

## INFRASTRUCTURE ASSESSMENT

Available infrastructure for broadband and cellular telephone access in Washington County is changing daily. During the study (November 2004 – March 2005) a new tower was constructed in Perry to provide wireless broadband service. It will also host a new repeater for one cellular telephone provider. Several business opportunities for additional broadband delivery opportunities are also under development.

This section documents available infrastructure using GIS mapping of equipment that can be mapped – towers, mobile sites, telephone central offices, and so on. Some infrastructure is not mapped either because it is available everywhere (phone lines) or because it is considered proprietary by PUC rules to the incumbent local exchange carrier, such as fiber optic cable.

Other types of infrastructure have the potential of reaching the so-called “last mile” of users. Some of this infrastructure can be mapped for general presentation purposes through line of site or near line of site wireless signals from a tower, but detailed topographic maps are needed to exactly identify all areas that would be served. Finally, some infrastructure enhancements can use existing telephone infrastructure – DSL from co-location facilities – and are mapped and described in the discussion.

### **Infrastructure Mapping**

In order to integrate traditional infrastructure with telecommunications requirements, the infrastructure mapping depicts where traditional infrastructure that supports economic development intersects with regional services, land designated for commercial and industrial development and telecommunications infrastructure.

The county was broken into its two Labor Market Areas – Calais and Machias - to obtain a scale at which existing infrastructure could be visible on a map. Areas of concentrated infrastructure are shown at a larger scale on inset maps on the same page to improve their legibility.

Map 1 Development Infrastructure - Machias Labor Market Area and Map 2

Development Infrastructure - Calais Labor Market Area depict:

- Development infrastructure - arterial highways, inter-modal transportation hubs, 3 phase power, airports
- Regional services - hospital, university, fire, ambulance; public water and sewer
- Land designated for commercial and industrial development - industrial parks, Pine Tree Development Zones, and
- Telecommunications Infrastructure

Maine Department of Transportation Sand and Salt facilities are included on the infrastructure maps because part of the Maine State government strategy to equip its own network with wired and wireless capability is to equip all such facilities with broadband access. Likewise many public libraries, schools and institutions of higher education are

equipped with broadband capability. Where these institutions have broadband capability they are depicted on the Map 4 Broadband Capacity.

### **Cellular Telephone Infrastructure Mapping**

Digital information provided by the Federal Telecommunications Commission of the service areas of cellular telephone companies (See Map 3 Cellular Phone Service Areas) depict a far better picture of service than is actually experienced in Washington County. The two primary licensees in Washington County are Atlantic Cellular Telephone of Delaware, LLC who provide Cingular/AT&T TDMA<sup>2</sup> digital cell phone coverage, and Maine RSA #4, Inc who provide US Cellular TDMA and CDMA<sup>3</sup> digital cell phone service. Map 3 shows these FCC service areas as well as the cellular telephone towers from which they send and receive their signals.

Those who live and work in the region have a mental map of where and when they can rely on service. The written comments from the survey confirm these gaps as well (Appendix F). This study put those mental maps on paper. On five separate days – December 15<sup>th</sup>, 16<sup>th</sup>, 17<sup>th</sup>, and 22<sup>nd</sup> 2004 and January 11<sup>th</sup>, 2005 – project staff drove the primary arterials of Washington County to map the signal strength of 5 different cell phones<sup>4</sup>. All days had very similar weather conditions – clear skies and bright sun with increasing clouds near the end of the day. Time and budget did not allow mapping of all roads with all phones.

Table 1 shows the length of miles surveyed for each phone and the varying signal strengths obtained. This information is mapped on Map 3 for US Cellular and AT&T service. As the FCC infrastructure in Washington County is licensed to US Cellular and AT&T, the maps of the other phone service providers simply show how well those phones pick up signals from the US Cellular and AT&T towers (varying strengths of these other phones are therefore shown on maps in Appendix D).

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2 Time Division Multiple Access (TDMA) is digital transmission technology that allows a number of users to access a single radio-frequency (RF) channel by allocating unique time slots to each user within each channel.

3 Code Division Multiple Access (CDMA) is a digital spread-spectrum technology that allows multiple frequencies to be used simultaneously. CDMA codes every digital packet it sends with a unique key. A CDMA receiver responds only to that key and can pick out and demodulate the associated signal.

