Kentucky FirstNet – SLIGP Project

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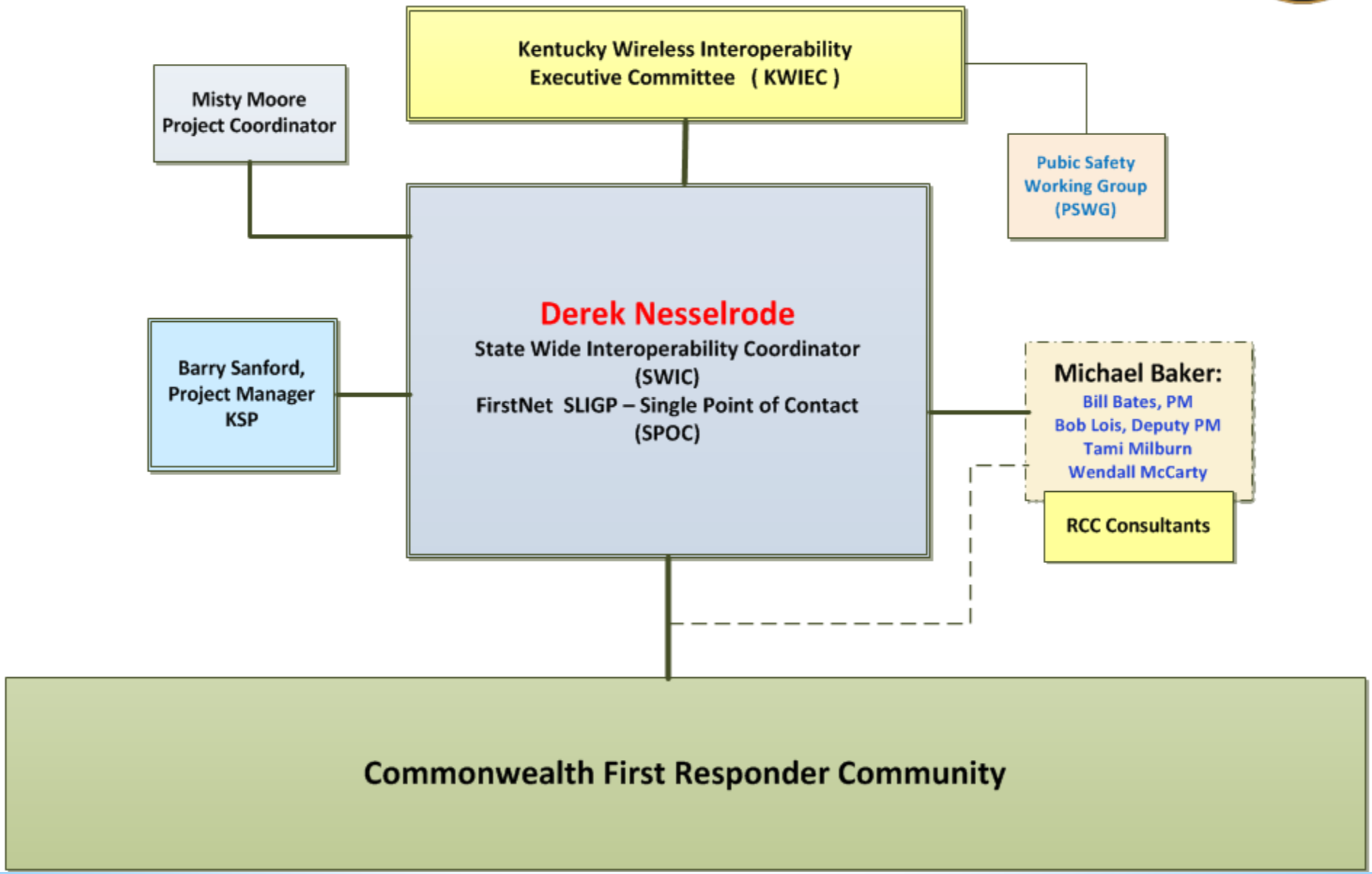
Meeting Agenda

1. Introduction
2. Network / FirstNet / SLIGP Overview
   a) FirstNet and the Network
   b) SLIGP Structure
   c) Decision Process
3. LTE Technology Overview
4. Potential Uses/Applications
5. The Planning Process
   a) Objectives
   b) Initial Suggestions
   c) Action Plan
6. Next Steps

Commonwealth of Kentucky

FirstNet SLIGP Project



Education and Outreach Locations:

Kentucky FirstNet Outreach Program

The locations for the initial phase of Kentucky's FirsNet Outreach program

Alexandria Fire Department
7951 Alexandria Pike
Alexandria, KY 41001

Date: 5/13/2014
Time: 9:00 AM - 12:00 PM

Ashland Community & Technical College
1400 College Drive
Ashland, KY 41101

Date: 5/14/2014
Time: 9:00 AM - 12:00 PM

Kentucky Transportation Cabinet Conference Center
200 Mero Street C101
Frankfort, KY 40622

Date: 5/12/2014
Time: 1:00 PM - 4:00 PM

Kentucky Dam Village State Park
113 Administration Drive
Gilbertsville, KY 42044

Date: 5/22/2014
Time: 9:00 AM - 12:00 PM

Fraternal Order of Police Lodge
150 Corvette Drive
Bowling Green, KY 42101

Date: 5/21/2014
Time: 9:00 AM - 12:00 PM

The Center for Rural Development
2292 South Hwy 2
Somerset, KY 42501

Date: 5/20/2014
Time: 1:00 PM - 4:00 PM

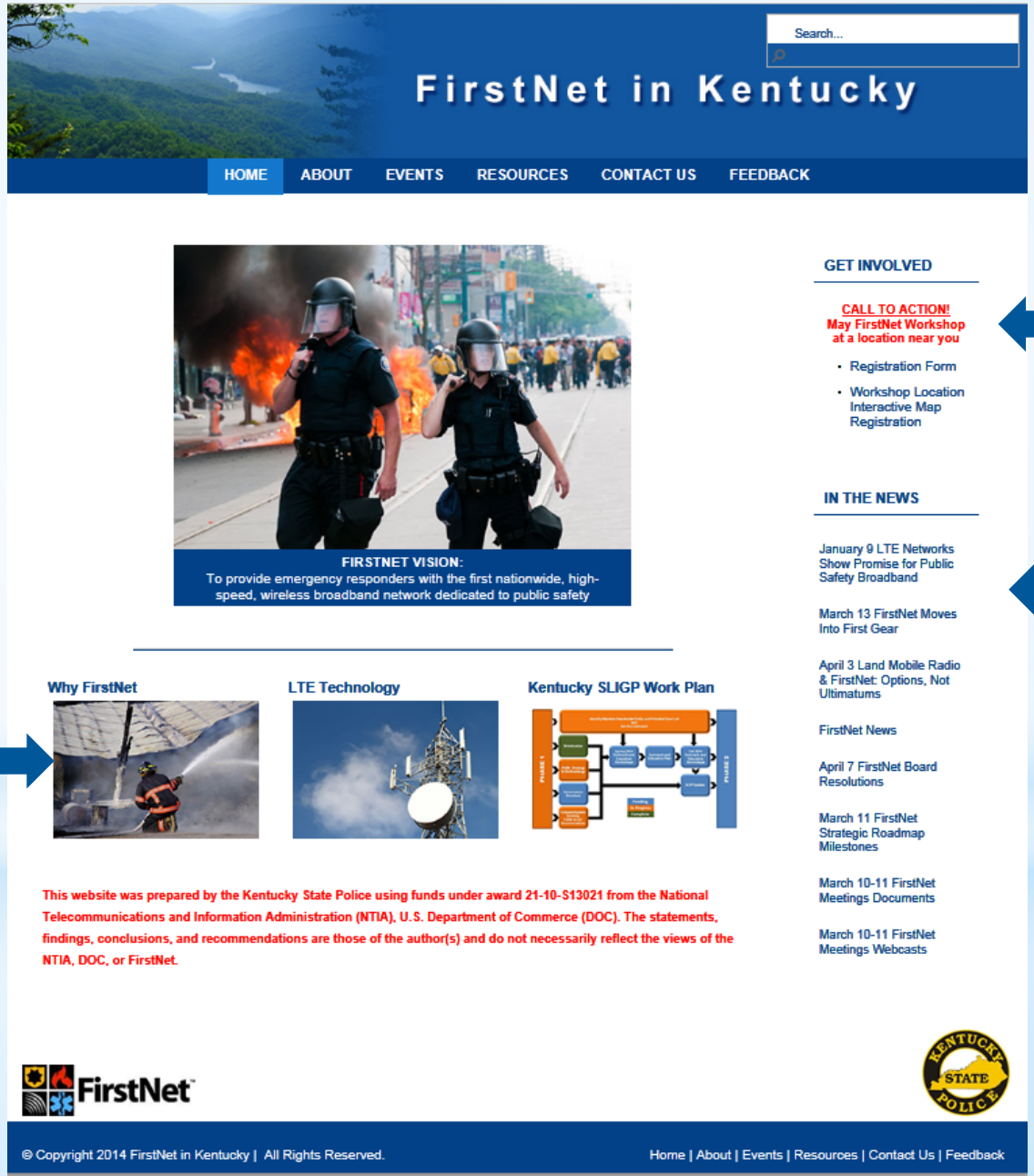
Hazard Community & Technical College
One Community College Dr
Hazard, KY 41701

