



Municipal “Wi-Fi”: Community Benefits of Leveraging New Wireless Technology

Municipal wireless networks can improve emergency preparedness, increase efficiency of municipal services, encourage business development, and help erase the digital divide. Learn how Massachusetts municipalities are using and benefiting from wireless networks. Discussion will be of a non-technical nature, allowing officials with little or no technology experience to participate.

PANELISTS

Den Connors is Systems Administrator in Pepperell.

Kyle Hinkle is the Executive Director of the Orleans Chamber of Commerce.

Scott Wilder is the Brookline Police Department’s Director of Technology.

James Malloy is Town Administrator in Sturbridge.



Municipal Wireless Network for the Town of Pepperell

Municipal “Wi-Fi”: Community Benefits
of Leveraging New Wireless
Technology

Massachusetts Municipal Association Annual Meeting
January 12, 2007



Municipal Wireless Network for the Town of Pepperell

Pepperell's do-it-yourself approach to establishing wireless Internet connections for municipal buildings throughout town

- Why did Pepperell implement a wireless network – rationale and benefits
- How it is being implemented – the low-cost approach
- Suggestions for implementations in other Massachusetts towns



Rationale & Benefits for a Town Wireless Network

- Rationale for a small town installing a wireless network
 - Reducing costs
 - Monthly charges for telecommunications – phone and internet connections to many buildings
 - Benefits of new technology
 - What additional features does a private, town-wide computer network provide?



Benefits of Reducing Telecommunications Costs

- **DPW facilities**
 - Sewer Pumps
 - Water Pumps
 - Water Tanks
 - Irrigation Pump
 - Sheds
 - Wastewater Treatment Plant
 - Water Dept.
 - Transfer Station
 - Cemetery Garage
 - Highway Garage
- **Fire stations & Public Safety**
- **Other town buildings**
 - Library
 - Senior Center
 - Community Ctr.
 - Town Hall
 - Schools





Rationale & Benefits for a Town Wireless Network

- Rationale for a small town installing a wireless network
 - Reducing costs
 - Monthly charges for telecommunications – phone lines to 32 buildings and internet connections to many of them (est. \$13-15K per year)
 - Benefits of new technology
 - What additional features does a private, town-wide computer network provide?



Current Rationale: Benefits to all sectors Public Works/Public Safety/Government

- Need to provide communications for buildings
 - Safety - phone access at all sites with Internet-Protocol PBX phones
 - Data - communications for SCADA
 - **ADD-ON** Security – IP-connected alarms for fire, smoke, heat, flooding, access, plus web cameras and panic buttons, remotely monitored
- Need to provide information systems support
 - Virtual Private Network (VPN) placing all users on the same network
 - All users share new email facilities
 - **ADD-ON** All computers updated automatically with security and software upgrades
 - **ADD-ON** All databases and business documents automatically backed up
 - **ADD-ON** All users get problem resolution from central support
- Need Public Safety voice/data support
 - **ADD-ON** Use of virtualized dedicated audio lines to connect radio repeaters and remote bases for combined VHF/UHF dispatch facilities and remote control
- Public Access
 - Connect WiFi hot-spots to central Internet access
 - **ADD-ON** Plan for temporary portable (Incident Command) and permanent mobile web access with mesh for Public Safety