4 US Cellular, Unicef Analog and Unicef Digital, CINGULAR/AT&T, Verizon

**Table 1 - Cellular Telephone Signal Strength in Washington County on Major Transportation Corridors**

Status	Length in miles				
	AT&T	Unicel (Analog)	Unicel (Digital)	US Cellular	Verizon
No Signal	117.67	109.21	146.64	109.67	88.91
Not Surveyed	138.92	138.92	111.80	149.76	251.53
Strong Signal	127.72	131.91	127.66	133.24	74.85
Weak Signal	49.37	53.64	47.58	41.01	18.40
Total Survey Area (Miles)	433.68	433.68	433.68	433.68	433.68
Not Surveyed (Miles)	138.92	138.92	111.80	149.76	251.53
Surveyed (Miles)	294.76	294.76	321.88	283.92	182.15
	(% of surveyed)				
No Signal	39.92	37.05	45.56	38.63	48.81
Strong Signal	43.33	44.75	39.66	46.93	41.09
Weak Signal	16.75	18.20	14.78	14.44	10.10

*Survey areas denotes US and State routes in Washington County.*

Map 3 and Table 1 confirm the experience described in the cellular telephone survey results. There is no reliable signal in roughly 40% of the primary travel corridors of Washington County and only a weak signal in about 15% of the same area. Thus less than half of the primary travel routes in Washington County have reliable cell phone service.

Project staff reviewed the Washington County Communication System Upgrade prepared November 11, 2002 and met with both the Local Emergency Planning Committee of Washington County and the Washington County Communications Committee (see membership in Appendix B). This analysis and interaction with those who depend on the system reveals that the infrastructure that serves public safety is also inadequate to provide complete coverage of Washington County. The Communication System Upgrade study found that, among upgrades that are needed at the dispatch center and base station:

- the County has no continuous coverage on any given channel,
- the number of transmitter sites is very inadequate for a County of this size, numerous sites need to be added and designated channels need to be built to cover the entire County such as County prime and County Fire, and
- there is no expandable foundation on which to build or expand the current system.

When asked to identify the single most important constraint on providing public safety services in Washington County the Local Emergency Planning Committee (LEPC) unanimously agreed it was gaps in cell phone and radio service.

### **Improving Reliability for Cellular Telephone and Emergency Services**

Budget constraints in the current study allowed only the rough depiction Map 3 of the poor coverage for cellular telephones in Washington County. However Map 3

corresponds with the written comments of survey respondents and is further confirmed by emergency services personnel.

Using computer modeling a performance analysis of the existing radio paths was included in the 2002 Communication System Upgrade study. Computer models generated maps that predict the radio path distances, losses and fade margins using existing infrastructure in Washington County. Gaps in mobile talk back coverage are shown on several maps in the study.

The most striking conclusion of the current study is that the private cellular telephone service infrastructure is installed on an almost completely different set of structures (towers, poles, etc) from the infrastructure that serves the public emergency service sector. Part of the reason for this stems from widespread municipal refusal in the past two decades to engage the private sector or even to allow towers on their land.

Map 5 depicts all of the towers and structures that are licensed by the FCC<sup>5</sup> within Washington County for public and private telecommunications services including cellular telephone, public safety, television, radio, microwave, and paging systems. Many of these structures are located very near to one another as they are on prime high elevation sites. However by using the gaps in service information depicted on Map 3 and the attribute data behind the FCC infrastructure depicted on Map 5 it appears there are numerous places where existing infrastructure (towers, poles, buildings, water towers) could be used to enhance cellular telephone service.

In addition, a visual comparison of the performance analysis in the 2002 Communication System Upgrade and the cellular phone service gaps on the Cellular Phone Service Areas map indicates there are several areas where coverage for both the private and public sector could be enhanced if they were to a) share existing sites (swap) with one another and b) construct new towers and equipment in cooperation with one another.

The following table summarizes sites that could be examined for the mutual benefit of the public and private sector (latitude and longitude for the sites already licensed by the FCC are included in Appendix H). The final eight entries show existing structures on which cellular antennas are located.

**Table 2 - Sites for New or Expanded Cellular and Radio Communication Infrastructure (and Wireless Broadband Internet Infrastructure)**

Tower Owner	Property Owner	Address	City	height at which antenna is supported	overall height above ground	structure type
Houlton Cable	Houlton Cable	1 KM W OF DANFORTH OF RT 169	Danforth	12	17	Pole

<sup>5</sup> Definitions of each type of FCC license are provided in Appendix H along with tables describing their location (latitude, longitude, address, town) of the various towers and antennas for each type of equipment (cellular, private land mobile, microwave etc.) in Washington County.