Date: 5/15/2014
Time: 9:00 AM - 12:00 PM

Overview of Education/Outreach Sessions

- **Session One**
  - Introduction and high level overview of the project and what to expect
- **Session Two**
  - Detail on the project, updates and timelines
  - Preparation for requirements gathering
- **Session Three**
  - Focused on requirements gathering
- **Session Four**
  - Focused on asset data collection

Website: https://www.kyfirstnet.com/



Action Items

News

Educational Modules

Website: https://www.kyfirstnet.com/

ABOUT

- About This Site
- About FirstNet
- About FirstNet in Kentucky
- The Act of 2012
- Executive Summary

Events

Title		Description	Registration
Frankfort - Monday, May 12, 2014 1:00-4:00	...	Kentucky Transportation Cabinet Conference Center 200 Mero Street Frankfort, KY 40622	Register
Northern Kentucky - Tuesday, May 13, 2014 9:00-12:00	...	Alexandria Fire Department 7951 Alexandria Pike Alexandria, KY 41001	Register
Ashland - Wednesday, May 14, 2014 9:00-12:00	...	Ashland Community & Technical College 1400 College Drive Ashland, KY 41101	Register
Hazard - Thursday, May 15, 2014 9:00-12:00	...	Hazard Community & Technical College One Community College Drive Hazard, KY 41701	Register
Somerset - Tuesday, May 20, 2014 1:00-4:00	...	The Center for Rural Development 2292 South Hwy 2 Somerset, KY 42501	Register
Bowling Green - Wednesday, May 21, 2014 9:00-12:00	...	Fraternal Order of Police Lodge 150 Corvette Drive Bowling Green, KY 42101	Register
Paducah - Thursday, May 22, 2014 9:00-12:00	...	Kentucky Dam Village State Park 113 Administration Drive Gilbertsville, KY 42044	Register

May 2014

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
27	28	29	30	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
	1:00 pm - 4:00 p Frankfort - Mon	9:00 am - 12:00 Northern Kentu	9:00 am - 12:00 Ashland - Wedr	9:00 am - 12:00 Hazard - Thurs		
18	19	20	21	22	23	24
		1:00 pm - 4:00 p Somerset - Tue	9:00 am - 12:00 Bowling Green	9:00 am - 12:00 Paducah - Thur		

RESOURCES

- Presentations
- Kentucky Work Plan
- FirstNet Fact Sheets
- FirstNet Links
- Other Links
- FAQs

Feedback

Please use this form to provide any feedback or questions concerning, FirstNet, or emergency management and/or public safety items as related to FirstNet.

Note: Fields indicated by a red asterisk are required and must be completed in order to proceed.

Last Name:*
First Name:*
Organization Name:*
Street Address:
City:
State:
Zip:
Email:*
Feedback Category:
Comments:

To submit your feedback, type the characters you see in the picture.
Picture:

If you cannot read the image, click the refresh button for a new image.

Type Characters:

Submit

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FirstNet / SLIGP Overview

Historic Legislation for Public Safety

On February 22, 2012, the President signed into law HR 3630, "The Middle Class Tax Relief and Job Creation Act of 2012," which includes Title VI: "Public Safety Communications and Electromagnetic Spectrum Auctions"

Broad Scope of Title VI --

- Created the First Responder Network Authority (FirstNet) in NTIA to Administer the PS BB Network
- D Block spectrum reallocated to PS
  - FirstNet will be the sole licensee!
- $7B for design of Nationwide BB Network
  - ➢ Permanent funding to come from network user fees and lease fees
- **$135M for planning and implementation grants**
- $100M + 200M* for NTIA research and development
- $115M for Next Generation 9-1-1 Grants

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FirstNet Duties & Responsibilities

- Develop and implement a nationwide system configuration
- Issue system construction RFP's
- Ensure the ongoing maintenance, operation and improvement of the network
- **The NPSBN would be designed with broad input from public safety agencies at the state, territory, county, municipal, and tribal levels**
  - Input will come during the consultation process
  - **We are now beginning this process . . .**

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Title VI Description of the Network --

- Under the Act, a separate and distinct NPSBN would be designed and developed principally for public safety use
- The NPSBN would be a single interoperable network by itself and not a network of network
- The NPSBN would be designed with broad input from public safety agencies at the state, territory, county, municipal, and tribal levels

The Network --

The National Public Safety Broadband Network (NPSBN) will:

- ✓ Be based on new commercial standards (LTE);
- ✓ Include national & regional data centers (Cores);
- ✓ Include a Radio Access Network (RAN) and backhaul;
- ✓ Be constructed, managed, maintained and operated taking into account the plans developed in the State, local, and tribal planning and implementation grant program;
- ✓ Leverage existing commercial wireless infrastructure;
- ✓ Be integrated with PSAP's;
- ✓ *NOT* replace current LMR system anytime soon (if at all).

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Devices For The Network

FirstNet will work with the vendor community on portable devices and in-vehicle routers

	Portables	In-Vehicle Routers	Specialized	Accessories
Device Types				
Category Driver	Build out to gain economies of scale		Special operational needs	Unique uses
Function	• Smartphone • Tablets • Modems	• Routers • Hotspots • Consoles	• Drones • Portable repeaters • Rovers	• Ruggedized cases • Battery packs • Chargers, mics.
Connectivity	• LTE, CDMA, HSPA • LMR/ P25 • Wi-Fi, Bluetooth • Direct mode	• LTE, CDMA, HSPA • Wi-Fi • Ethernet • USB	• LTE, CDMA, HSPA • LMR/ P25 • Satellite repeaters • Location services	• Bluetooth • USB • WiFi
Location Enabled	Yes	Yes	Some	n/a
Band 14 Support	2014	2013/2014	2015+	n/a

