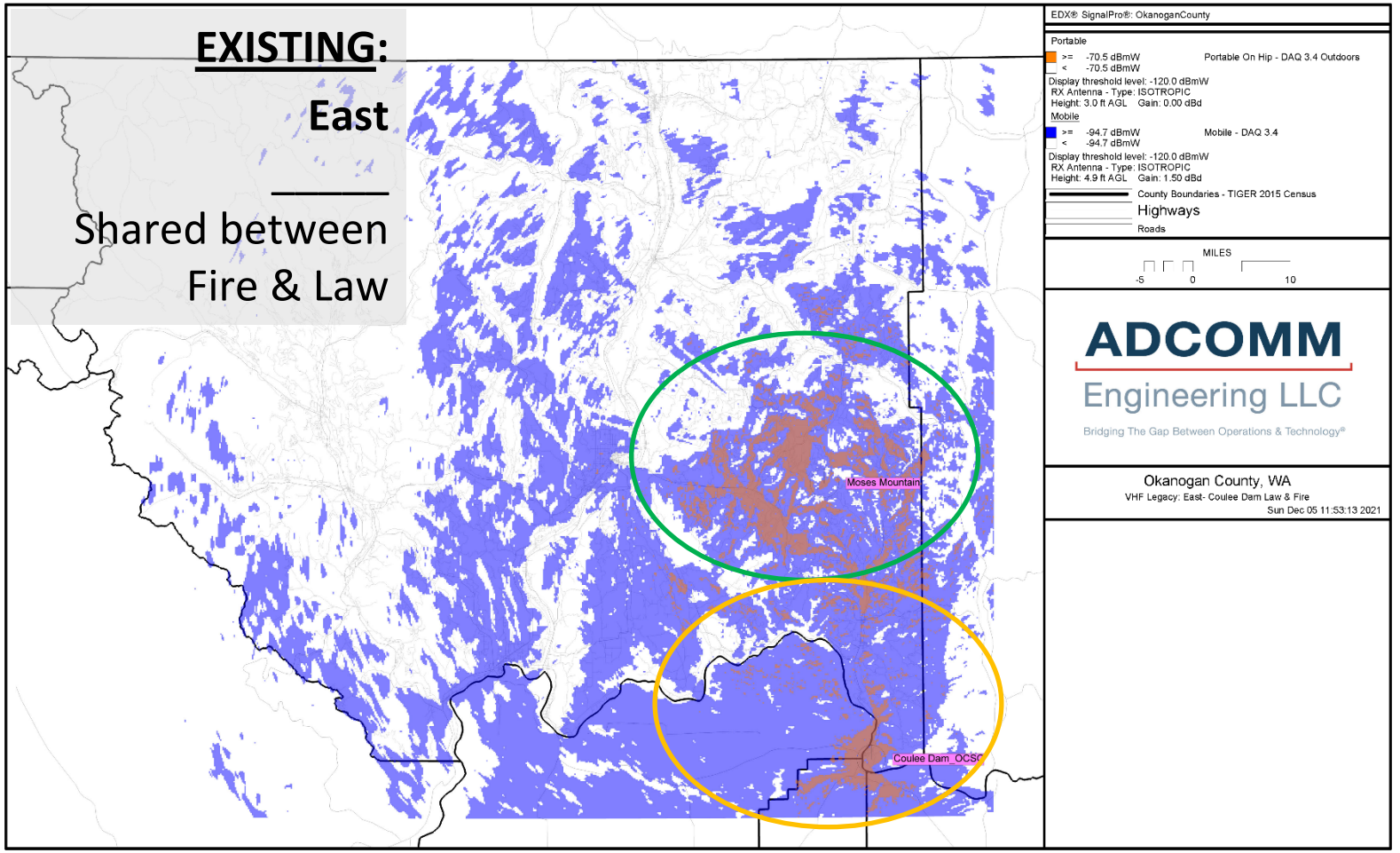
*Note:
Although CHANNELS are organized as ZONES; only one SITE can be active at a time.

Multiple sites active at once in a single zone may cause interference or loss of audio for one or both sites.

Existing Radio System – Each Channel* has UNIQUE Coverage

AGENDA

1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment



*Note:
Although CHANNELS are organized as ZONES; only one SITE can be active at a time.

Multiple sites active at once in a single zone may cause interference or loss of audio for one or both sites.

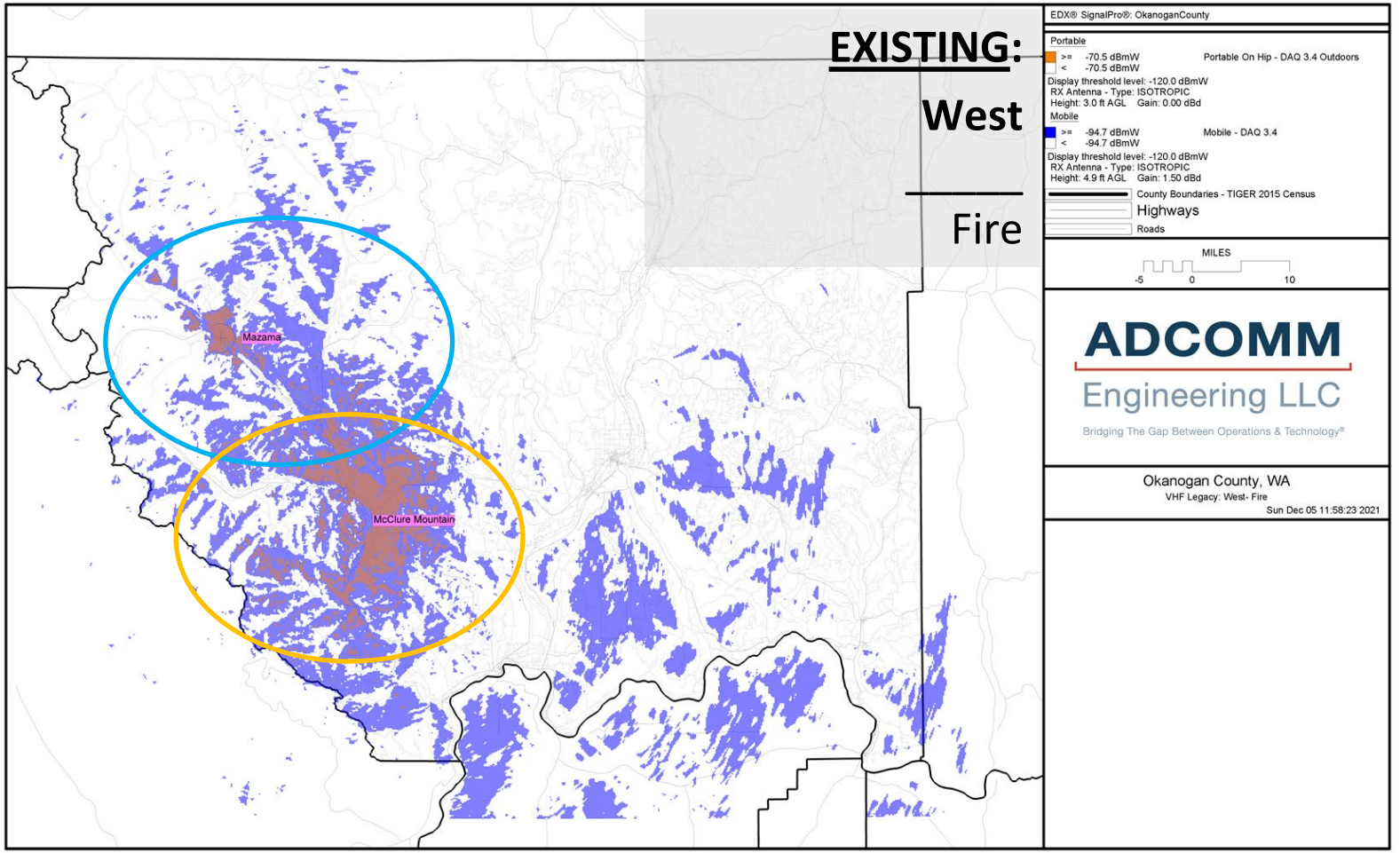
Existing Radio System – Each Channel* has UNIQUE Coverage

AGENDA

1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment

*Note:
Although CHANNELS are organized as ZONES; only one SITE can be active at a time.

Multiple sites active at once in a single zone may cause interference or loss of audio for one or both sites.



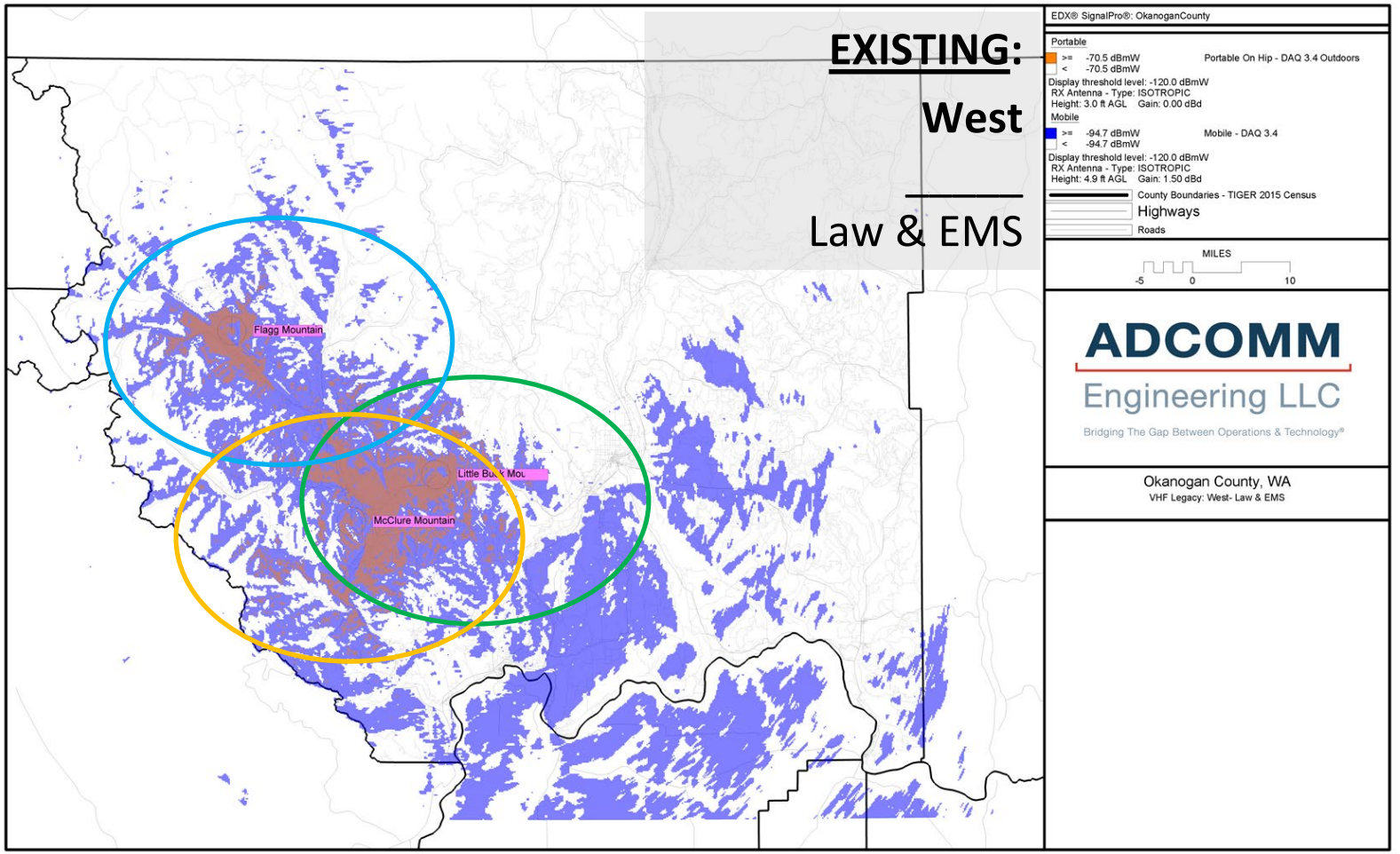
Existing Radio System – Each Channel* has UNIQUE Coverage

AGENDA

1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment

*Note:
Although CHANNELS are organized as ZONES; only one SITE can be active at a time.