**Table 2 - Sites for New or Expanded Cellular and Radio Communication Infrastructure (and Wireless Broadband Internet Infrastructure)**

Tower Owner	Property Owner	Address	City	height at which antenna is supported	overall height above ground	structure type
Thomas Dizenzo	Leased Land	GATES HILL	Carroll	30	30	Tower
PCT Comm	PCT Comm	MUSQUASH MOUNTAIN	Topsfield	39	39	Tower
EMEC	PCT Comm	3 KM OFF RT 6 ON MUSQUASH MOUNTAIN	Topsfield	38	41	Tower
Border Patrol	PCT Comm	MUSQUASH MOUNTAIN RT 6	Topsfield	42	42	Tower
PCT Comm	PCT Comm	MUSQUASH MOUNTAIN SUMMIT	Topsfield	27	27	Tower
HC Haynes	PCT Comm	MUSQUASH MOUNTAIN	Topsfield	15	15	Tower
Ind Twp Tribal Gov	Ind Twp Tribal Gov	MUNICIPAL BUILDING ROUTE 1 IND	Princeton	30	36	Tower
Ind Twp Tribal Gov	Ind Twp Tribal Gov	PUBLIC SAFETY BLDG PETER DANA POINT	Princeton	30	30	Tower
CALAIS HOSP	CALAIS HOSP	50 FRANKLIN ST	Calais	16	18	Tower
EMEC	EMEC	9 UNION ST	Calais	22	22	Tower
WQDY INC	WQDY INC	637 MAIN ST	Calais	21	21	Tower
WQDY INC	WQDY INC	10 FRANKLIN ST	Calais	48	48	Tower
City of Calais	City of Calais	FIRE STA NO ST OPPOSITE UNION ST	Calais	70	70	Tower
CALAIS HOSP	CALAIS HOSP	50 FRANKLIN ST	Calais	9	16	Tower
City of Calais	City of Calais	SE COR CEMETARY	Calais	38	39	Tower
WQDY INC	WQDY INC	0.3MI S OF S ST ON RD TO CITY DUMP	Calais	85	85	Tower
Domtar	Domtar	GP CORP PULP & PAPAER 3 BOILER	Baileysville	91	91	Tower
EMEC	Gene Cookson	MAGURREWOCK	Calais	28	31	Tower
Thomas Dizenzo	Gene Cookson	MAGURREWOCK MTN	Milltown	80	80	Tower
Domtar	Domtar	E SIDE OF RT 1 1/2 MI SE	Woodland	9	12	Tower
Town of Baileysville	Town of Baileysville	1 KM S OF MAIN ST ON RT 1	Baileysville	36	43	Tower
Lane Construction	Lane Construction	CHARLOTTE RD	Calais	18	19	Tower
Maine Public	Maine Public	MEDDYBEMPS	Meddybemps	58	58	Tower
Atlantic Comm	Atlantic Comm	COOPER MOUNTAIN	Cooper	30	33	Tower
PCT Comm	PCT Comm	SUMMIT OF COOPER MOUNTAIN	Cooper	31	36	Tower
RH Foster	Cherryfield Foods	2.5 MILES NORTH ON ROUTE 191	Cooper	31	31	Tower
MeState DOT	State of Me	COOPER Z HILL W RT 191	Cooper	43	43	Tower
PCT Comm	PCT Comm	COOPER MOUNTAIN	Cooper	46	52	Tower
County of Washington	County of Washington	COOPER HILL	Cooper	46	49	Tower
Summit Comm	Summit Comm	2 MI NW	Cooper	97	97	Tower
Clinton Gardner	Clinton Gardner	COOPER MOUNTAIN W	Cooper	28	31	Tower
Pleasant Point TG	Pleasant Point TG	PLEASANT POINT MUNICIPAL BLDG	Perry	12	15	Tower
County of Washington	County of Washington	COOPER MOUNTAIN	Cooper	19	22	Tower
Eastport Airport	Eastport Airport	EASTPORT MUNICIPAL AIRPORT	Eastport			Pole
Jim Lowe	Jim Lowe	RT 190 .3 MI N WASHINGTON ST	Eastport	5	5	Tower
Eastport City Build	Eastport City Build	89 HIGHS T	Eastport	6	12	Building
Dennysville Fire	Dennysville Fire	FIRE STATION	Dennysville	30	36	Tower
Browns Comm	Champion Paper	LEAD MOUNTAIN	Township 28	30	30	Tower
Lubec Water	Lubec Water	SCHOOL ST	Lubec			Water Tower
WALZ	WALZ	MAINE RT. 192 & U.S. RT 1A, APPR. 2.45 MI NW OF	Machias	46	46	Tower