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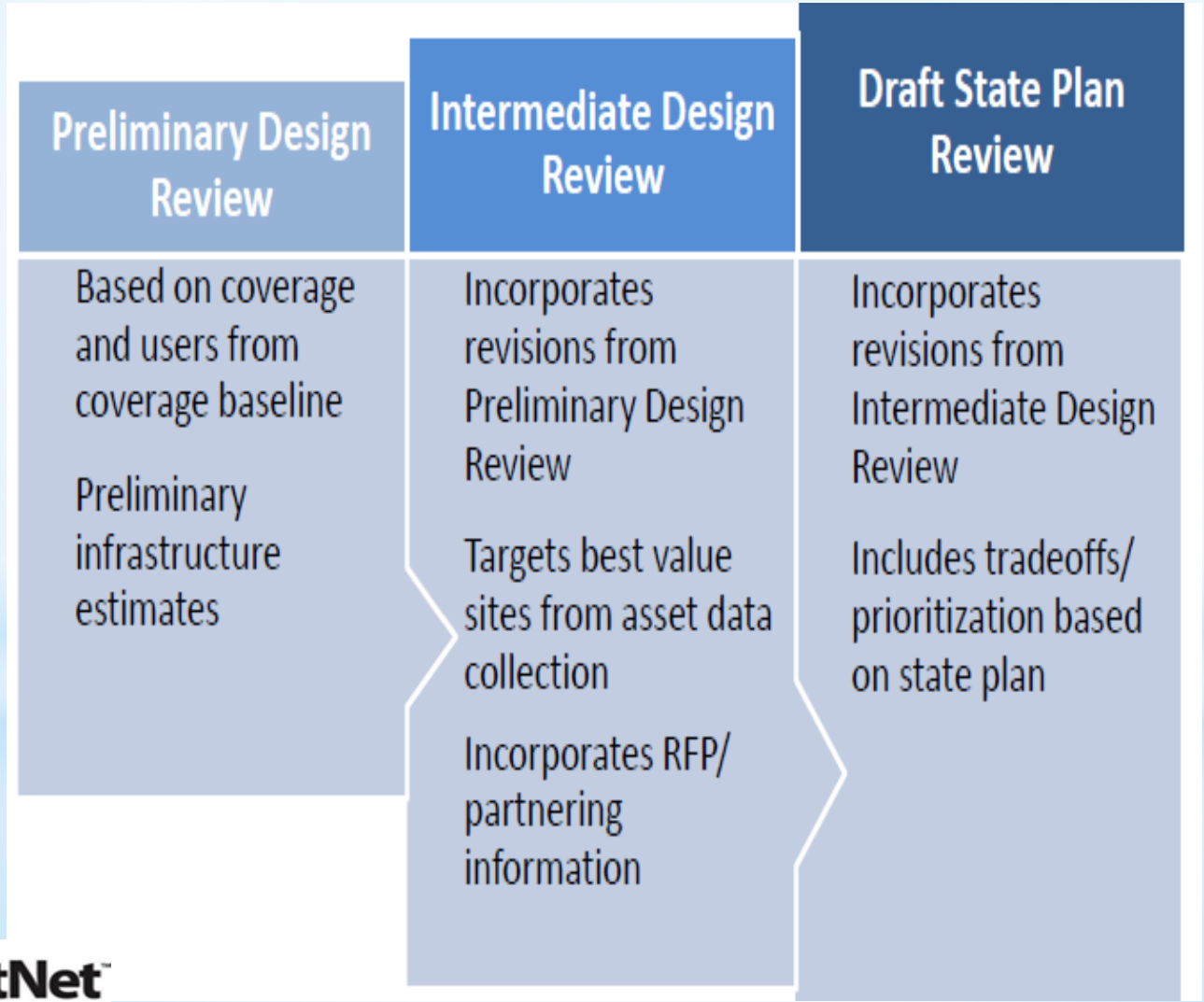
State and Local Implementation Grant Program (SLIGP) - *Structure*

- **Phase One** to be used for the following activities;
  - Planning, consulting, and development activities in preparation for consultations with FirstNet;
  - Defining coverage needs, user requirements, and network hardening and resiliency requirements;
  - ***Collecting requirements and establishing a baseline design***
- **Phase Two** to be used for:
  - Preparing for additional consultation with FirstNet and performing data collection activities;
  - ***Identifying network resources and developing a more detailed design and business plan.***

SLIGP – Eligible and Ineligible Costs

- **Eligible Costs:**
  - Personnel Costs;
  - Costs associated with planning meeting, including travel costs;
  - Costs to develop, modify, or enhance statewide plans and governance structures;
  - Costs for communications, education, and outreach activities;
  - Costs to develop standardized MOAs;
  - Costs to identify potential public safety users;
  - Administrative, legal and training costs;
- **Ineligible Costs:**
  - Site preparation;
  - Broadband deployment, installation, construction, or the acquisition of equipment used to provide wireless broadband services.

FirstNet Vision of the Consultation and Design Process



The Decision Process…

- Upon completing the State Plan, the FirstNet Authority will provide KY:
  - Details of it's proposed portion of the FirstNet build out plan (RAN Design), and
  - The Kentucky build out funding and business plan.
- States have 90 days to determine if the FirstNet offer meets its public safety needs and decide whether to accept the FirstNet offer (Opt-In) or to (Opt-Out) and develop its own network

(*States can still apply for grant funding and to lease needed spectrum

The Business Case

FirstNet is Developing the Business Case for the National Public Safety Broadband Network (NPSBN):

- ✓ Funding for the build-out will come from the $7B;
- ✓ The network must be self-sustaining;
- ✓ Users will pay a monthly service fee for use of the network;
- ✓ States that "Opt-Out":
  - ✓ Will be allowed to apply for funding; pay a spectrum lease fee; pay a core connection fee;
  - ✓ Will not be allowed to offer commercial service; all funds collected must be used for maintenance and upgrades.

To develop the business case, FirstNet will need to know: coverage and capacity requirements; number of users; assets available

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LTE Technology Overview

LTE is Unique

- Designed from ground up (e.g., flat IP network); multiple releases;
- Complex set of processes to improve spectral efficiency and maximize data throughput (Uplink [UL] to 75 Mbits/sec, Downlink [DL] 300 Mbits/sec [in a 20 MHz channel]);
- Many advanced techniques: OFDM, MIMO, antenna sectorization, FEC, fast dynamic scheduling, link adaptation techniques, power control techniques, adjacent cell interference techniques;
- Issues: Frequency reuse = 1 (more interference limited than earlier systems with reuse =7); high peak to average RF power; still new technology; not designed for public safety

LTE Systems differ from LMR

- Major System Performance Attributes
  - It's coverage *and* data capacity (# users, speeds, BER, latency),
- User Experience
  - Data speeds will unexpectedly increase/decrease because of other users (like a cable broadband system),
- Priorities/QoS
  - LTE has multiple mechanisms; must be pre-planned for PS operations,
- Failure Modes
  - Complex network centric system; currently no direct mode,