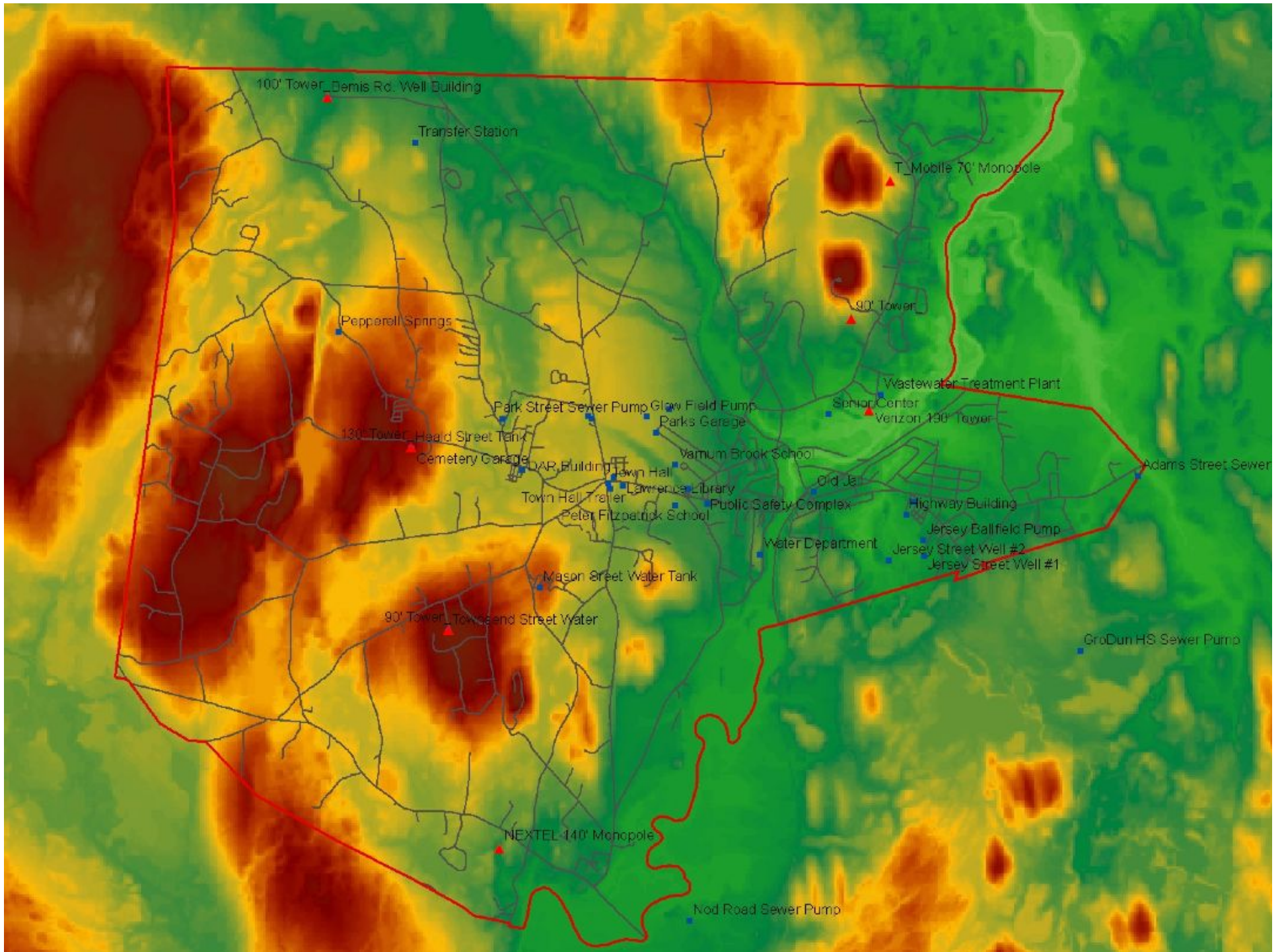
How it is being implemented – the low-cost approach

- Rationale for us doing it “ourselves”
 - Three options: turn-key system, consultants, or do-it-yourself with on-site engineering & technical support
- How we did it
 - Used local expertise
 - For communications systems, use members of local Information Systems Technology Committee, plus systems administrator
 - consulting costs reduced for wireless and network subsystems
 - For Construction use DPW resources, plus in-house specialists (including Fire Department)
 - construct towers, masts, guying anchors
 - construction costs reduced dramatically
 - Built relationship with local experts
 - Worked with Direct Network Services for equipment & support
 - Built relationship with primary equipment vendors - Proxim
 - Take the time to learn the system
 - Get hands-on experience with a few wireless links initially



How it is being implemented – the low-cost approach

- What we did
 - Designed a point-to-multipoint dedicated municipal wireless network
 - Included talks with all departments, design planning review with outside engineering support
 - Used **GIS** for site location – elevation/distances, terrain & vegetation
 - Initial field tests – test visibility of all sites, try a link at a time
 - Build out in small steps – phase 1
 - Tower construction, Mast construction where needed
 - Site installation, one site at a time
 - System monitoring of work in progress
- Next steps
 - Phase 2 - WiFi hotspots, lot of cameras/alarms, IP-PBX
 - Phase 3 – mesh network for mobile resources