**Table 2 - Sites for New or Expanded Cellular and Radio Communication Infrastructure (and Wireless Broadband Internet Infrastructure)**

Tower Owner	Property Owner	Address	City	height at which antenna is supported	overall height above ground	structure type
Deblois Fire	Deblois Fire	FIRE STA ON RT 193 AT JCT OF LANE RD	Deblois	7	7	Building
East Machias Fire	East Machias Fire	US RT 1 MAIN ST	East Machias	9	9	Tower
Jasper Wyman	Jasper Wyman	ON RT 193 5 MI SE OF RT 9	Deblois			Tower
Bangor Hydro	Bangor Hydro	PUMPKIN RIDGE	Machias	21	21	Tower
Jasper Wyman	Jasper Wyman	RT 193	Deblois	21	21	Tower
County of Washington	County of Washington	OFF Cutoff Road in Centerville	Centerville	46	52	Tower
County of Washington	County of Washington	COUNT COURT HOUSE 47 COURT ST	Machias	24	24	Tower
Machias Fire	Machias Fire	FIRE STATION OUTER BROADWAY	Machias			Building
UM Machias	UM Machias	Powers Hall, Univ of Maine Machais	Machias	11	14	Building Pipe
County Concrete	County Concrete	CEMENT PLANT ON CENTERVILLE RD	Columbia			Building
Look Construction	Look Construction	US RT 1	Jonesboro	15		Building
Summit Comm	Summit Comm	MARTINS RIDGE ROAD	Franklin	99	105	Tower
Blue Bird Ranch	Blue Bird Ranch	RT 1	Jonesboro	60	60	Building
Jasper Wyman	Jasper Wyman	RT 193	Cherryfield	21	21	Tower
Harrington Fire	Harrington Fire	HARRINGTON FIRE STA RT 1	Harrington	12	15	Tower
Jasper Wyman	Jasper Wyman	ON RT 193 2 MI N OF	Cherryfield	30	30	Tower
Pine Tree Cable	Pine Tree Cable	Old Rd. 1.3 miles west of East Machais	Machias	45	45	Tower
Pleasant Pt Tribal Gov't	Pleasant Pt Tribal Gov't	0.5 miles N of Route 1 near Pembroke town line	Perry	58	58	Tower
Riverside Electric	Bill Barnett	Maguerrowock Mountain	Calais	75	75	Tower
Passamaquoddy Water	Passamaquoddy Water	School St.	Eastport	15	15	Water Tower
Carver Oil	Carver Oil	.1 MI N OF RT 187 JONESPORT CTR	Jonesport	49	49	Tower
US Cellular	US Cellular	4 miles NW of Dennysville	Dennysville	125	128	Tower
US Cellular	US Cellular	3 miles from Machias	Machiasport	103	106	Tower
US Cellular	US Cellular	Rt 1 Calais behind WCCC	Calais	122	125	Tower
US Cellular	US Cellular	2.5 miles NE Milbridge	Milbridge	96	97	Tower
US Cellular	US Cellular	3.6 miles W of Topsfield	Topsfield	35	37	Tower
US Cellular	US Cellular	Route 9 Wesley	Wesley	55	58	Tower
US Cellular	US Cellular	2.7 miles from Rt1 & Rt193	Beddington	25	28	Tower
US Cellular	US Cellular	15 Miles NW of Deblois flight strip	Aurora	91	94	Tower

In addition to these existing sites others were identified through input from the public surveys, the Advisory Committee, the Local Emergency Planning Committee and the Washington County Communications Committee. They include:

- Alexander Elementary School
- Water Street and/or Central Congregational Church on Middle Street, Eastport
- Trimble Mountain in Robbinston
- Former Cutler Navy Base towers
- Pineo Ridge, Cherryfield
- Church steeple in Perry (65 feet interior of steeple, Eastport and Lubec visible at top)

- Church steeple in Robbinston (50 feet at tip of weathervane)
- Church steeple in Dennysville (75 feet interior of steeple, Eastport visible from top of steeple)
- New Tower to replace Machias County Courthouse roof in southern Marshfield
- South Princeton on Pocomoonshine Mountain
- Tunk Mountain (ME Forest Service); however access is limited and power is only solar
- Princeton site offered by survey respondent<sup>6</sup>

### **Conclusions and Recommendations from Cellular Telephone Infrastructure Assessment**

It will take further examination of capacity and engineering feasibility at the sites in Table 2 and listed above to realize improvements in cellular telephone and emergency radio service. It will also require communication and cooperation among private and public sector personnel. Wireless broadband internet providers can also benefit from use of this existing infrastructure. The scale at which they provide service is in smaller sectors than cellular telephone coverage. Improvements in cellular infrastructure could provide co-location opportunities for wireless broadband internet access. Further analysis specific to wireless broadband coverage is also required to first map wireless internet service gaps and then to determine the feasibility of using existing infrastructure or to construct new towers.