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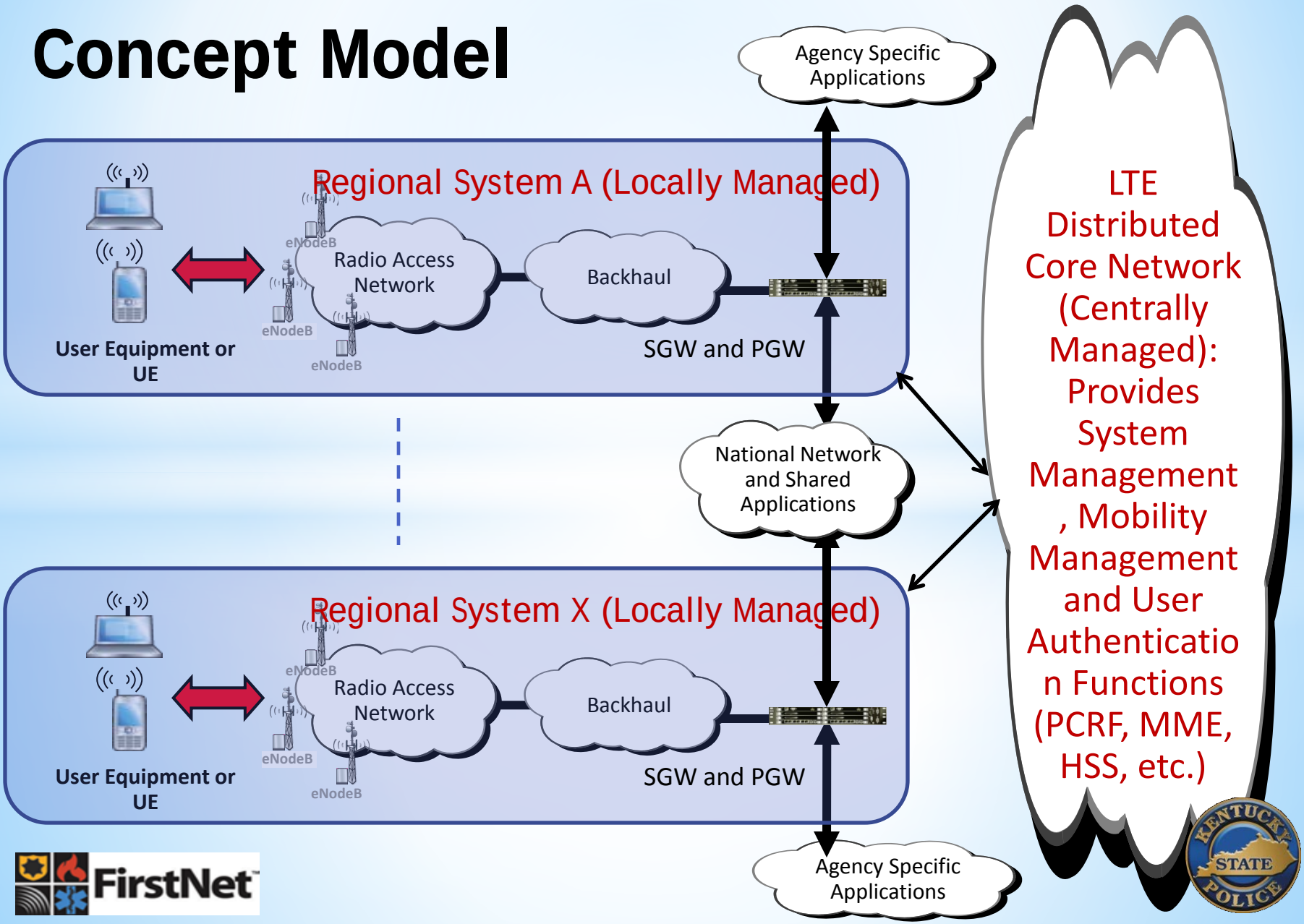
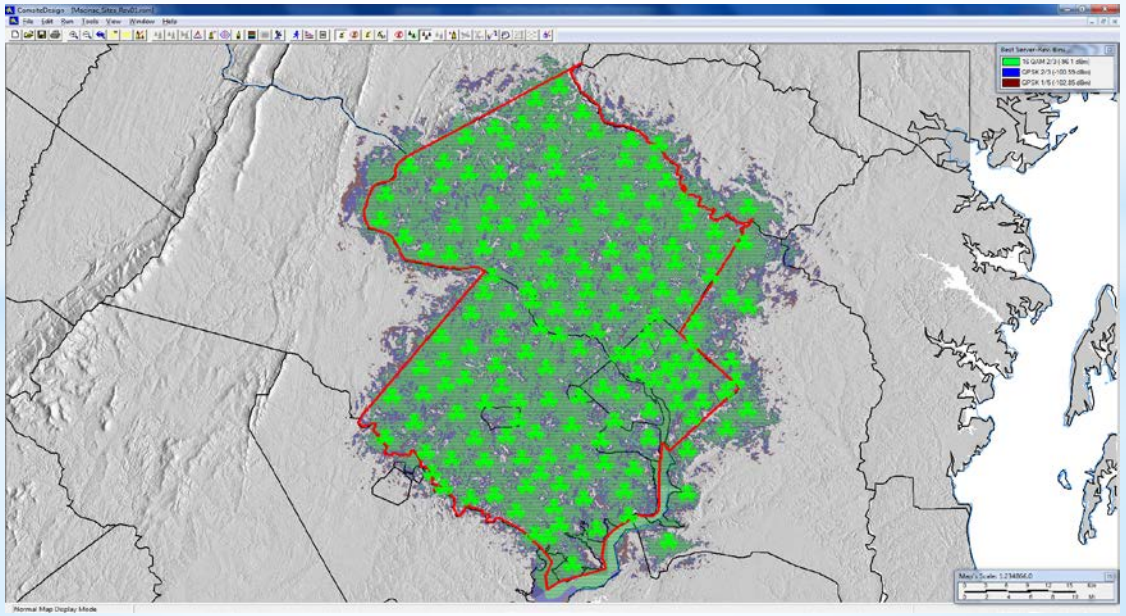
PS LTE Distributed Core/Local RAN Concept Model



LTE Coverage Considerations

- Existing LMR sites may be a starting point for LTE deployment, although antennas are generally lower
- Many more sites will be required for ubiquitous LTE coverage (possibly 5 x sites)
- Same frequency block used at all LTE sites – neighboring site interference affects performance/capacity



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Capacity vs. Coverage

- Most of the industry discussion has been about coverage
- Capacity is equally important, even in rural areas
  - Examples: 9/11 Shanksville PA; Horrific PA Amish school house massacre
  - Although rural areas may have less responders; as a result incident commanders may therefore be more dependent on multiple video feeds
- LTE systems reuse the same frequency blocks at every cell site, so adjacent cell sites can interfere with each other and reduce capacity
- Capacity (in megabits/second) falls off rapidly away from the center of the cell

Designing for coverage Designing for Capacity

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Issues Impacting "Delivered Capacity"

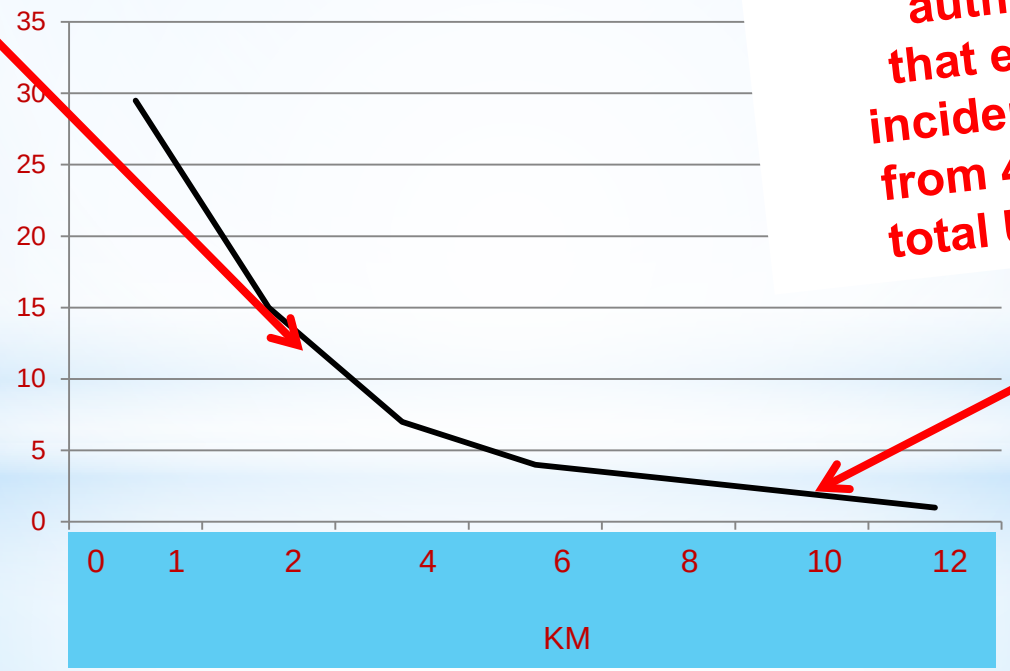
- "Delivered Capacity" is bandwidth that a user has available at her location. It is affected by:
  - User location to cell center (LTE 'gear shifts' data speed between 64QAM, 16 QAM, and QPSK)
  - User location to adjacent cell (interference)
  - Antenna sectorization
  - MIMO use
  - User's prioritization
  - User's app bandwidth and prioritization
  - App's FEC and jitter, latency, packet loss sensitivities
  - Nature of user's traffic, and adjacent users' traffic: bursty, variable rate, continuous, random (stochastic)
  - Adjacent users in same sector and their apps/priorities
  - Total cell site backhaul capacity vs. total bandwidth demands from all sectors of that cell

Overall capacity decreases as the number of devices increases and a user moves further from the Site

Data Capacity vs. Distance to Cell Site

12 Video Feeds
(1 Mbps each)
At 2 KM
(1.3 mi) away

Uplink Mbps vs. Distance to Cell Antenna
LTE, 10 MHz x 10 MHz



Multiple authors suggest that even common incidents will require from 4.8 to 6.3 Mbps total UL Data speed!