Multiple sites active at once in a single zone may cause interference or loss of audio for one or both sites.



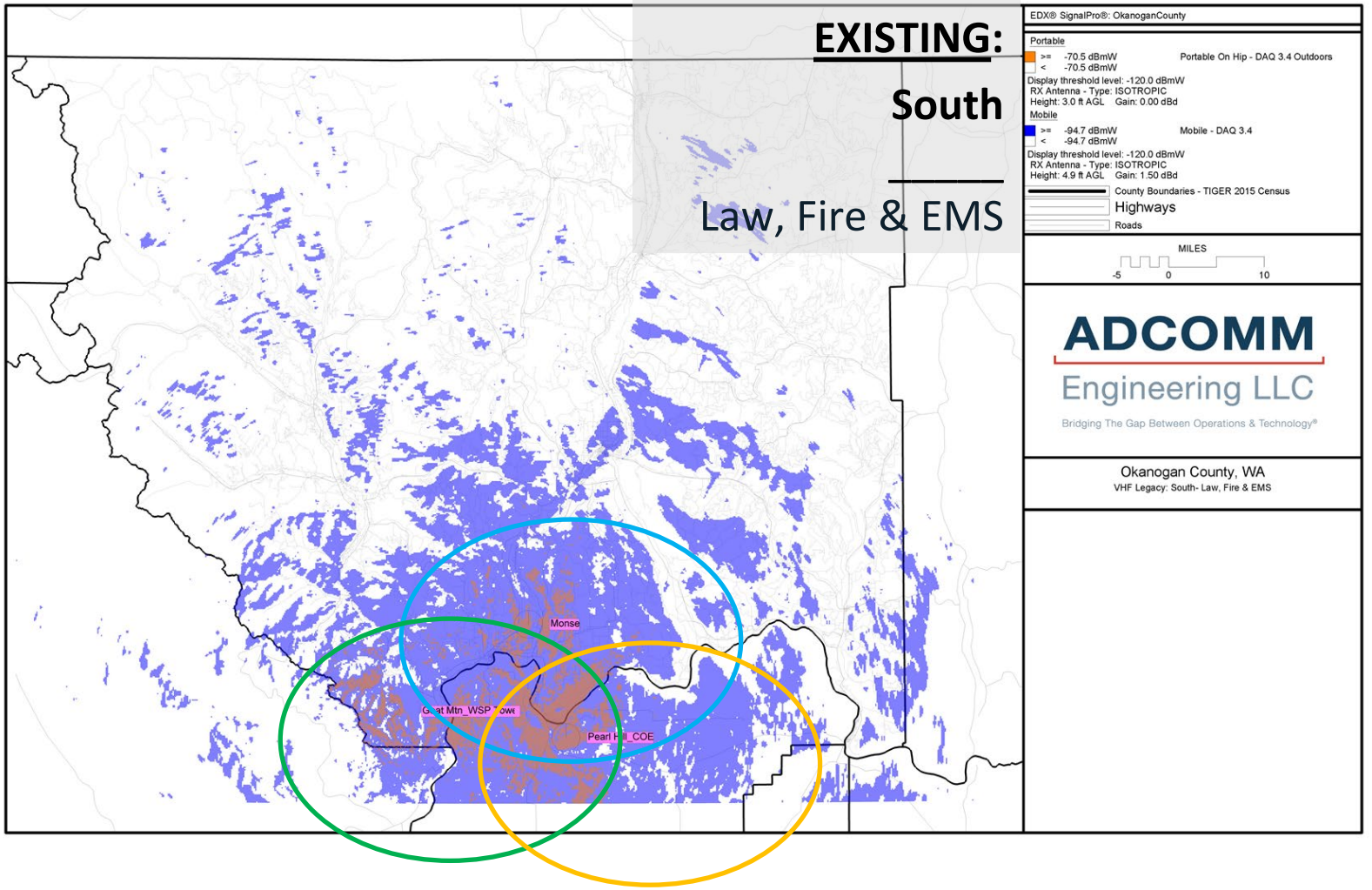
Existing Radio System – Each Channel* has UNIQUE Coverage

AGENDA

1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment

*Note:
Although CHANNELS are organized as ZONES; only one SITE can be active at a time.

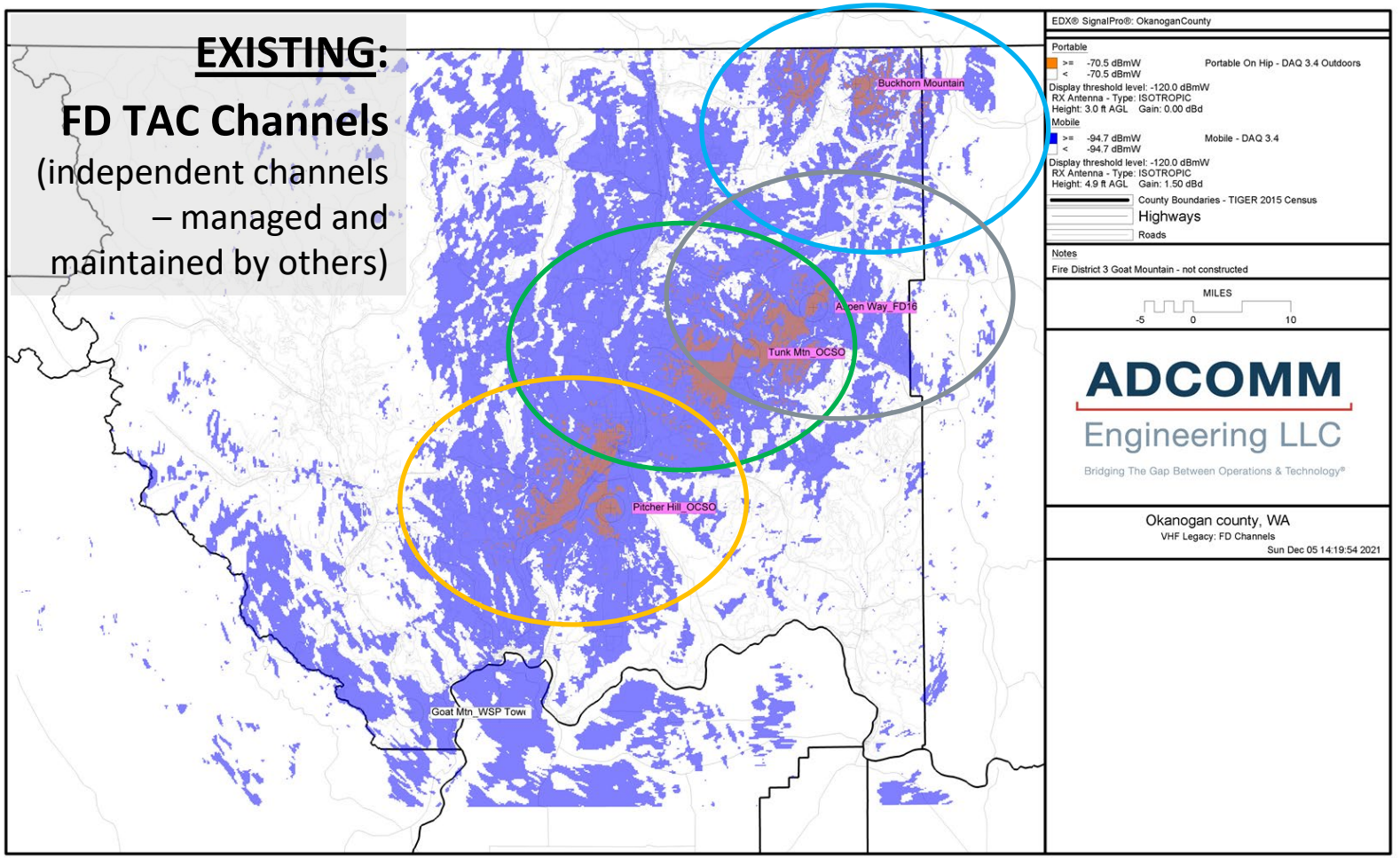
Multiple sites active at once in a single zone may cause interference or loss of audio for one or both sites.



Existing Radio System – Each Channel* has UNIQUE Coverage

AGENDA

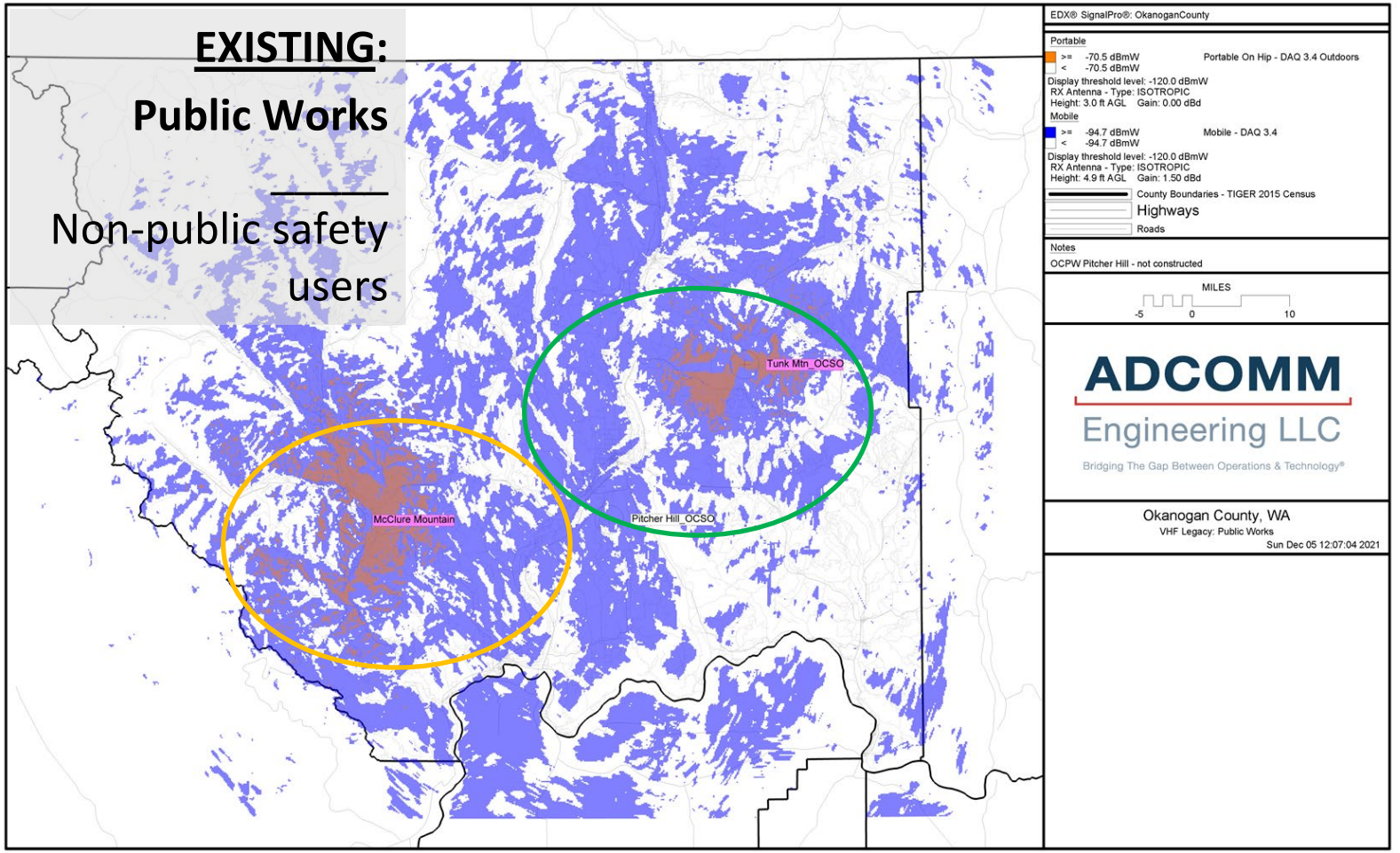
1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment



*Note:
Although CHANNELS are organized as ZONES; only one SITE can be active at a time.