However, it appears that all of these public and private sectors will gain from such examination and cooperation. Examples of lease arrangements that have facilitated this type of cooperation are included in Appendix J.

#### **RECOMMENDATION:**

*Examine capacity, engineering feasibility and costs of co-location of facilities on public and private sites identified in Table 2 to improve cellular telephone and radio coverage in Washington County. Prioritize sites for infrastructure improvement with results.*

#### **RECOMMENDATION:**

*Coordinate, where feasible, co-location of cellular telephone, emergency services and broadband wireless infrastructure on new and existing sites.*

#### **RECOMMENDATION:**

*Review and revise County and Town policies to allow and encourage private use of public sites.*

### **Specific High Priority Sites Needing Upgrade**

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<sup>6</sup> Bonnie Kake of Princeton indicated in her survey response that she owns 150 acres in Princeton that sits “practically in the middle of the areas that have extremely poor service” She offers her land for consideration/analysis for installation of new infrastructure. Her contact information is available through the WCCOG office.

According to the Washington County Communications Committee existing facilities on top of the Machias County Court House are at capacity. Private sector inquiries to locate antennas on the Court House were refused by the Washington County Commissioners due to concerns over the hazards associated with putting any more structures on top of the building. The existing public safety infrastructure is also old and needs upgrading. Construction of a new tower in the vicinity could address several complimentary efforts including:

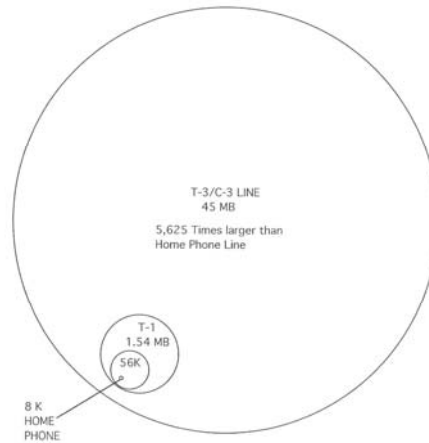
5. removing a mass of antennas from a historic building,
6. upgrading equipment and capacity at the Regional Communications Center,
7. offering lease space to the private sector for enhanced cellular and wireless Internet opportunities, and
8. spreading the funding opportunities across homeland security and economic development agencies currently targeting rural areas for improvements in telecommunications services

**RECOMMENDATION:**

*Develop a site for a new tower to replace/enhance wireless facilities on County Court House in Machias. Build for co-location to support emergency services and regional economic development goals.*

## Broadband Infrastructure Mapping and Assessment

Broadband or high-speed<sup>7</sup> access to the Internet is a relative term. The conduit through which information streams can be represented by the diagram below. For certain applications (file and software downloads, e-mail, on-line banking) the smallest broadband “pipe” (128KBps-1.5MBps) can be sufficient for residential and small business needs. For other applications (video-streaming, videoconferencing, high user and data volume applications) the larger broadband “pipes” (1.5MBps-several MBps) are essential for certain home businesses and large economic endeavors.



High-speed Internet<sup>8</sup> (broadband) is available anywhere in Washington County over existing copper telephone lines. However a very real constraint to its accessibility is cost. A T-1 line, available over a dedicated line of copper wire infrastructure will cost the end user between \$200 and \$1800 per month depending upon bandwidth.

Dan Breton,  
Director of  
Government Affairs  
at Verizon provided  
a generalized map  
describing the  
available fiber optic  
cable network in  
Maine. While we  
could not obtain  
specific information  
about the  
availability of fiber  
optic cable at the  
designated Pine  
Tree Zone sites in  
Washington County  
Mr. Breton  
indicated that “once