Only One
Video Feed
At 10 KM
(6.5 mi) away

From Tait presentation at 2013 Radio Club of America Tech Symposium

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Issues Impacting "Delivered Capacity"

- Operational Implications:
  - Delivered capacity to a particular user will change over time depending on the changes to the factors in the previous slide
    - Completely different experience from voice trunking
    - For example this will result in inexplicable changes to video quality during an incident
  - Depending on the incident's needs, It may be necessary to make on-the-fly changes to user and application priorities in real time

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Backhaul Network Considerations

- LTE sites require a large capacity backhaul connection; generally 50-150 Mbps depending on topology
  - Microwave or Fiber
- Backhaul will be larger percentage of network deployment (possibly 40%)
- Backhaul capacity becomes a significant deployment driver

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System Roaming

- Public Safety users will have access to common applications and their “home” applications anywhere in the country
  - The NPSBN will have a single PLMN ID
- Opportunity to roam onto commercial system when NPSBN coverage is lacking
  - Applicable to certain geographic areas
  - Devices must be multi-band capable
  - Not likely to have priority service when roaming
  - Roaming charges may apply

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Potential Uses & Applications

Applications Supported by the NPSBN

- High Speed Internet Access (Speeds will vary)
- Status Web Page
- VPN Support
- SMS/MMS Services
- Video Services (as bandwidth allows)
- Hosted Applications (NCIC. CJIC, IAFIS, NFIRS)
- Dynamic Priority and QOS Adjustments (Emergency, Immediate Peril, ICS Incident Priority, Itinerant User)
- 9-1-1 Services (traditional and NG)
- Cellular Telephony (Full duplex telephone sessions (Future))
- Commercial Mobile Alert System (CMAS)
- PTT Voice (Non-Mission Critical and Mission Critical (Future))

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Example Data Uses by Service

- Law
  - Real time video
  - Arrest process check list
  - AFIS Fingerprint scanner
  - Airborne platform video sharing
  - Officer cam
  - ALPR

- Fire
  - Vehicle extrication info based on license plate
  - GIS info for wildland fires
  - Wildland personnel tracking
  - In-building personnel tracking

- EMS
  - ePCR from CAD to EMT to hospital
  - Geo based illness or pandemic info
  - 2 way video hospital –scene
  - 12 lead + O2 sat + EtCO2
  - ‘Just in Time’ video refresher enroute

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The APCO Application Community

- In April 2013, APCO launched **AppComm**, an on-line community focused on maintaining a collection of applications related to public safety and emergency response, for use by the general public and first responders: **http://appcomm.org/**
- APCO has:
  - An MOU with FirstNet to collaborate on apps;
  - Begun development of an ANSI standard for apps that interface with public safety communications centers;
  - Published the key attributes of effective apps for PS and emergency response

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SLIGP Planning Objectives for KY

NPSBN/SLIGP High Level Objective

The primary objective of the SLIGP work is to ensure that the Commonwealth obtains a RAN that meets the needs of KY and all of its constituent public safety agencies. This can be achieved:

- Via the proposed RAN offered by FirstNet "Opt-In";
- Via a RAN developed and managed by KY "Opt-Out".

The planning approach maintains these options

High Level Planning Objective -- *Process*

To accomplish Commonwealth objectives, the Baker/RCC Project Team will work with KSP and the stakeholder community to:

- Ensure the needs of KY for the NPSBN are documented;
- Ensure KY is adequately prepared for consultation with FirstNet;
- Evaluate the FirstNet proposed RAN design, to determine if it meets the needs of the Commonwealth;
- Recommend action to the Commonwealth in the event the RAN offered by FirstNet does not meet KY needs

Planning Process

The KY Broadband team; Members of the KWIEC and the PSWG; the Baker/RCC team met in April to:

- Review the NPSBN overview and update provided by the Office of Emergency Communications (OEC);
- Review the OEC baseline coverage suggestions for KY;
- Establish KY's objectives for the NPSBN and the planning process;
- Discuss the process and next steps.

Established Planning Objectives for KY

- Compile and document requirements and communicate to FirstNet;
  - Review OEC coverage suggestions, plus additions
- Address goals within the SCIP;
- Maximize the use of the NPSBN throughout the Commonwealth and include a broad set of users;
- Maximize the use of existing state assets;
- Coordinate with other on-going state initiatives;
- Minimize device acquisition and maintenance cost.

Requirements – *Coverage Objectives*

- OEC provided valuable data and a "suggested" baseline to be reviewed and updated;
  - Metro/High-Traffic Areas (>1000 people per Mile^2):
    - In-building (one wall minimum)/Handheld coverage
  - Outside High Traffic Areas (>500 people per Mile^2)
    - Handheld / Partial In-Building Coverage
  - Interstates and Rural Areas (>5 people per Mile^2)
    - Vehicle level coverage (some handheld)
  - Rural areas (<5 people per Mile^2):
    - Satellite/Deployable

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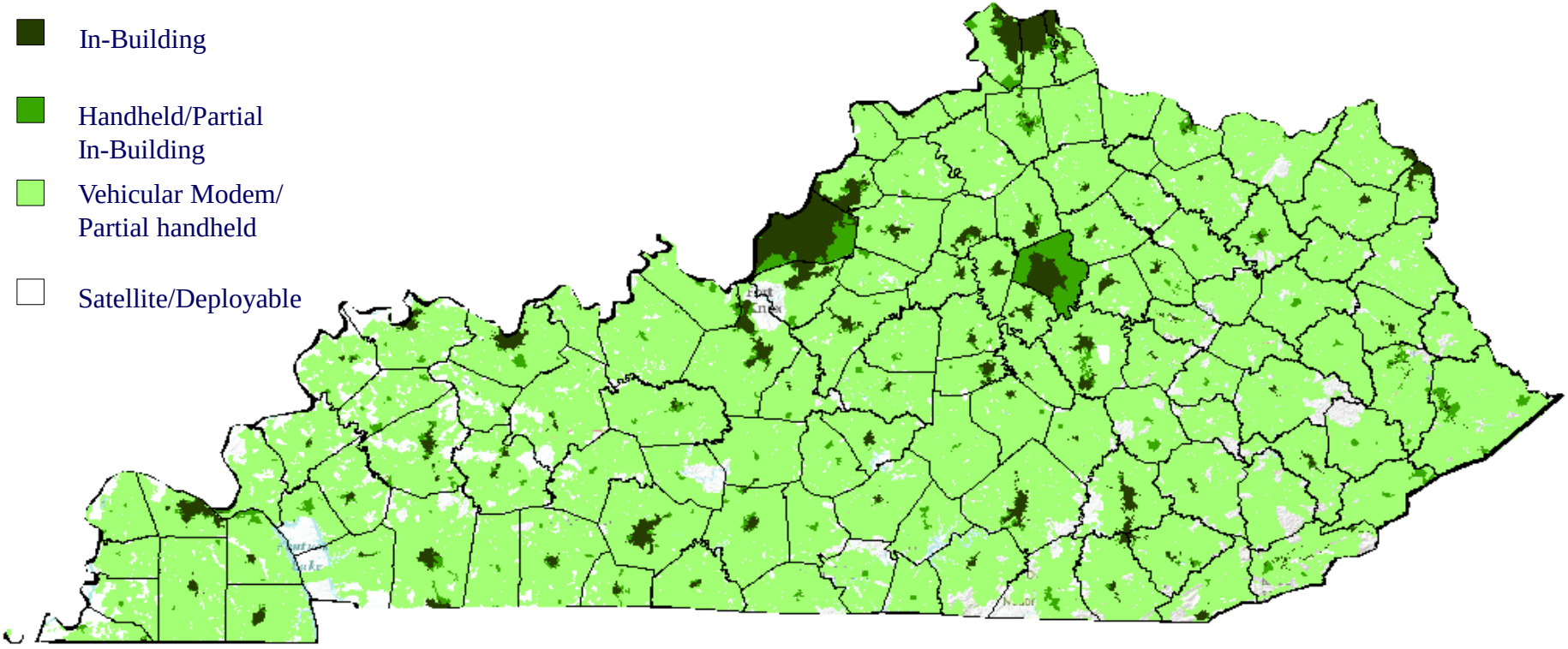
Coverage – OEC Suggested Baseline