Multiple sites active at once in a single zone may cause interference or loss of audio for one or both sites.

Existing Radio System – Each Channel* has UNIQUE Coverage



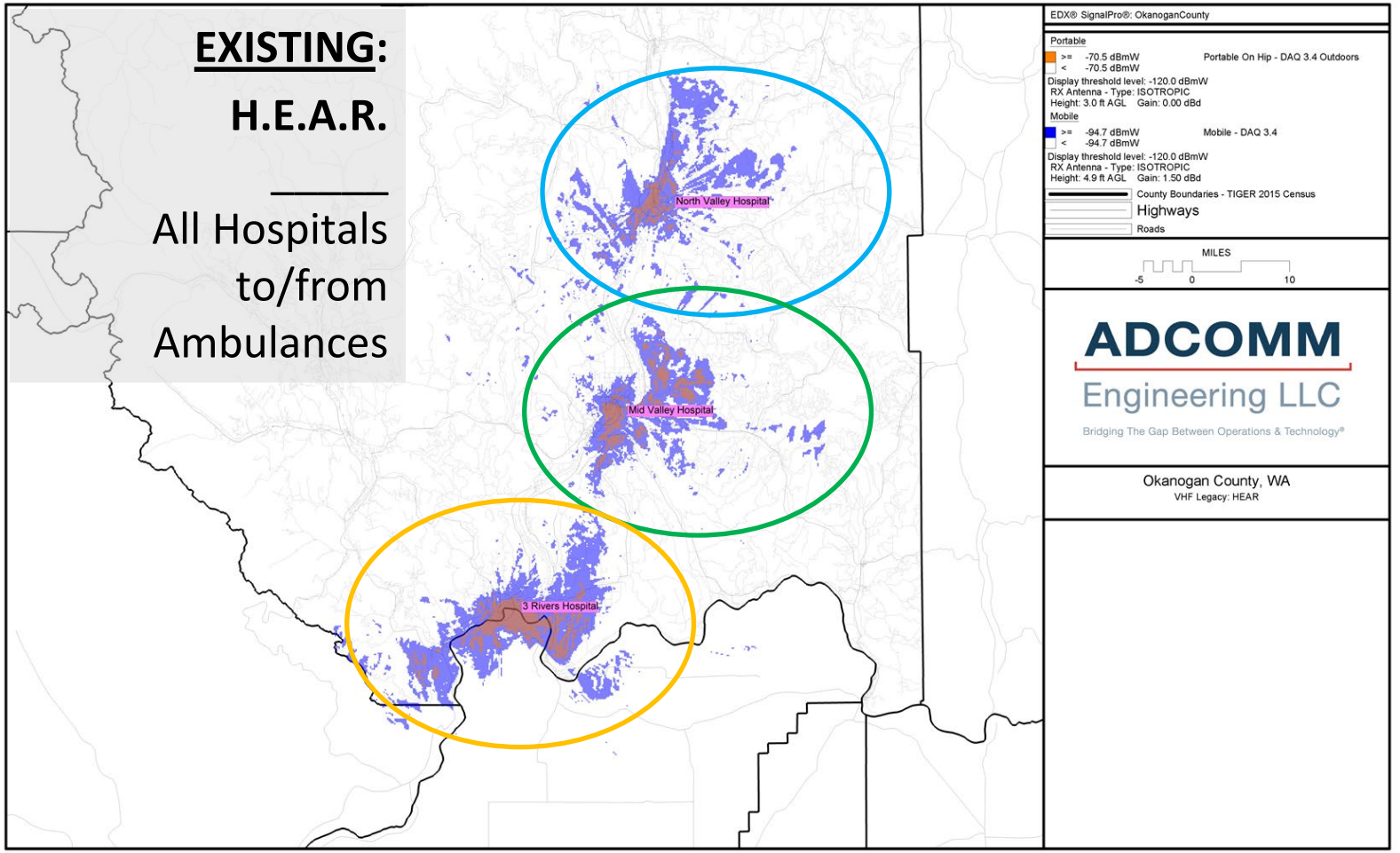
*Note:
Although CHANNELS are organized as ZONES; only one SITE can be active at a time.

Multiple sites active at once in a single zone may cause interference or loss of audio for one or both sites.

Existing Radio System – Each Channel* has UNIQUE Coverage

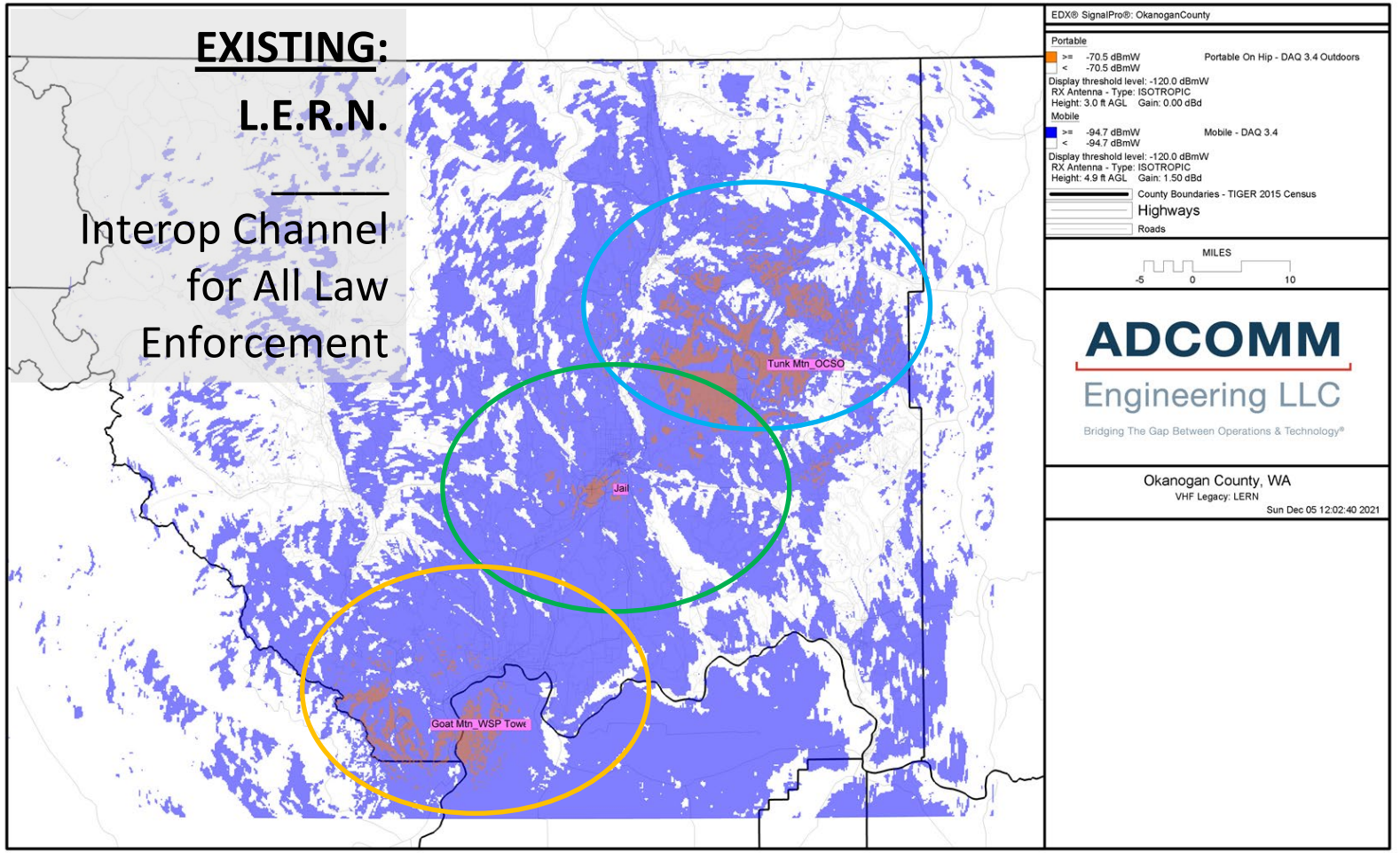
*Note:
Although CHANNELS are organized as ZONES; only one SITE can be active at a time.

Multiple sites active at once in a single zone may cause interference or loss of audio for one or both sites.



Existing Radio System – Each Channel* has UNIQUE Coverage

Note: Current use of Goat Mtn requires permission from WSP



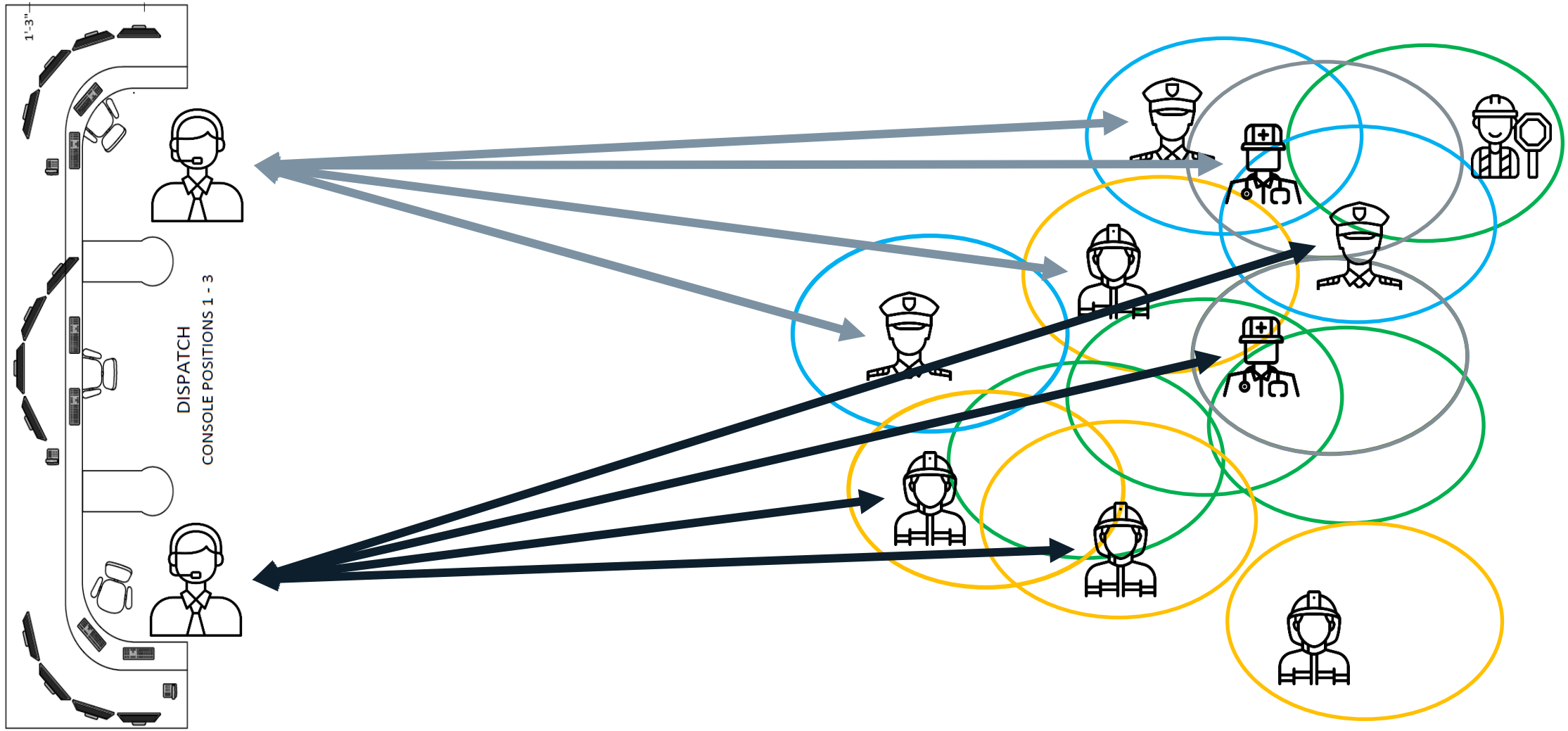
*Note:
Although CHANNELS are organized as ZONES; only one SITE can be active at a time.

Multiple sites active at once in a single zone may cause interference or loss of audio for one or both sites.