## Maine's Advanced Network

verizon

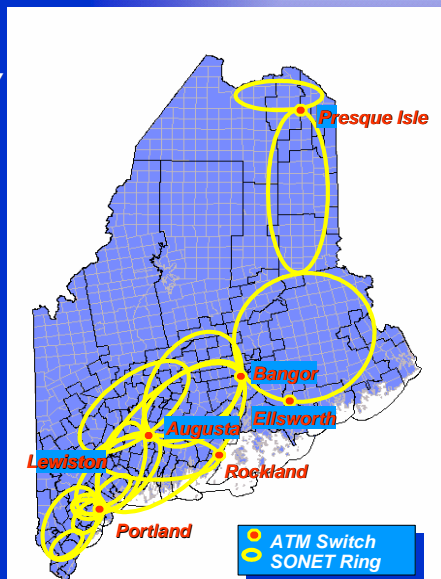
### ■ SONET Backbone

- *State-of-the-Art Service Reliability*
  - ◆ Top-to-Bottom of State
  - ◆ 50+ SONET Rings
  - ◆ 500,000+ Circuits
- *Intelligent Self-Healing Network*
  - ◆ Renders Cuts in Network Invisible to Customers
  - ◆ Automatically re-routes traffic in reverse direction

### ■ ATM Overlay

- *Switched Broadband Technology*
  - ◆ 10 Switches Deployed
  - ◆ Statewide Availability
  - ◆ New Applications

### ■ DWDM Deployment



<sup>7</sup> Following the Federal Communications Commission definition the term ‘high-speed’ describes services that provide the subscriber with transmissions at a speed in excess of 200 kilobits per second (Kbps) in at least one direction.

<sup>8</sup> Appendix I provides a comparison of high speed Internet options currently available in Washington County.

a customer orders a fiber based service – like a 45 megabit or Asynchronous Transfer Mode service, the fiber would be extended into the customer’s location.”

Map 4 depicts the services of those who are currently delivering and expanding broadband service in Washington County. As noted above, high-speed T-1 service is available wherever existing phone service is available but is cost prohibitive for most users. A variety of products are now on the market to fill this gap. The service areas of Wabanaki Wireless, CCP Wireless, Axiom Technologies and Verizon are shown on the map. Several assumptions are made on Map 4 about extent of service area including the 18,000 foot distance from Verizon central offices for Verizon DSL, and line of site or near line of site distances from CCP Wireless and Wabanaki Wireless towers. Other wireless broadband providers are discussing entering the market as well.

### **Recent initiatives to deliver high speed Internet to “the last mile”**

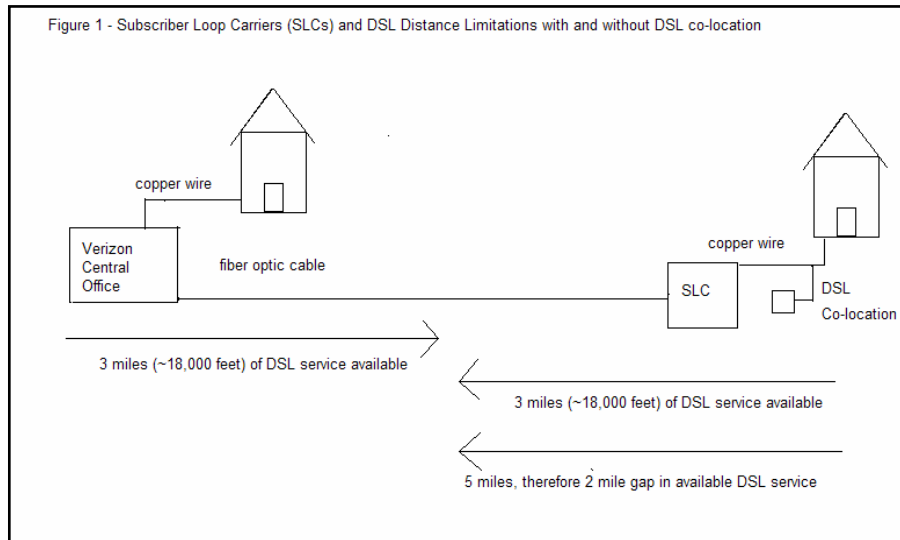
Throughout Washington County constraints on obtaining high-speed Internet access include certain distance limitations from Verizon Central Offices (CO’s). For instance, Digital Subscriber Services (DSL)<sup>9</sup> has traditionally required that a subscriber be within 18,000 ft. (3 miles) of a telephone central office (CO) though new technologies are changing this limitation.

Several Washington County based companies are developing technologies and building infrastructure to reach the many, dispersed individuals and businesses in the so-called “last mile” of high speed Internet service. For instance, Axiom Communications has a DSL product that can be provided anywhere in Maine but it is a business service that exceeds the going residential market (\$30/month).