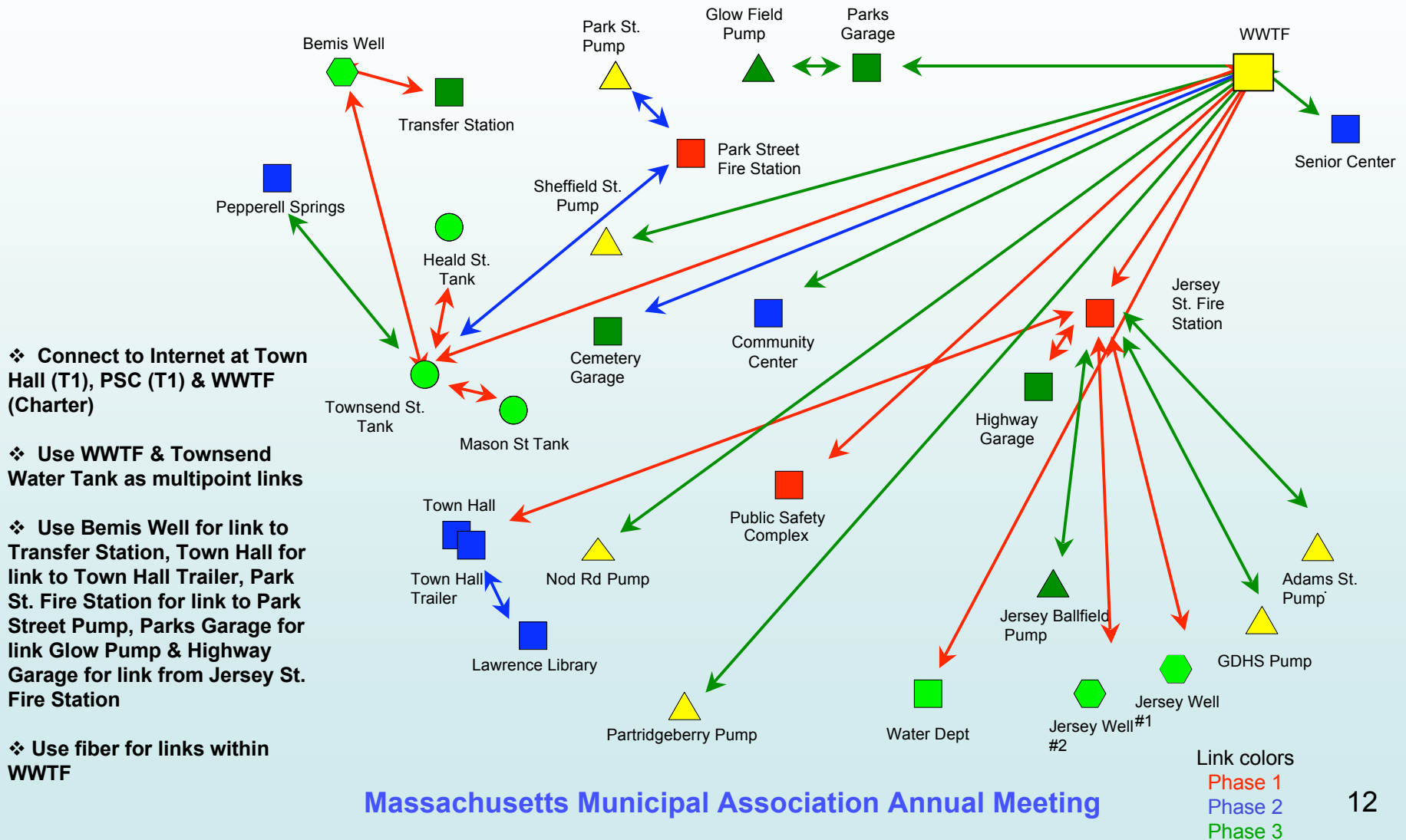
How it is being implemented – the low-cost approach

- What we did
 - Designed a point-to-multipoint dedicated municipal wireless network
 - Included talks with all departments, design planning review with outside engineering support
 - Used GIS for site location – elevation/distances, terrain & vegetation
 - Initial field tests – test visibility of all sites, try a link at a time
 - Build out in small steps – **phase 1**
 - Tower construction, Mast construction where needed
 - Site installation, one site at a time
 - System monitoring of work in progress
- Next steps
 - Phase 2 - WiFi hotspots, lot of cameras/alarms, IP-PBX
 - Phase 3 – mesh network for mobile resources