Existing Radio System – Geographic-based Channel Allocation

AGENDA

1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment



Existing Radio System – Findings Summary

What did we learn?

AGENDA
1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment

Usability / Operability: the system is NOT simple to use or operate for either the field users or dispatch operators.

Capacity: multiple incidents in the same area causes CONGESTION.

UNIQUE Coverage is NOT Helpful

1. Users must *know* where their channel works well.
2. Users must switch to the right channel based on physical location.

Need: Improved Coverage

Not just *better* coverage but CONSISTENT coverage across all channels and areas

SHARING Channels Causes Congestion

1. Sheriff – Police – Fire – EMS each perform very different operations.
2. Users must wait their turn and jump in when the channel opens.
3. There is CONGESTION where ONE channel must be shared for any INCIDENT in EACH North-East-West-South regions between LAW - Fire - EMS users.

Need: Improved Channel Capacity

Not just *more* channels but BETTER ALLOCATION of channels

Dispatch Operators are Challenged

1. Dispatchers must listen to the different users across multiple channels.
2. Dispatchers must respond to the right person on the right channel.

…with consideration to the number and assignment of dispatch operators.

User Needs

Who asked for what?

AGENDA

1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment

System Needs (9)

Additional User requested Needs

Agency	Coverage Outdoors	Channel Capacity / Sharing Contention	Ease of Use	Reliability / Resiliancy	Maintenance / Aging Equipment	Interoperability	Coverage Indoors	Cost / Funding	Scalability	Frequency Reuse / RF Interference	Governance / Representation	Dispatch Staffing	Radio Use Training	Dispatch Contention / Priority	Dispatch & EOC Facilities	Emergency Button / Unit ID	Mobile Data	AVL / GPS	Cellular Service	Encryption	WiFi Messaging
	14	10	2	6	4	10	5	4	0	6	4	5	7	7	1	5	9	7	7	1	1
Sheriffs Office	X	X			X	X		X		X		X	X	X	X	X	X	X	X		
Omak Fire		X								X	X	X	X	X							
Omak PD	X	X				X	X							X		X	X	X	X		
Coulee Dam PD	X	X												X		X		X	X	X	
Ferry County Sheriffs Office				X													X				
North Valley Hospital	X					X													X		
Aero Methow	X					X	X				X						X				
FD #6		X				X				X		X		X							
Rivercom 911	X																				
Sheriffs Office	X	X		X	X		X			X						X		X			
Lifeline Ambulance	X	X	X	X		X				X			X				X		X		X
Okanogan County Public Work	X												X	X			X		X		
Douglas Okanogan FD #15	X	X				X		X			X	X	X	X				X			
Colville Tribes	X			X	X	X	X	X			X										
WSDOT	X			X	X												X				
Winthrop Marshall's Office	X	X				X	X	X				X	X			X	X	X	X		
Oroville FD#1	X	X	X	X		X				X			X				X	X			

©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

Stakeholder Needs

AGENDA

1. Project Purpose & Status
2. Stakeholder Findings
3. Technology Assessment

1. Improved Coverage & Audio Clarity

There are many areas with coverage holes; meanwhile some areas where coverage exists the audio quality is poor.

2. Sufficient Capacity

Users would like a system with enough capacity so Law-Fire-EMS users don't have to share the same channels.

3. Simple to Use

Users would like a system where all channels work countywide; no need to remember which channels work where.

4. Reliable

One site failure can take down multiple other sites. Some sites could go offline for months if they fail catastrophically or in the winter.

5. Maintainable

Each agency uses different maintenance shops and funding sources; it would be *easier* if there was a one-stop-shop to go to.

6. Interoperable

VHF radios will continue to be needed to work with adjacent agencies.

7. Coverage: In Buildings

The VHF radio system doesn't work well inside large commercial building or within some residences.

8. Cost Effective

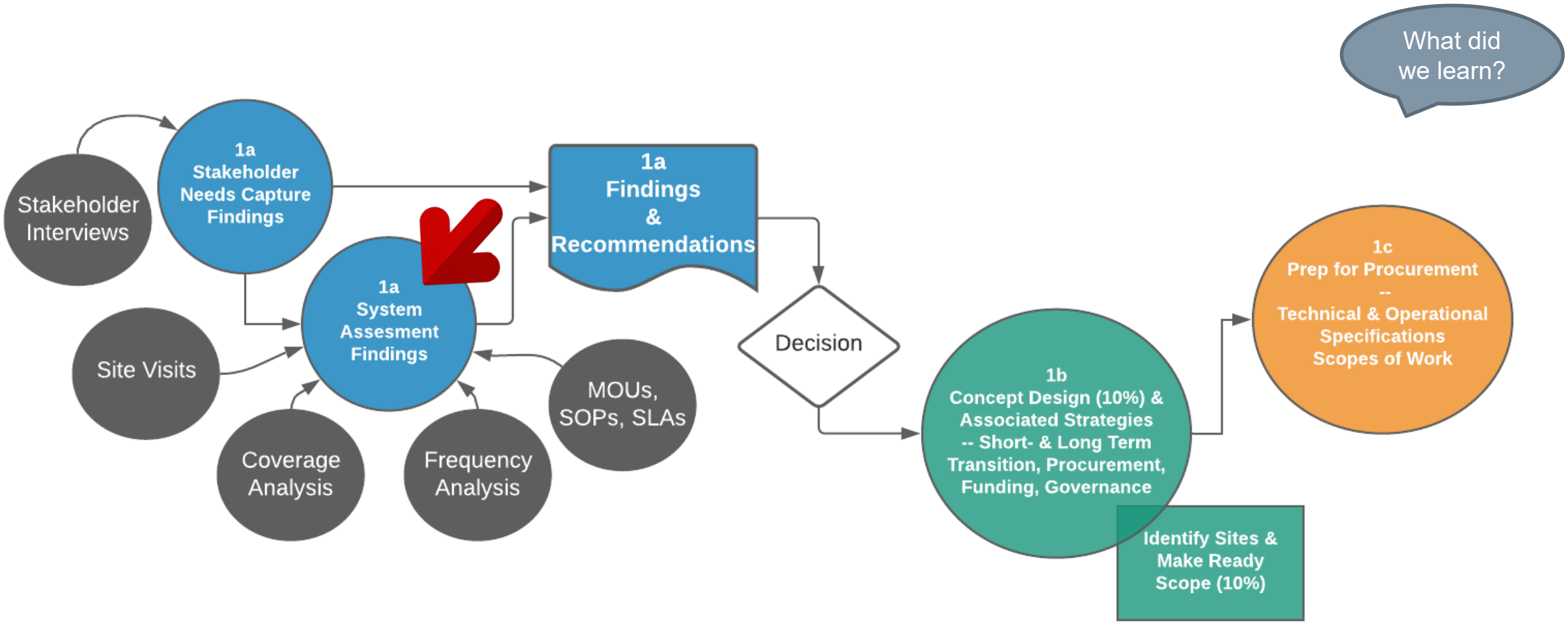
Each agency has limited funds; a replacement radio system needs to be as cost effective as possible.

9. Scalable

A upgraded or replacement system should be P25 compliant and easy to expand sites/ channels if needed.

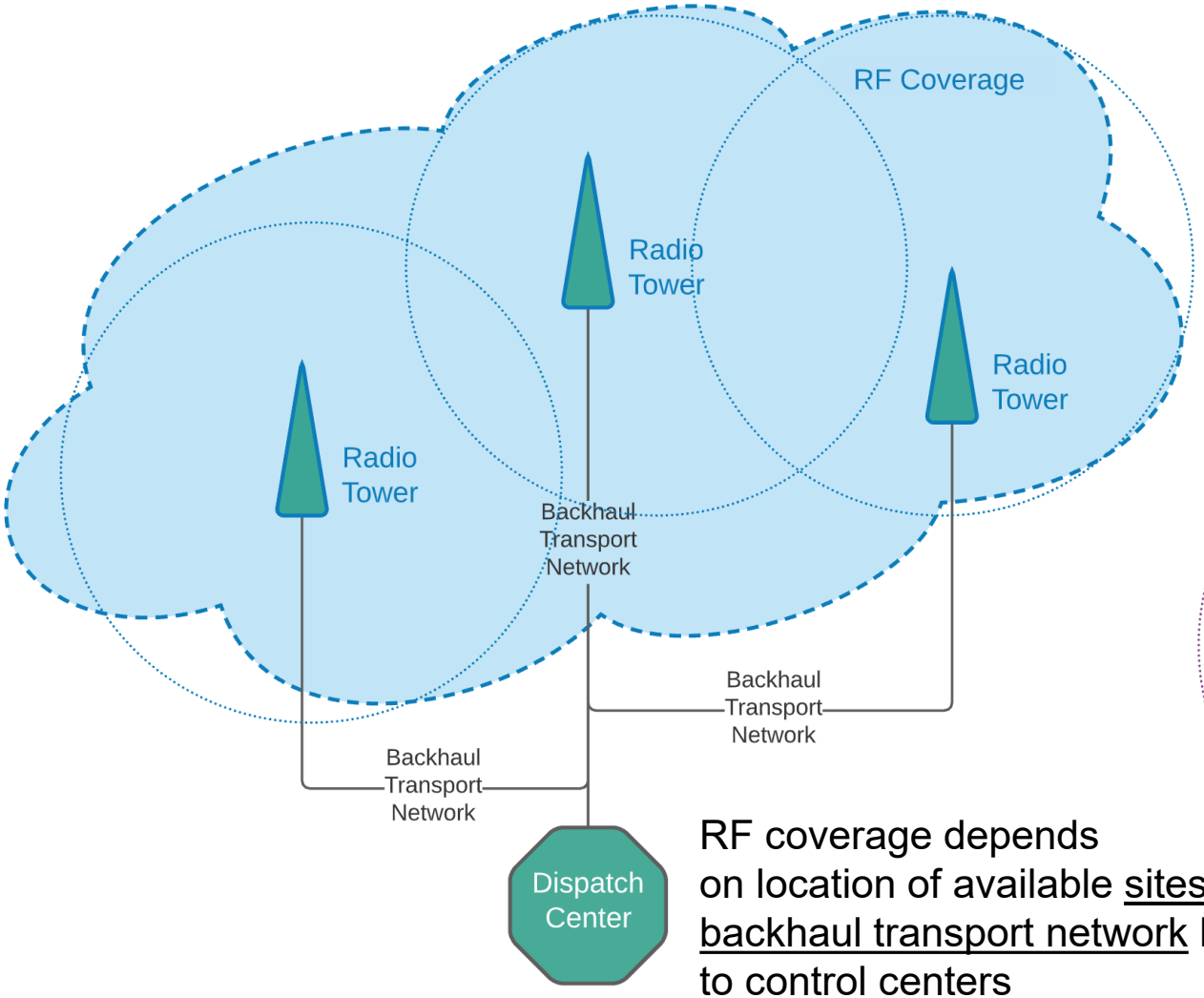
©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