OEC Starting Point

- Interstates, major U.S. highways and non-CDP areas with more than 5 people per square mile (using census blocks)

- All other areas would use Satellite/ Deployable coverage.



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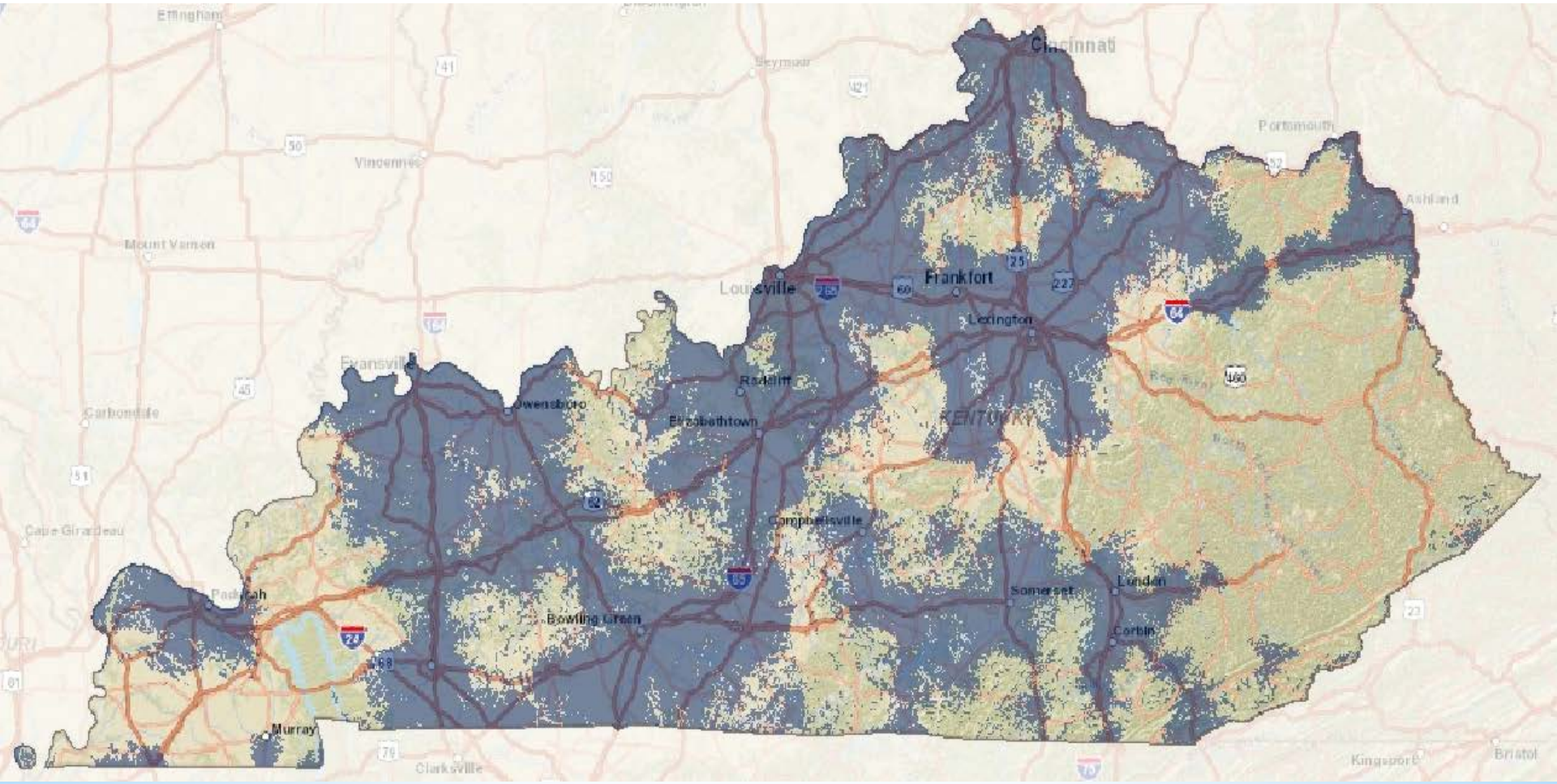
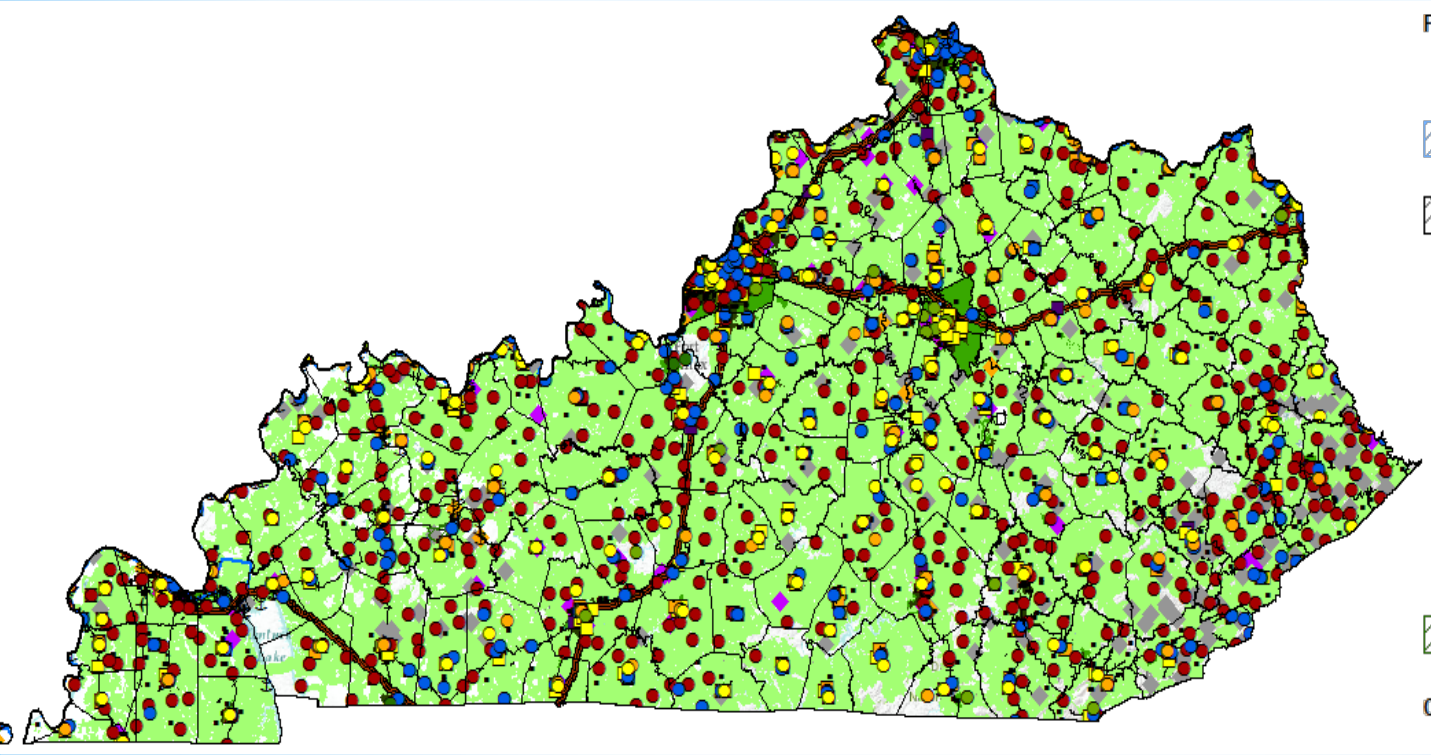
Commercial LTE Coverage --