Subscriber Loop Carrier systems (SLCs) or Digital Loop Carriers (DLCs) are also a barrier to DSL deployment. An SLC or DLC extends the Verizon Central Office using fiber optic cable. Once the fiber cable reaches the SLC, the line splits off into a copper wire. The result is that DSL only extends for the first 18,000 feet of fiber. Beyond the SLC only T-1 service and not DSL is available over the copper wires. The left hand side of Figure 1 depicts the 3 mile (18,000 feet) distance limitation from Verizon Central Offices to provide DSL. There are scores of these areas in Washington County.

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<sup>9</sup> a modem technology that turns an existing phone line into a 3 channel data delivery system – voice, data downstream & data upstream.



Axiom Technologies LLC has developed proprietary technology that allows them to co-locate within the SLCs and provide DSL to residential customers in Machias and Calais. As Figure 1 depicts co-location at the SLC extends DSL service beyond the SLC to more remote areas. If the SLC is more than 18,000 feet from the Central Office then there is a DSL service gap.

The question of whether Verizon will upgrade SLC's to provide broader DSL access in Washington County and other parts of rural Maine was answered in front of the Public Utilities Commission in January of 2005.

The Office of the Public Advocate asked<sup>10</sup>:

“With regard to the DLCs that do not have DSLAM functionality listed in your response to data request 105, indicate whether you plan, in calendar year 2005, to a) upgrade the DLC so that it will have DSLAM functionality, or b) replace the DLC with a DLC that has DSLAM functionality.”

The OPA asked the same question for calendar years 2006 and 2007.

Verizon's response was:

“In a manner similar to other businesses operating in the State of Maine, Verizon-ME's investment decisions regarding DSL deployment and other services are based, in large part, on its ability to earn an acceptable return on its investment. Verizon continuously reviews its options and opportunities in Maine and elsewhere in regard to expanding its DSL service offerings. Although Verizon-ME has no current plans to upgrade/replace

<sup>10</sup> In Maine PUC Docket 2004-809 "Investigation Into Line Sharing Pursuant to State Law" Verizon responded to data requests (discovery) from the Office of the Public Advocate, Cornerstone Communications LLC, and Biddeford Internet Corporation d/b/a Great Works Internet.

DLCs for DSLAM functionality in 2005 or beyond, its plans are subject to change as Verizon-ME learns more about customer demand and associated business considerations. There are several criteria that are carefully considered and continually revisited in connection with Verizon ME's decision whether it should continue further DSL deployment, including market size, expected market interest, capital availability, and work force demands.”

This study concludes that Verizon has no current plans to upgrade DLS services in Washington County unless the market directs them to do so.

With respect to what defines “high speed” internet access Axiom Technologies LLC argues that while the FCC provides a good working definition of DSL (see footnote 7 above), it excludes a whole product line between dial-up and the 200kbps level. Many dialup customers in Maine, small businesses outside of other broadband coverage options, are limited to 26kbps. The business class Axiom product will reach these customers at 144kbps (\$150/month) and 288kbps (\$279/month) just about anywhere in the County. While the 144kbps service isn't the fastest option, it is sometimes the only affordable option for a business-class service, even if it falls below the 200kbps guideline created by the FCC. Axiom can also deploy 2.3Mbps via ADSL and 3Mbps via SDSL for business customers with existing equipment, with one site turned up at 3Mbps.

For wireless (non-WiFi) systems, a proprietary radio frequency delivery system that requires radio and antenna at the customer location, a subscriber can be further away: up to 6 miles from the transmitter for non-line of site installations and up to 20 miles from the transmitter for near-line of site installations. High speed wireless internet service is currently provided by CCP Wireless from Calais and by Wabanaki Wireless from Perry and Pleasant Point (see Map 4). Both companies are also currently researching and developing additional repeater stations. Rates and speed are competitive with DSL providers. At higher monthly rates, speeds can be comparable with T-1 but at a much lower cost than T-1 service.

Another computer company in Machias is also researching and planning a similar type of wireless internet service. And yet another, Lighthouse Communications, is developing WiFi Instant Hotspot systems in Machias. These systems allow wireless broadcast and repeater broadcasts of signals provided by other ISP's. Two products are in production, the original instant WiFi Hotspot, and the instant WiFi repeater hotspot. Two others are nearing the end of the development stage are the Super Instant WiFi hotspot and the Big Spot Instant WiFi Hotspot. Both are amplified long distance versions of the current products and are intended for ISP's to use for their own signal re-broadcast.

A new opportunity to provide high speed internet service in remote areas was identified during the study. A Point of Presence (POP) tower that provides wireless high speed internet access could be erected at an SLC thus reaching beyond the 18,000 foot radius that the DSL co-location would provide (see Figure 1).