TECHNOLOGY ASSESSMENT

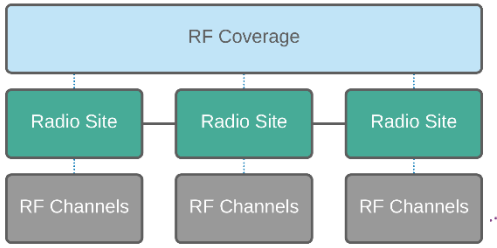


©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

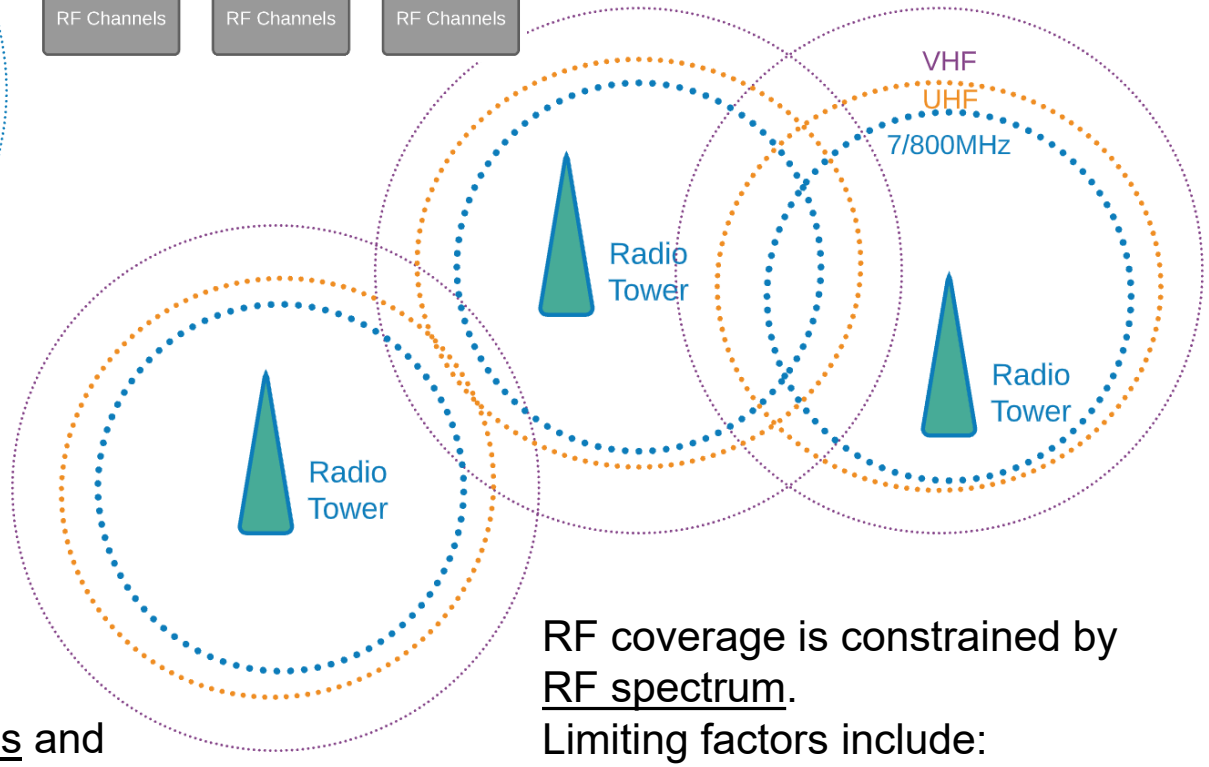
Radio System: RF Coverage Dependencies



RF coverage depends on location of available <u>sites</u> and <u>backhaul transport network</u> links to control centers



RF coverage is *always* a KEY performance criteria with respect to radio systems.



RF coverage is constrained by <u>RF spectrum</u>.
Limiting factors include:

- RF propagation characteristics,
- antenna type, height, system losses, and
- FCC license allocations & limitations

Radio Frequency (RF) Spectrum FINDINGS

AGENDA
2. Stakeholder Findings
3. Technology Assessment
4. Potential Solutions

What did we learn?

Radio Frequencies – or wireless spectrum – is the *foundation* of a wireless communications system. Spectrum (aka *frequencies, channels*) provides the channel capacity to support user communications.

Need: Improved Channel Capacity

VHF: 150-174 MHz

NO NEW VHF CHANNELS (frequency pairs) can be acquired.

Existing channels MAY be reallocated to improve usability although VHF travels LONG distances therefore frequencies are not easily 'reused'.

PLUS… the VHF band is experiencing INCREASED NOISE levels – reducing RF coverage.

Meets Need? **NO**

UHF: 450-512 MHz

A LIMITED NUMBER OF NEW UHF CHANNELS may be acquired to support conventional operation; not enough are available to support trunked operation.

UHF frequencies provide better indoor coverage than VHF.

Use of UHF spectrum requires NEW subscriber radios.

Meets Need? **Somewhat**

700 MHz

Sufficient numbers of 700 MHz channels may be acquired to support trunked operation.

700 MHz frequencies provide better indoor coverage than both UHF and VHF. 700 MHz does not propagate as far as VHF.

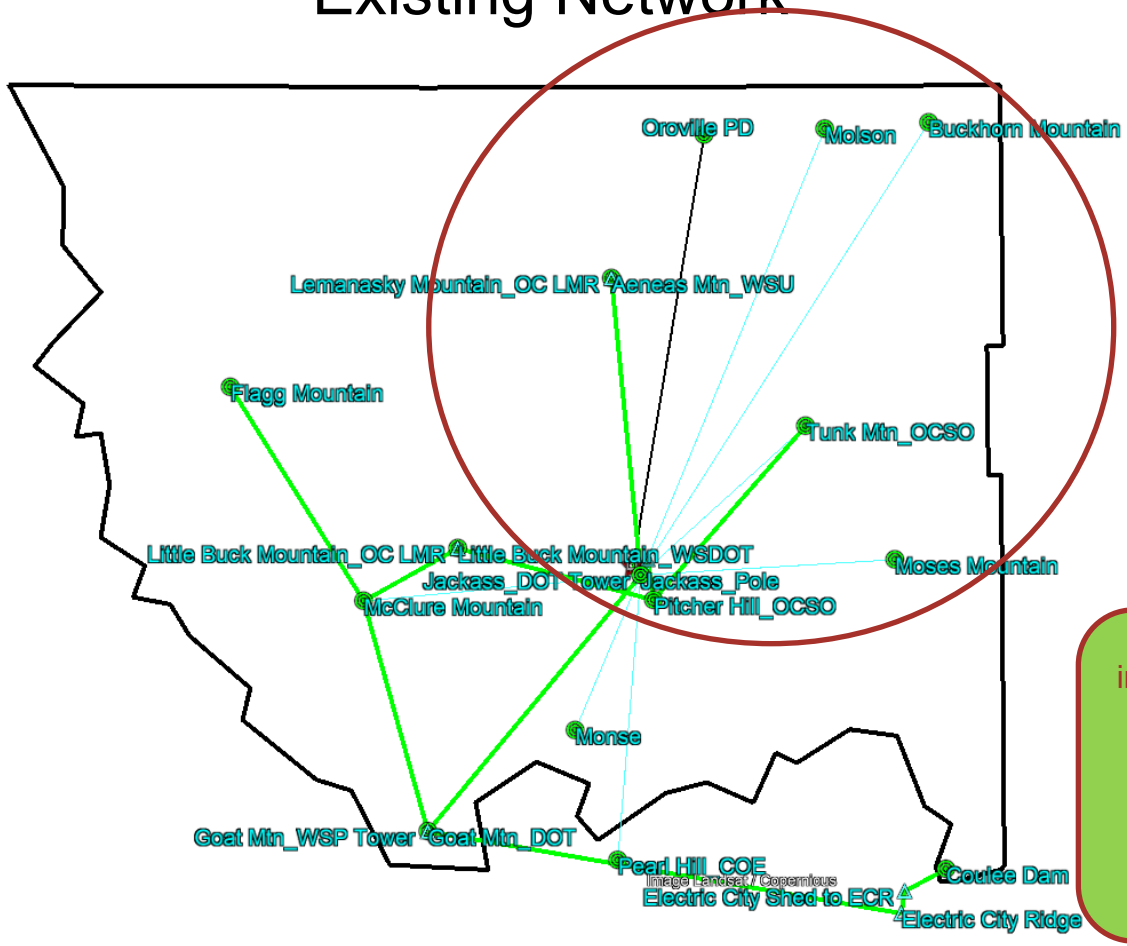
Use of 700 MHz spectrum requires NEW subscriber radios.

Meets Need? **YES**

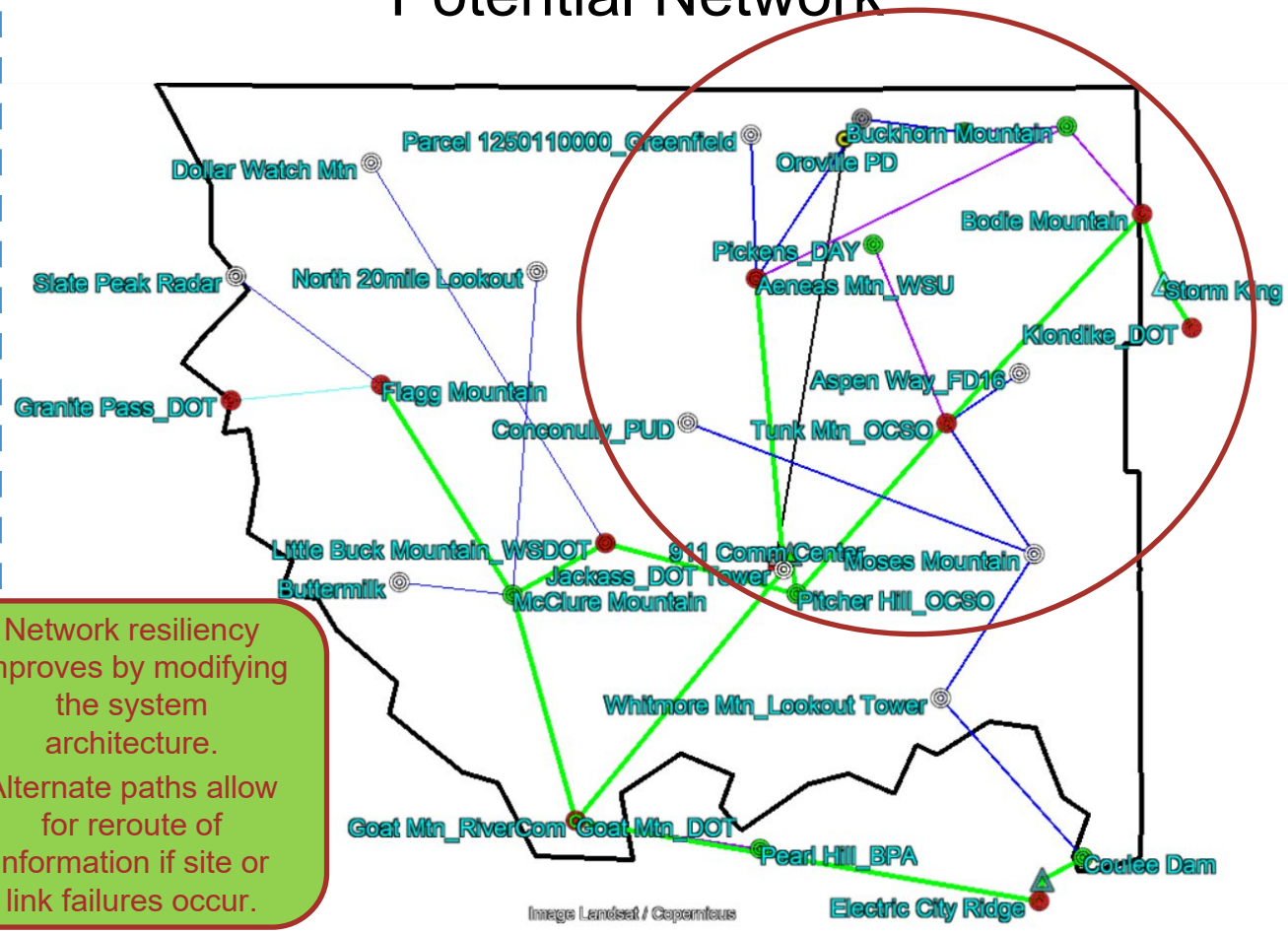
Backhaul Network: Microwave, Fiber, RF point-to-point