Requirements – Coverage Priorities for Kentucky

- Key facilities for coverage:
  - First responder facilities;
  - Schools;
  - Hospitals;
  - Specific municipal facilities;
  - Others;
- Address coverage in and around these facilities

Coverage Additions -- OEC Baseline Data



Agencies
- EMS Departments
- Federal
- Military
- Emergency Management
- Law Enforcement
- Fire Departments

Facilities
- Major State Government Building
- Court Houses
- Prison Areas
- Corrections
- Airport
- Airports
- Local Emergency Operations Centers
- State Emergency Operation Centers
- Urgent Care Facilities
- Hospitals
- PSAP
- Schools
- Ports
- Amtrak Stations
- Air National Guard (ANG) Sites
- Army National Guard (ARNG) Installations
- Canada and Mexico Border Crossings

Critical Infrastructure
- Manufacturing
- Hazardous Materials Routes
- Energy
- Nuclear Plants
- Dams
- Public Venues

Requirements - *Capacity*

- Establishing capacity objectives:
  - OEC provided valuable data for agencies and locations;
  - KY Project Team is compiling a list of stakeholders and agencies within the Commonwealth;
    - The needs of each of these agencies will be compiled with input received during the needs assessment;
  - Also address specific events throughout Kentucky --
    - Derby; Thunder Over Louisville; World Equestrian Games;
    - Basketball and Sports Games; Other large events?;

Planning Objectives: *SCIP Goals*

- Replace Kentucky Wireless Information Network Service (KyWINS); Support KyWINS Messenger
  - Will drive coverage
- Achieve sustainable funding in the current fiscal climate is a priority for Kentucky.
  - Will drive the business plan
  - Legislation requires the network to be self-sustainable

Planning Objectives - *Users*

- Maximize the use of the NPSBN throughout the Commonwealth -- include a broad set of users:
  - Public safety and First Responders,
  - Other agencies and responders (EMA, DOT, public works, etc.),
  - Local government and elected officials,
  - Federal users operating in the Commonwealth,
  - Utilities, telcos, etc.

Planning Objectives - *Assets*

- Maximize the use of existing assets*: Government *and* commercial;
  - Existing communication sites;
  - Potential communication sites (government-owned lands, tall buildings, etc.);
  - Backhaul Infrastructure;
  - Staff and human resources.
- Maximize synergies with on-going or planned projects
  - Next Generation Kentucky Information Highway (NG KIH).

*FirstNet will provide a list of attributes to be used for asset data collection

SLIGP Planning:
Action Plan and Next Steps

Current Action Plan - *Establish Coverage Requirements*

- Distribute OEC proposed coverage boundaries on a county-by-county basis:
  - County reps to review and provide feedback and suggested changes;
- Compile list -- buildings and facilities to be covered:
  - Compare facility locations relative to proposed coverage boundaries;
  - Determine what additions are required;

Be Prepared to Respond to these Requests

Current Action Plan -- *Identifying Potential Users*

- Work with the Commonwealth and the individual counties to identify all first responder and support agencies that would potentially utilize the NPSBN to:
  - Protect life and property;
  - Respond to incidences and emergencies;
  - Stabilize incidences and prevent further damage;
  - Enhance situational awareness and information management;
  - Recover from emergencies and restore critical infrastructure.

Be Prepared to Review Current Agency List

Future Action Plan - *Establish Capacity Requirements*

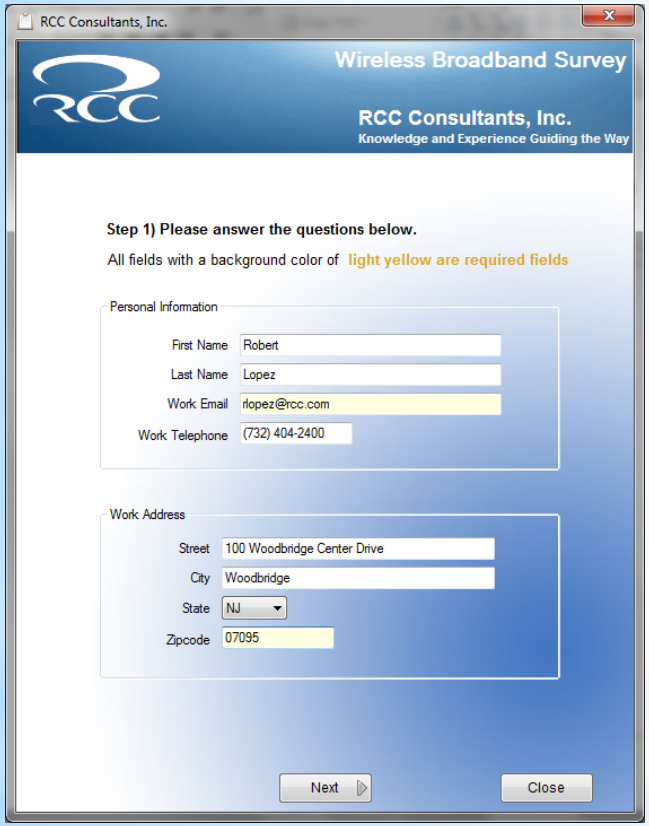
- Baker/RCC team will perform a geographically – based needs assessment to compile PS broadband capacity needs:
  - OEC recommendations do not address capacity;
- The aggregated coverage/capacity needs will drive the design for the RAN within the Commonwealth;
- The requirements will be communicated to FirstNet and used during the consultation process.