Systems Summaries

Wireless Broadband Private Network (plan C)





How it is being implemented – the low-cost approach

- What we did
 - Designed a point-to-multipoint dedicated municipal wireless network
 - Included talks with all departments, design planning review with outside engineering support
 - Used GIS for site location – elevation/distances, terrain & vegetation
 - Initial field tests – test visibility of all sites, try a link at a time
 - Build out in small steps – phase 1
 - Add on to existing communications towers
 - **Tower construction**, Mast construction where needed
 - Site installation, one site at a time
 - System monitoring of work in progress
- Next steps
 - Phase 2 - WiFi hotspots, lot of cameras/alarms, IP-PBX
 - Phase 3 – mesh network for mobile resources



Municipal Wireless Network – Add-on to existing towers

- Use existing towers where available (shown here is the main repeater site on a water tower)
- Be careful of interference to others users of existing facilities
- No additional construction costs





Municipal Wireless Network

– Add-on to existing towers

- Use communications towers already in existence
- Always include town co-location on tower contracts with communications companies
- No additional construction costs





Municipal Wireless Network - Build new towers

- Wastewater Treatment Facility complex
- Ideal location for feeding down the Nashua river and into Main Street and the east side
- Used Fire Department Ladder Truck for construction
- Total costs ~ \$3K plus labor





Municipal Wireless Network - Add masts to buildings



- Wireless node at Transfer Station
- Used 2 24' sections of aluminum pipe & local welder to get above the local canopy
- Cost ~ \$400 plus labor
- This construction technique used at several sites



How it is being implemented – the low-cost approach

- What we did
 - Designed a point-to-multipoint dedicated municipal wireless network
 - Included talks with all departments, design planning review with outside engineering support
 - Used GIS for site location – elevation/distances, terrain & vegetation
 - Initial field tests – test visibility of all sites, try a link at a time
 - Build out in small steps – phase 1
 - Add on to existing communications towers
 - Tower construction, Mast construction where needed
 - Site installation, one site at a time
 - **Cost analysis**, System monitoring of work in progress
- Next steps
 - Phase 2 - WiFi hotspots, lots of cameras/alarms, IP-PBX
 - Phase 3 – mesh network for mobile resources



Rough relative cost analysis of contract vs. “do-it-yourself”

- 70' tower - ~ \$40K to \$60K
- 3 48' masts - ~ \$8K
- 4 existing towers - ~ \$18K
- 6 existing masts - ~ \$6K
- 4 roof mounts - ~ \$4K
- 18 wireless installations - \$70K
- Network components - ~ \$12K
- Wireless components - ~ \$17K

~ \$195K

**(note: these costs will vary widely,
based on time frames and level
of activity)**

- 70' tower - \$3K plus labor (DPW, PFD)
- 3 48' masts - ~ \$1K plus labor
- 4 existing towers - labor
- 6 existing masts - labor
- 4 roof mounts – labor
- 18 wireless installations - ~ \$16K
- Network components - \$3K plus labor
- Wireless components - ~ \$17K

~ \$40K

**An implementation cost savings
factor of 5:1 achieved, along
with 2/3 reduction in
telecommunications charges**



How it is being implemented – the low-cost approach

- Next steps for Pepperell
 - Phase 2 - WiFi hotspots, lots of cameras/alarms, IP-PBX
 - Phase 3 – mesh network for mobile resources
- Assist other towns with initial planning



Suggestions for implementations in other Massachusetts towns

- Get advice from others
 - Municipal Broadband Working Group, John Adams Innovation Institute, Massachusetts Technology Collaborative
<http://www.masstech.org/institute/index.htm>
 - Pepperell and other implementers
 - Local consultants, local wireless engineering firms
- Find local expertise
 - For wireless communications system use citizens, employees
 - For construction use DPW resources, Fire Department, local specialists (welders, Hams, etc.)
- Built relationship with local experts
 - Use the wireless engineering firms for engineering and technical services where needed
- Built relationship with primary equipment vendors
 - Take the time to learn the system
 - Get hands-on experience



Municipal Wireless Network for the Town of Pepperell

Questions?