AGENDA
2. Stakeholder Findings
3. Technology Assessment
4. Potential Solutions

Existing Network



Potential Network

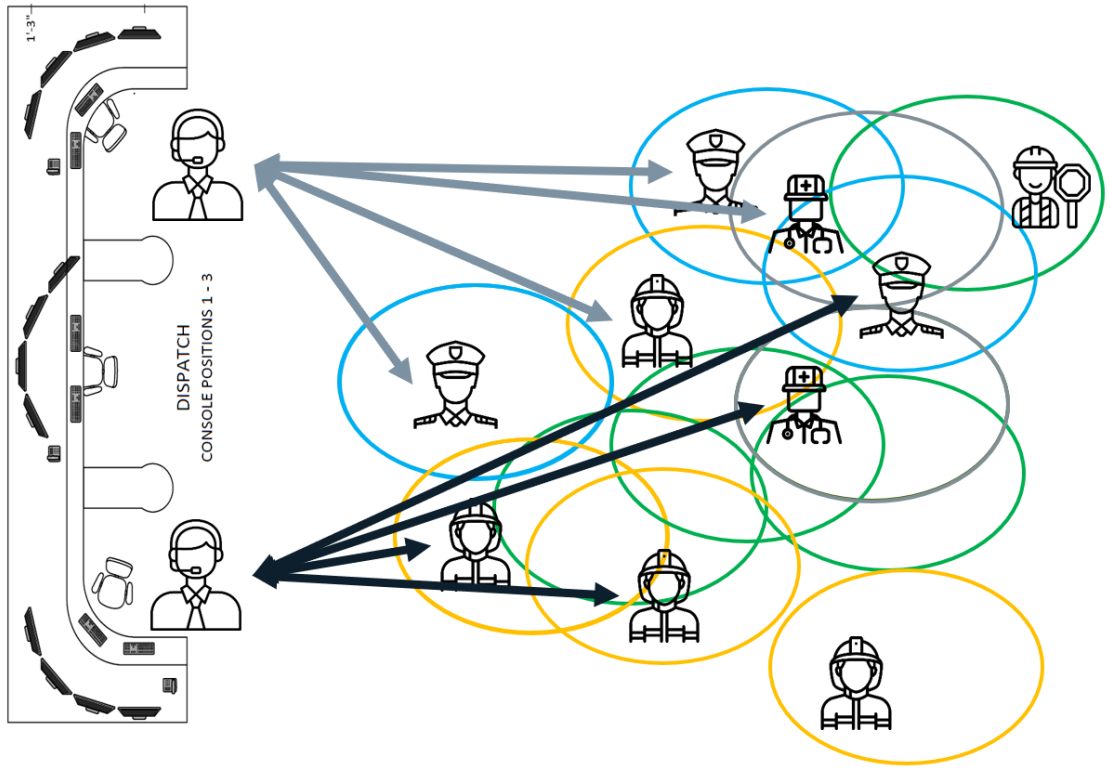


Network resiliency improves by modifying the system architecture.

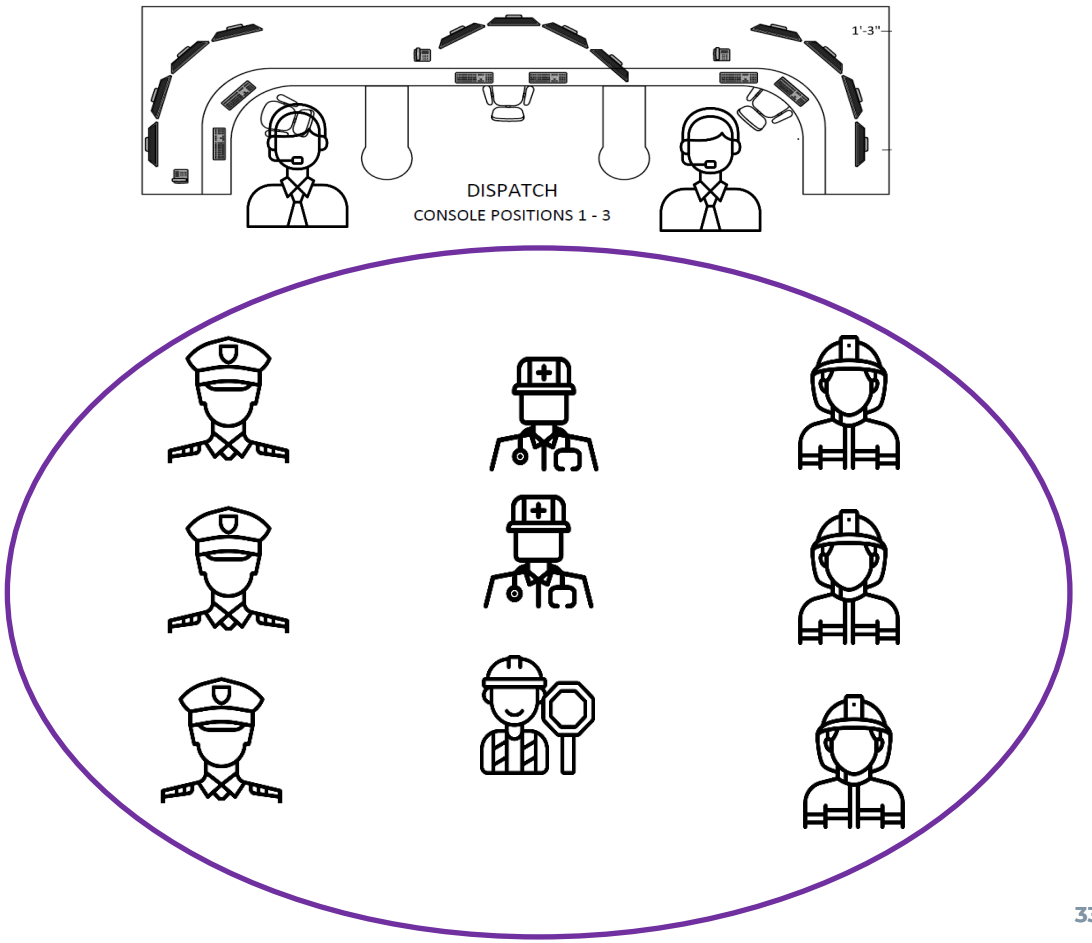
Alternate paths allow for reroute of information if site or link failures occur.

Conventional vs Trunked Mode

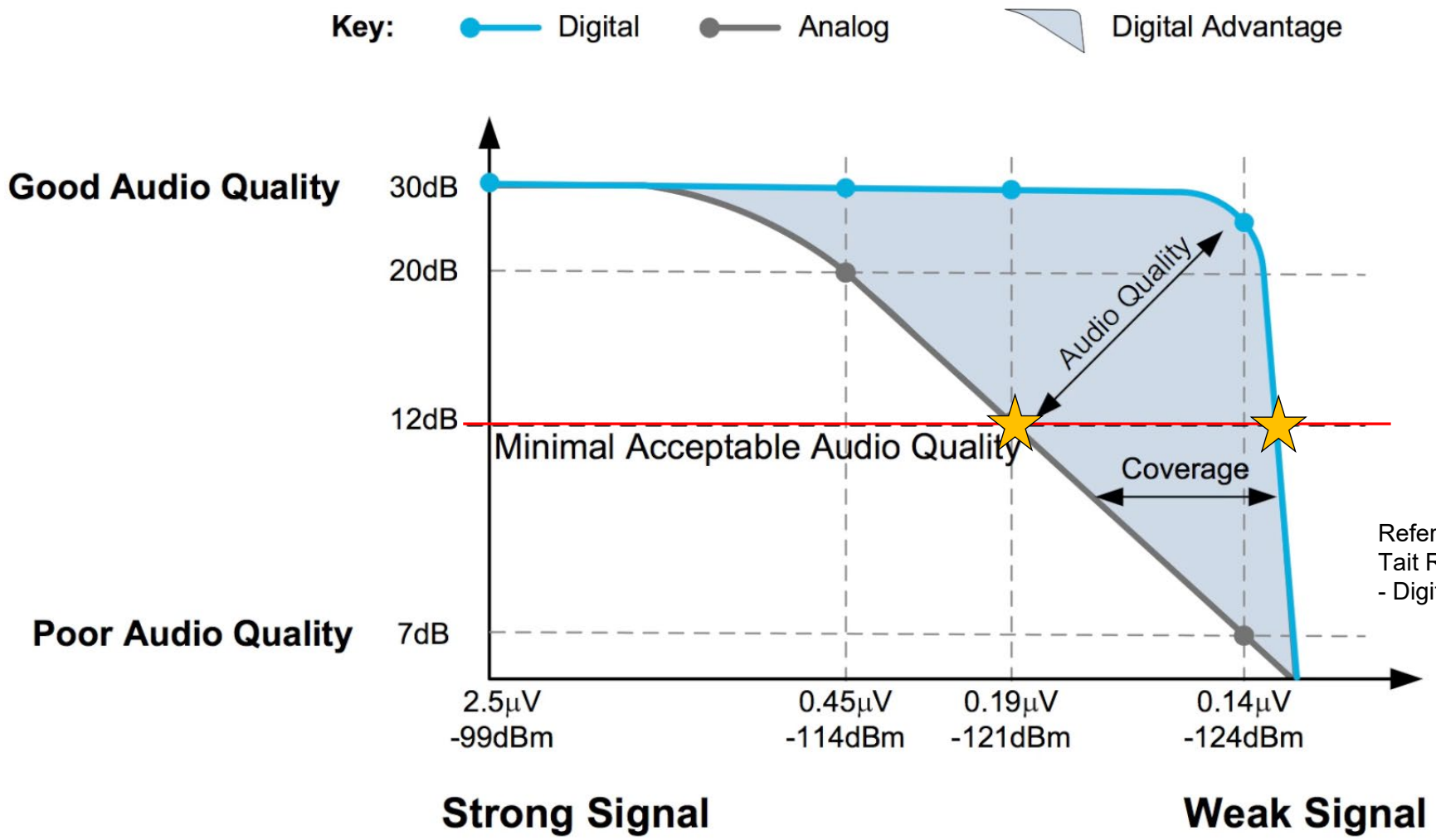
Geographic-based Configuration (Conventional LMR)



Operations-based Configuration (Trunked LMR)



Radio System Technologies: Analog vs Digital Modulation



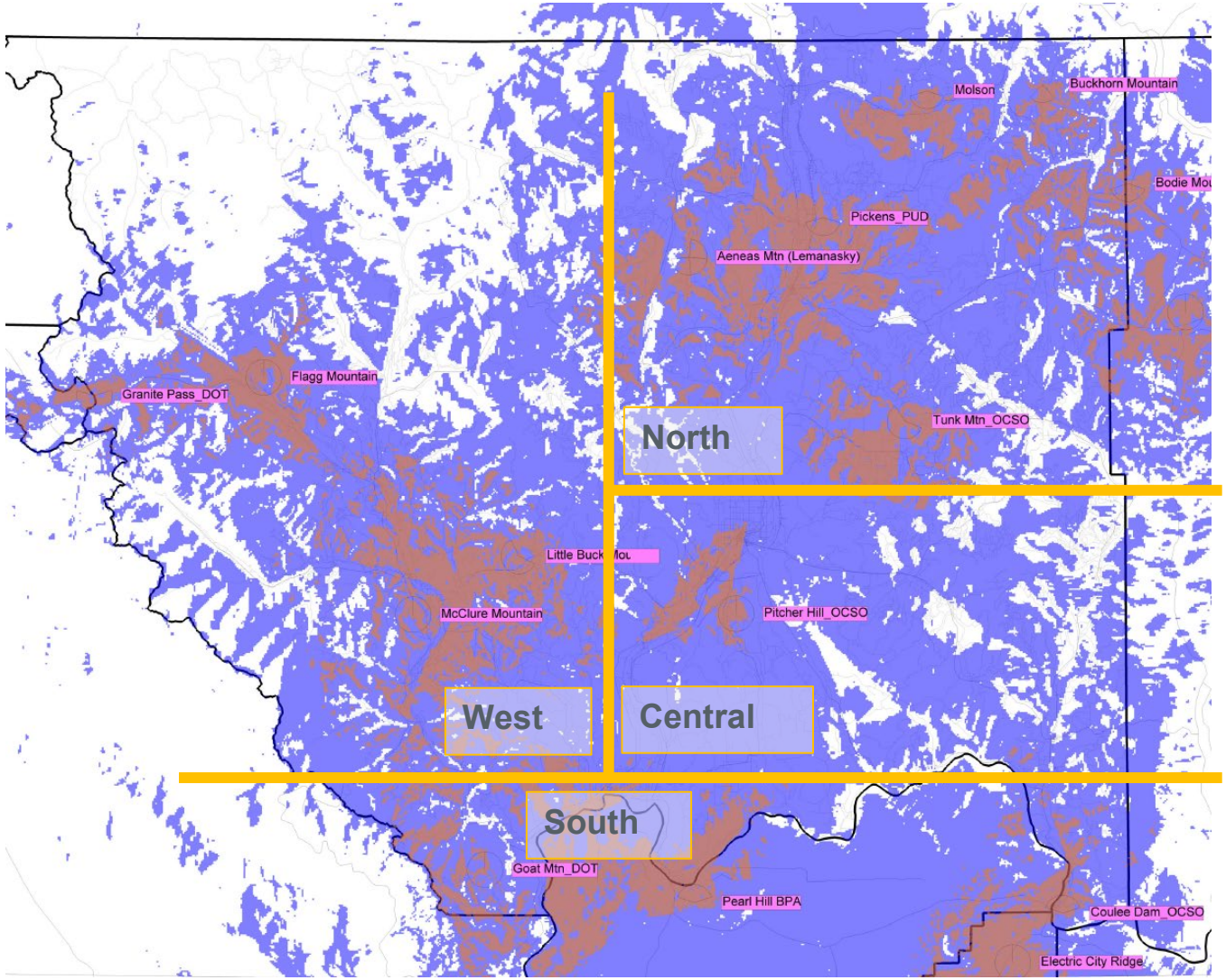
Digital allows for:
User IDs
GPS/ Location
Emergency Button