Capacity Needs Assessment Process

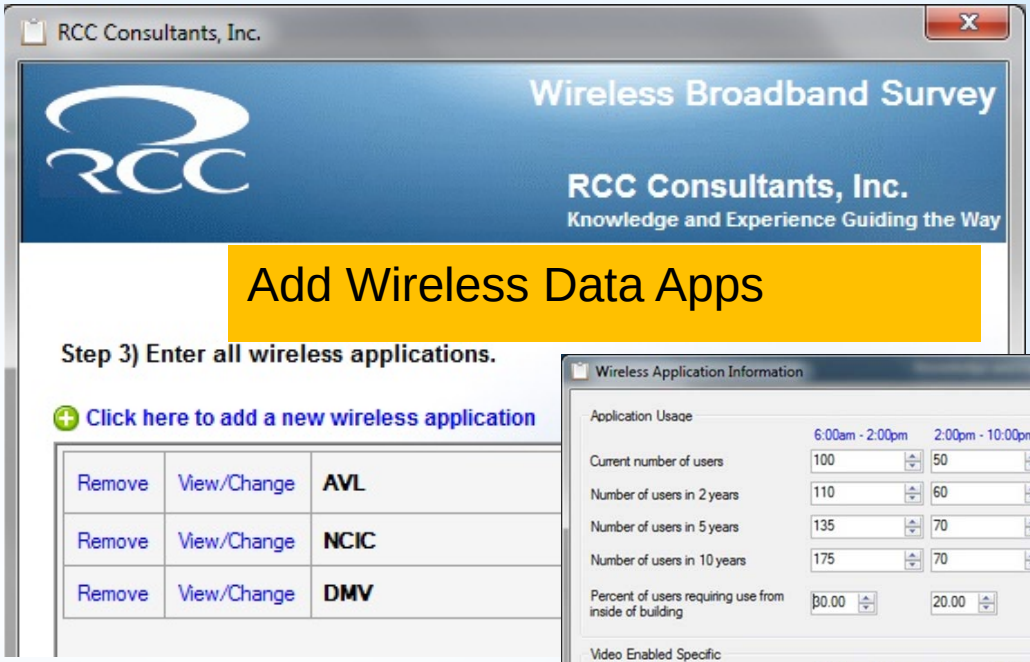
- The needs assessment will include:
  - Number of users;
  - List of applications by agency/department;
  - Usage patterns by agency/department geographically throughout KY;
  - List of incident types:
    - Number/mix of resources by incident type:
    - Typical application usage patterns by resource during an event:
    - If available, a map of incident types and frequency on a statewide basis.

Future Correspondence will Request Your Input

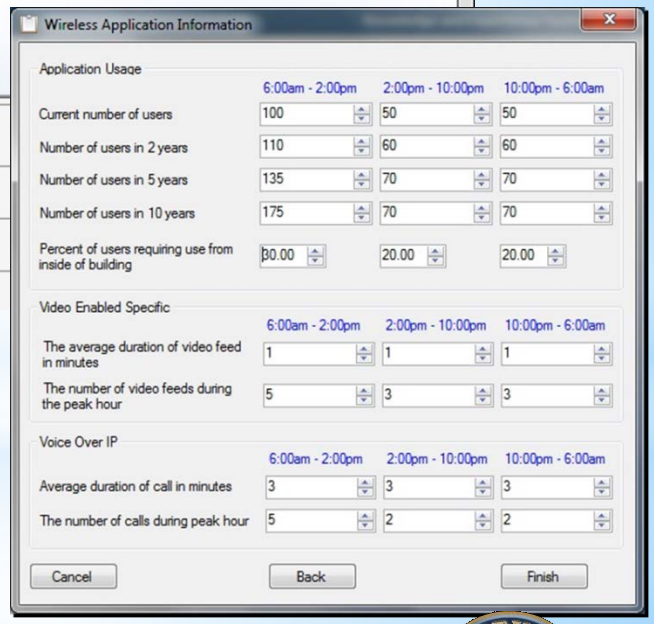
Broadband Data Needs Assessment On-Line or Desktop Application



Begin Survey



Add Wireless Data Apps



Add Usage Patterns, Number of Users by Department Expected Data Rates and Latencies

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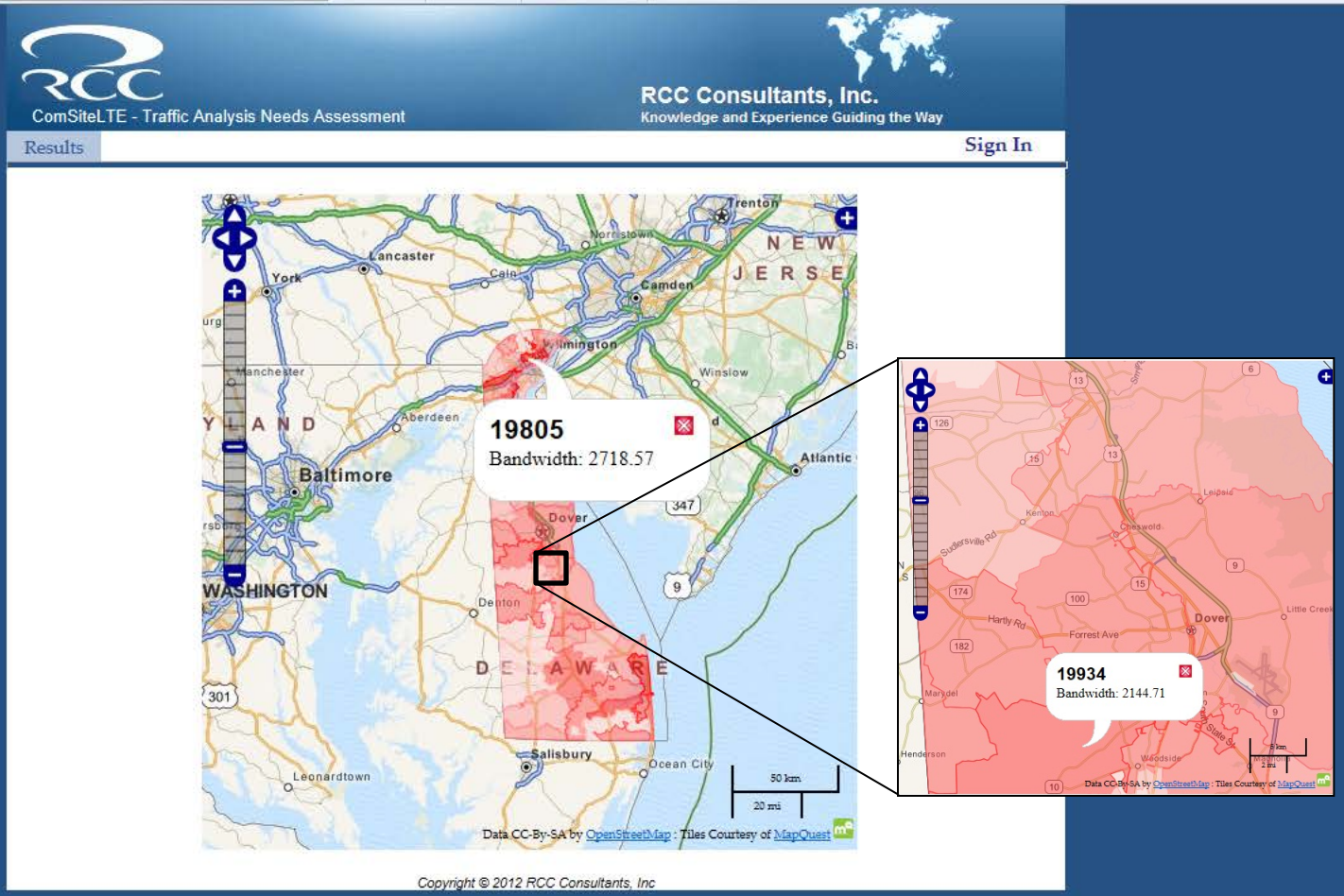
Example Traffic Data Layer



Broadband Data Traffic Density Layer in Mbps

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KENTUCKY STATE POLICE

Next Steps: Planning Sessions 2 and 3: Needs Assessment and Traffic Definition

- Prepare users for and conduct needs assessment:
  - Compile list of users today – consider the future
  - Compile list of applications used today – consider future;
  - Identify usage patterns by department geographically throughout the Commonwealth;
  - Investigate existing usage reports;
  - Investigate historical information on events and incidences (locations, users involved, applications, etc.).

Additional Information to Come

Education and Planning Session 4: Identification of Infrastructure

- Recommend participating agencies begin to identify potential infrastructure assets that can be used in the NPSBN deployment. Potential assets include:
  - Existing towers/water tanks;
  - Building rooftops;
  - Potential site locations;
  - Backhaul (fiber, microwave);
  - Data centers;
  - Staffing: maintenance, PMs, technicians.

Additional Information to Come

Questions and Discussion