Reference:
Tait Radio Academy
- Digital versus Analog Audio (link)

Potential: Initial Augmented System

AGENDA

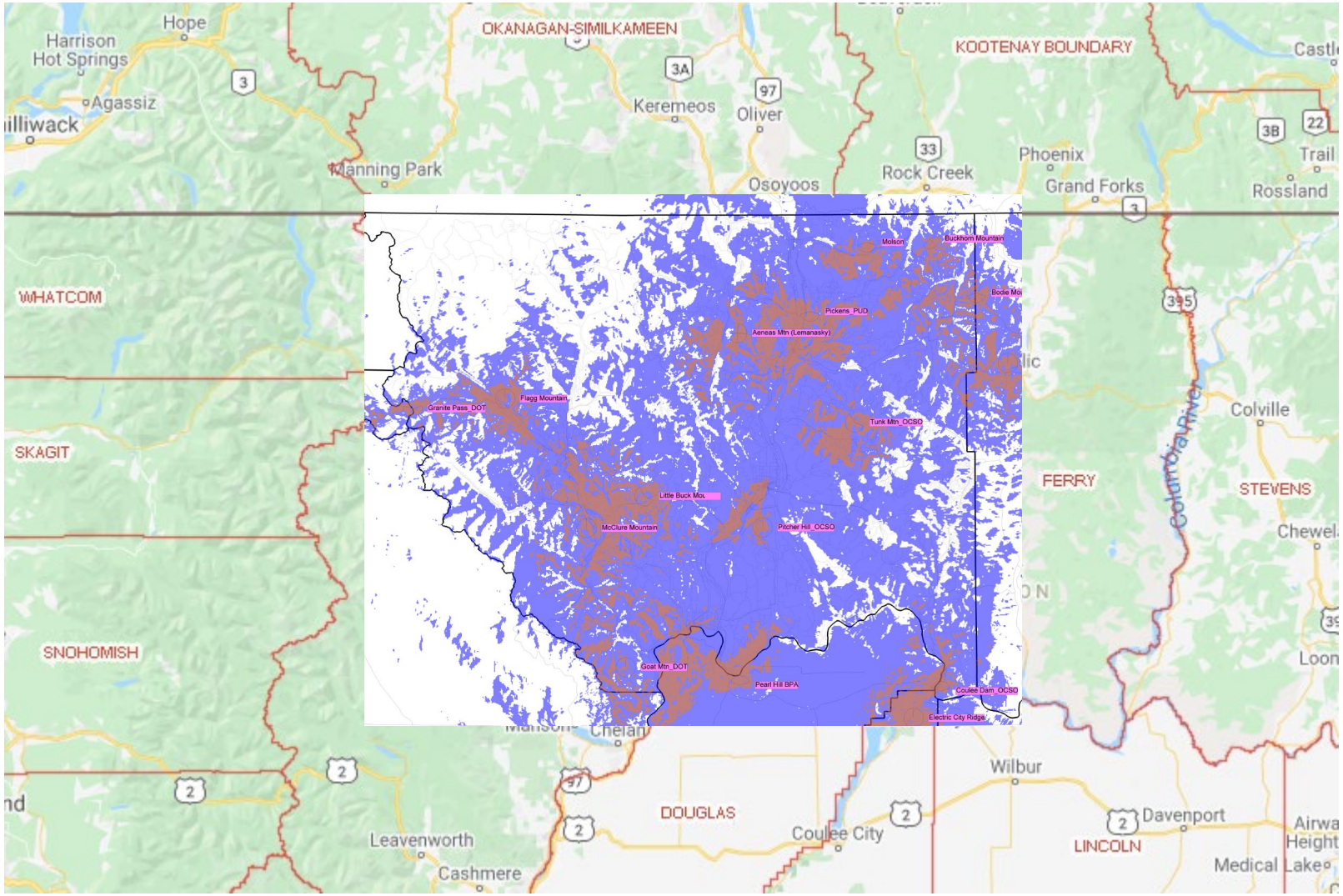
2. Stakeholder Findings
3. Technology Assessment
4. Potential Solutions



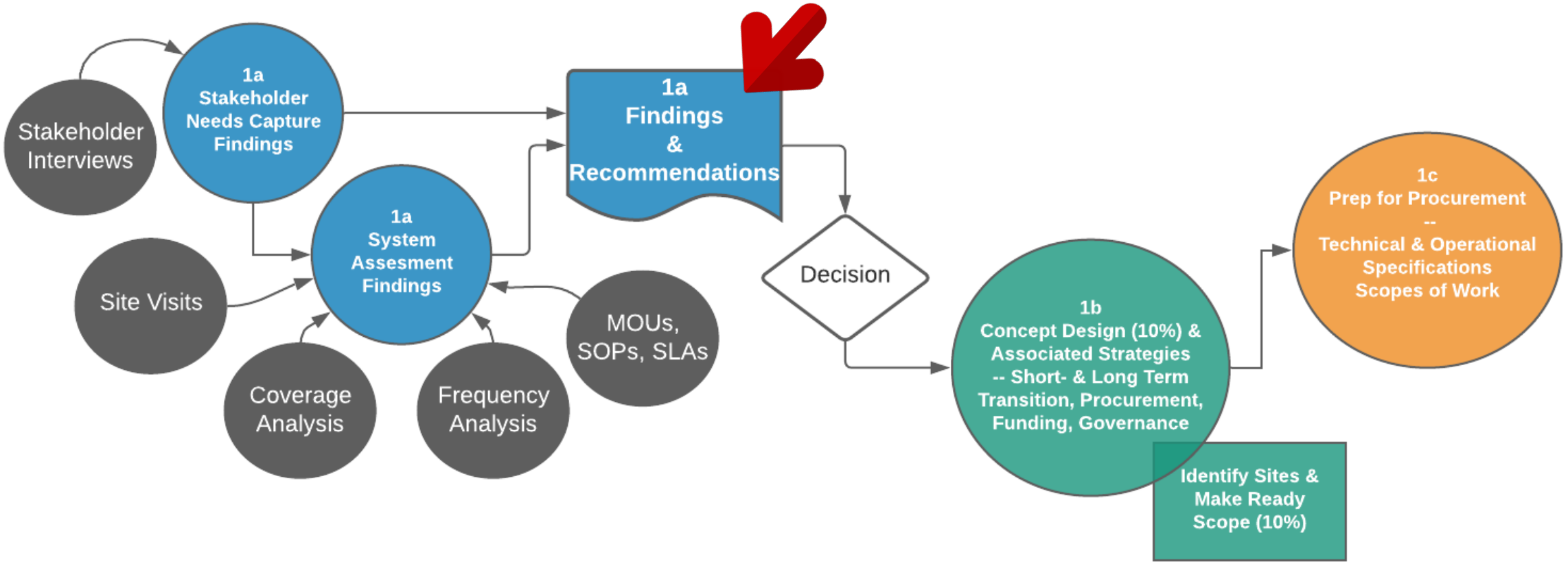
Interoperability: Adjacent Counties

AGENDA

2. Stakeholder Findings
3. Technology Assessment
4. Potential Solutions



FINDINGS AND RECOMMENDATIONS



©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

Optional Solutions

AGENDA
3. Technology Assessment
4. Potential Solutions
5. Next Steps

Option #	Description	Capital Cost vs. On-going Maintenance	Performance
1	Enhance the Existing VHF Radio System	$ Medium-Low Initial Cost $$ Medium On-going Cost	Slightly improved usability; no coverage improvement; improved reliability
2	Replace with a UHF Radio System	$$$ Medium-High Initial Cost $$ Medium On-going Cost	Slightly improved usability; slightly improved capacity; improved indoor coverage
3	WSDOT 700MHz Radio System Expansion	$$$ High Initial Cost $ Low On-going Cost	Highly improved usability; best coverage - most resilient and reliable
4	Okanogan owned 7/800MHz Radio System	$$$$ Highest Initial Cost $$$ Highest On-going Cost	Highly improved usability; best coverage – more resilient and reliable

1
Enhance Existing VHF System
Update infrastructure & subscriber equipment for current make-model; modify FCC licenses for improved usability – capacity

2
Replace with a UHF System
Update equipment for current make-model; replace all subscriber radios; modify FCC licenses

3
WSDOT 700MHz System Expansion
Enhance WSDOT system with additional sites & channels; replace all subscriber radios

4
Okanogan 7/800MHz Radio System NEW BUILD
Build entirely new system; replace all subscriber radios; FCC licenses

System Needs (recap)

AGENDA

3. Technology Assessment

4. Potential Solutions

5. Next Steps

1. Improved Coverage & Audio Clarity

There are many areas with coverage holes; meanwhile some areas where coverage exists the audio quality is poor.

2. Sufficient Capacity

Users would like a system with enough capacity so Law-Fire-EMS users don't have to share the same channels.

3. Simple to Use

Users would like a system where all channels work countywide; no need to remember which channels work where.

4. Reliable

One site failure can take down multiple other sites. Some sites could go offline for months if they fail catastrophically or in the winter.

5. Maintainable

Each agency uses different maintenance shops and funding sources; it would be *easier* if there was a one-stop-shop to go to.

6. Interoperable

VHF radios will continue to be needed to work with adjacent agencies.

7. Coverage: In Buildings

The VHF radio system doesn't work well inside large commercial building or within some residences.

8. Cost Effective

Each agency has limited funds; a replacement radio system needs to be as cost effective as possible.

9. Scalable

A upgraded or replacement system should be P25 compliant and easy to expand sites/ channels if needed.

©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

Option 1: VHF Enhancement

1. Improved Coverage & Audio Clarity

MINOR IMPROVEMENT.

Slight improvement expected.

2. Sufficient Capacity

POOR.

NO CHANGE. Law/Fire/EMS users must "share" limited channels in each locale.

3. Simple to Use

POOR.

NO CHANGE. Field users & dispatchers must know field user location in order to pick the best site.

4. Reliable

MINOR IMPROVEMENT.

Some improvement due to updated two new microwave links (not related to VHF/UHF/700 radio system).

5. Maintainable

POOR.

NO CHANGE. Okanogan responsible to maintain all sites, site equipment, and subscribers.

6. Interoperable

GOOD.

No change. Most other agencies are using VHF.

7. Coverage: In Buildings

POOR.

Limited in-building coverage.

8. Cost Effective

MEDIUM-HIGH COST.

due to replacement infrastructure, improved microwave links, and replacements subscribers (current version is no longer available)

9. Scalable

NO CHANGE.

Not scalable. Sites and/or channels affect existing system and users. Subscriber radios must be reprogrammed.

Option 2: UHF Replacement

AGENDA
3. Technology Assessment
4. Potential Solutions
5. Next Steps

1. Improved Coverage & Audio Clarity

GOOD.

Improvement expected.

2. Sufficient Capacity

SOME IMPROVEMENT.

Additional channels should allow parsing Law/Fire/EMS users onto separate channels; quantity increase is limited.

3. Simple to Use

POOR.

NO CHANGE. Field users & dispatchers must know field user location in order to pick the best site.

4. Reliable

MINOR IMPROVEMENT.

Some improvement due to updated two new microwave links (not related to VHF/UHF/700 radio system).

5. Maintainable

POOR.

NO CHANGE. Okanogan responsible to maintain all sites, site equipment, and subscribers.

6. Interoperable

POOR.

Most other agencies are using VHF. Some VHF subscribers will need to be kept and maintained for continued inter-operations.

7. Coverage: In Buildings

GOOD.

Improved coverage inside buildings.

8. Cost Effective

MEDIUM-HIGH COST.

Due to replacement equipment (subscriber + infrastructure) and revised microwave network.

9. Scalable

NO CHANGE.

Not scalable. Sites and/or channels affect existing system and users.

Option 3: WSDOT 700 MHz Expansion

1. Improved Coverage & Audio Clarity

GREAT.

Improvement expected. Talk Groups (channels) dedicated to use rather than location.

2. Sufficient Capacity

GREAT.

Significant improvement.

3. Simple to Use

GREAT.

Channels based on USE (not location).

4. Reliable

GOOD.

Major improvement due to updated microwave network resiliency.

(not related to VHF/UHF/700

5. Maintainable

GOOD.

WSDOT radio shop responsible to maintain the radio system equipment; Okanogan responsible for sites and subscribers.

6. Interoperable

GREAT.

Partner VHF channels can be "mapped" to the larger trunked radio system.

7. Coverage: In Buildings

GOOD.

Significantly improved coverage inside buildings.

8. Cost Effective

HIGH COST.

due to replacement equipment (subscriber + infrastructure), revised microwave network, and additional sites.

9. Scalable

GREAT.

Significant improvement. Sites and/or channels can be added without affecting existing system and users.

Option 4: Okanogan 7/800 MHz New Build

AGENDA

3. Technology Assessment

4. Potential Solutions

5. Next Steps

1. Improved Coverage & Audio Clarity

GREAT.

Slight improvement expected. Some channels dedicated to use rather than location.

2. Sufficient Capacity

GREAT.

Significant improvement.

3. Simple to Use

GREAT.

Channels based on USE (not location).

4. Reliable

GOOD.

Major improvement due to updated microwave links

(not related to VHF/UHF/700 radio system).

5. Maintainable

POOR.

NO CHANGE. Okanogan responsible to maintain all sites, site equipment, and subscribers.

6. Interoperable

GREAT.

Partner VHF channels can be "mapped" to the larger trunked radio system.

7. Coverage: In Buildings

GOOD.

Significantly improved coverage inside buildings.

8. Cost Effective

HIGHEST COST due to

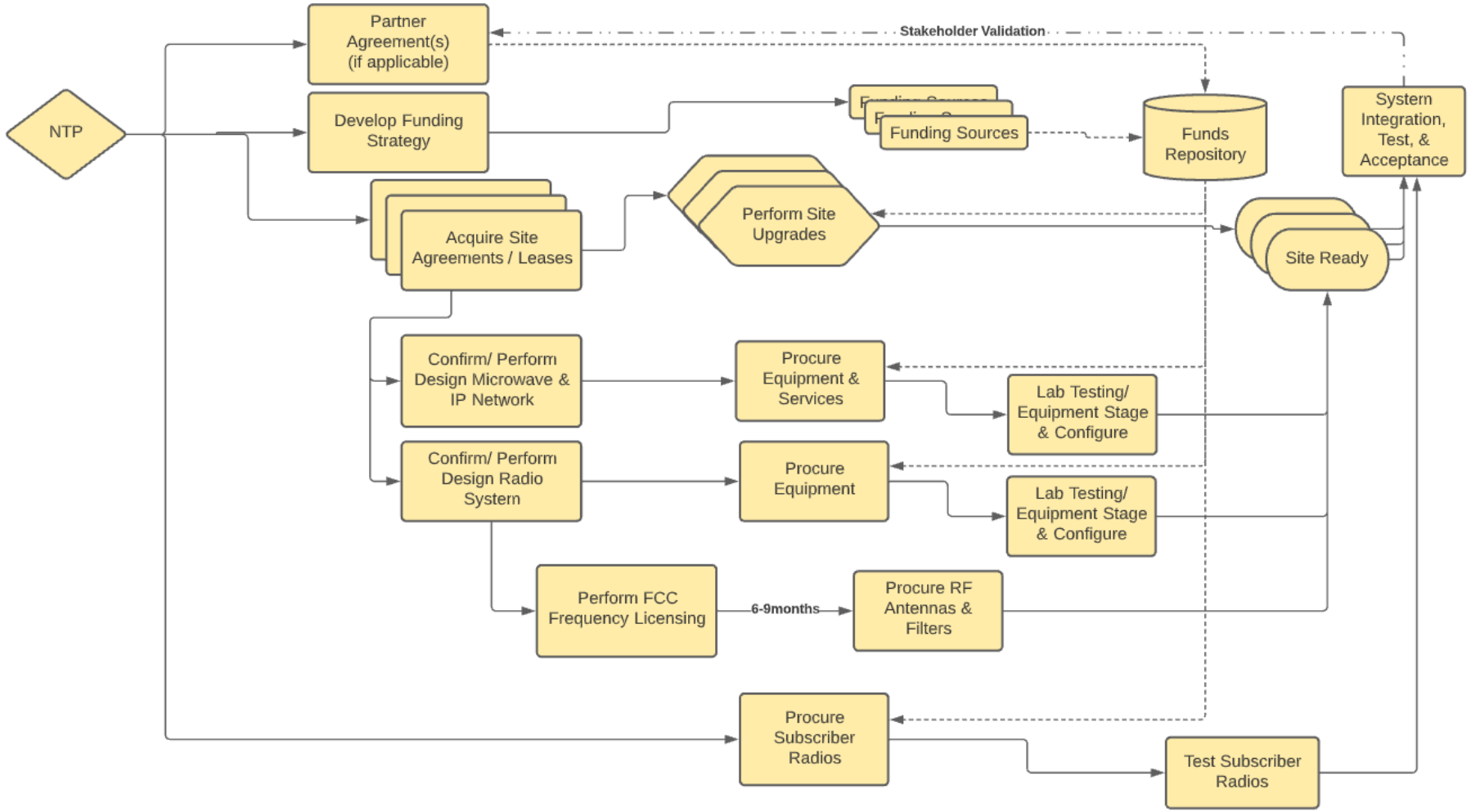
replacement equipment (subscriber + infrastructure) and revised microwave network.

9. Scalable

GREAT.

Significant improvement. Sites and/or channels can be added without affecting existing system and users.

Implementation Process: Options 2, 3, & 4

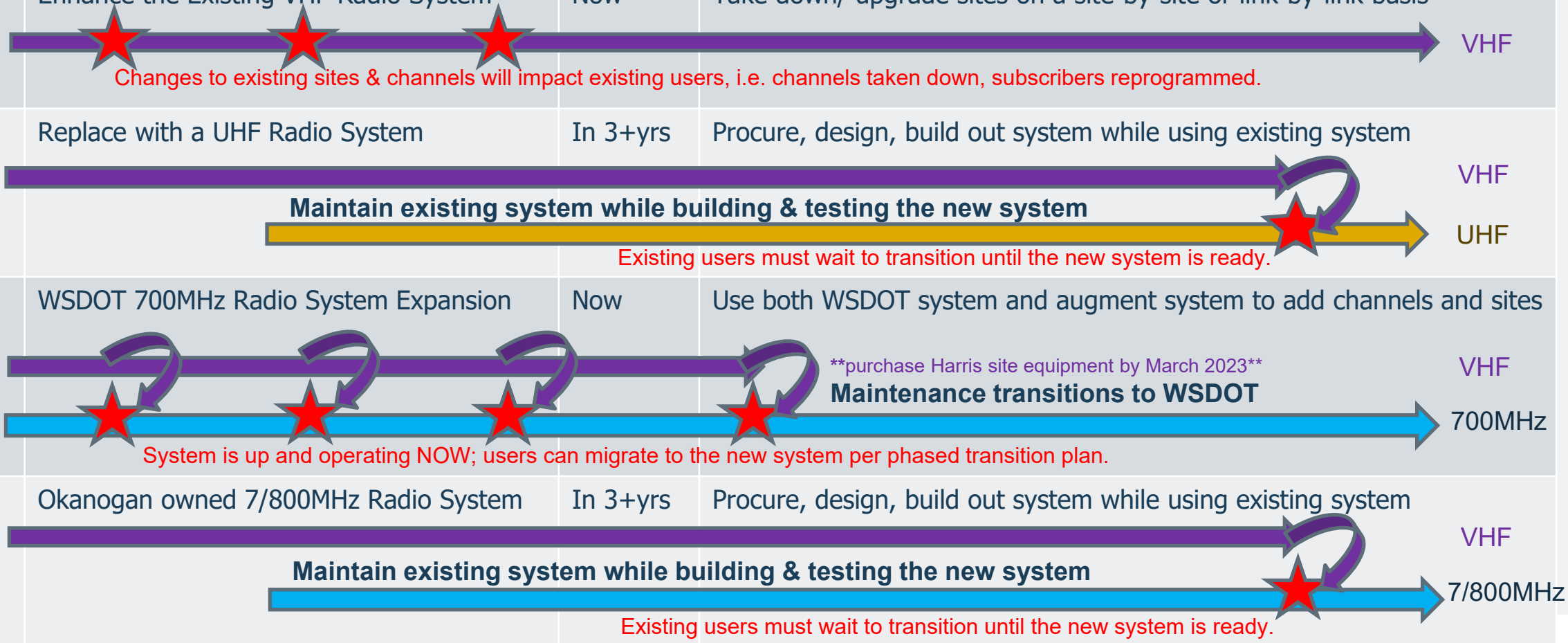


Timeline: Optional Solutions

Impacts existing users

AGENDA
3. Technology Assessment
4. Potential Solutions
5. Next Steps

Option #	Description	On the Air	Impact
1	Enhance the Existing VHF Radio System	Now	Take down/ upgrade sites on a site-by-site or link-by-link basis
2	Replace with a UHF Radio System	In 3+yrs	Procure, design, build out system while using existing system
3	WSDOT 700MHz Radio System Expansion	Now	Use both WSDOT system and augment system to add channels and sites
4	Okanogan owned 7/800MHz Radio System	In 3+yrs	Procure, design, build out system while using existing system



Recommended Solutions

AGENDA
3. Technology Assessment
4. Potential Solutions
5. Next Steps

Option #	Description	Capital Cost vs. On-going Maintenance	Performance
1	Enhance the Existing VHF Radio System	$ Medium-Low Initial Cost $$ Medium On-going Cost	Slightly improved usability; no coverage improvement; improved reliability
2	Replace with a UHF Radio System	$$$ Medium-High Initial Cost $$ Medium On-going Cost	Slightly improved usability; slightly improved capacity; improved indoor coverage
3	WSDOT 700MHz Radio System Expansion	$$$ High Initial Cost $ Low On-going Cost	Highly improved usability; best coverage - most resilient and reliable
4	Okanogan owned 7/800MHz Radio System	$$$$ Highest Initial Cost $$$ Highest On-going Cost	Highly improved usability; best coverage – more resilient and reliable

1
Enhance Existing VHF System
Update infrastructure & subscriber equipment for current make-model; modify FCC licenses for improved usability – capacity

2
Replace with a UHF System
Update equipment for current make-model; replace all subscriber radios; modify FCC licenses

3
WSDOT 700MHz System Expansion
Enhance WSDOT system with additional sites & channels; replace all subscriber radios

4
Okanogan 7/800MHz Radio System NEW BUILD
Build entirely new system; replace all subscriber radios; FCC licenses

NEXT STEPS

- **Need Decision**
  - Option 1, 2, 3, or 4?
- **Decide Strategies**
  - Partnership agreements
  - Site – system – maintenance sharing opportunities
  - Procurement opportunities
  - Funding opportunities
- **Build Project Schedule**
  - Use: Implementation Process Flow Chart
    - Update for specific timeline
  - Work that must start ASAP!
    - Secure real estate (approvals, leases, purchases, etc.)
    - Upgrade existing facilities
    - Develop new sites
- **Kick off the next Project Phase!**

©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.

©2021 Copyright. ADCOMM Engineering, LLC. All Rights Reserved.