Satellite Internet access is not constrained by distance from the transmitter but does require a clear unobstructed view of the southern sky and can be negatively affected during poor weather conditions. Providers in Washington County include DirecWay.

Cable internet access, delivered over cable TV lines, is also not constrained by distance but by the lack of available cable TV lines. High speed Internet is available over cable in areas where cable television (Pine Tree Cable, Adelphia) is wired. Written comments indicate some satisfaction with cable but widespread dissatisfaction with the service as it is vulnerable to service losses and degradation due to over-subscription, temperature extremes (cold) and multiple user demands.

### **Conclusions and Recommendations from Broadband Infrastructure Assessment**

There are numerous current initiatives to expand high speed internet services in Washington County. They include wireless internet service, several DSL choices, cable, T-1, and satellite. Many are innovative and specifically target the so-called “last mile” of service in rural Maine. Most residents still use dial up services that are not considered “high-speed” and tie up their phone lines in the process. Many are also unaware of the variety of choices that are already available and on the horizon for expansion. Businesses contacting the local Chamber of Commerce are also unaware of available high speed services and most assume that it will not be adequate for their needs.

Indeed during the study (February, 2005) the PUC launched an interactive map on their web site to provide the public with information about the types of broadband Internet access available according to the town where they live. At the time of publication (May, 2005) data for Washington County included only incomplete descriptions of cable service (no provider name), incomplete listings of DSL providers and included none of the satellite or wireless providers. Washington County providers are in the process of updating that information.

#### **RECOMMENDATION:**

*Washington County high speed internet service providers should aggressively make their service areas known to the PUC and link this information to local economic development web sites (Sunrise County Economic Council, Eastern Maine Development Corporation, all local Chambers of Commerce).*

Discussions with the Advisory Committee acknowledge that 100% coverage of high speed internet in Washington County, or indeed rural Maine, is not a realistic goal. There will be better service and more choice in population centers with concentrated development. It is not realistic to expect high speed internet access that enables telecommuting to the far corners of the earth from every remote cabin in the woods at the same price as you would pay in the center of Calais, Machias or Eastport. More remote areas will have fewer choices and may have to pay more for it. This is consistent with both the cost to get the service to those locations as well as State policy expressed in the Planning and Land Use Regulation Act (AKA the Growth Management Law). Namely,

public investments should concentrate development efficiently in areas with existing infrastructure and services. Any resident has the right to choose to live further from those services but they should expect to pay a little more for their choice.

### Cellular and ISP Providers Interviews

After compiling the results of the GIS mapping and the survey we conducted several interviews with providers of broadband services in Washington County. We only interviewed one provider of cellular telephone service.

Steve Buza is Chief Executive Officer of Axiom Technologies, an information technology company that specializes in professional consultant services, broadband internet service and network security. Axiom operates throughout most of Maine and a few places in New Hampshire. They are planning to expand into Vermont to cover all of Northern New England.

Phil Hahn is President of Lighthouse Communications, who manufactures and sell OMNI-WiFi equipment to Internet Service Providers in rural Maine but do not plan to be an ISP.

Dan Bretton is Director of Governmental Affairs for Verizon.

Mark Gartley is Construction Manager for US Cellular and provides cellular telephone service throughout the United States including Washington County under an FCC license to Maine RSA#1, Inc.

Bill Barnett is President of CCP Wireless a provider of wireless broadband services based in Calais. They obtain propriety signals from Pioneer Wireless in Aroostook County and sell the signal in Washington County to their own retail customers and on a wholesale basis.

Damar Dore is President of Wabanaki Wireless a new provider of wireless broadband services in southeastern Washington County. Wabanaki purchases bandwidth from CCP Wireless for re-sale to their own subscribers.

Questions<sup>11</sup> were asked of private sector service providers in an interview format.

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1. If you are not yet licensed to provide service in Washington County, what are the barriers to entry in to the market?
2. Here are the **gaps** (maps of service); here are the **opportunities** (existing sites where private/commercial land mobile facilities already exist); here is the **demand** from the survey – what does it take to fill the gaps?
  - regulatory and licensing
  - infrastructure, hardware, leasing
  - Does your market strategy include the region?
3. How much additional subscription would it take to
  - a. Invest in additional infrastructure in Washington County?
  - b. Invest in on-going maintenance on new infrastructure if it were constructed/obtained through public investment/subsidy?
4. What are the priority areas in Washington County to fill?
5. What is your experience obtaining from or leasing to public sector sites for tower or antenna sites? Any example/successful lease arrangements you could share with us?
6. What are the opportunities and needs looking forward?
7. For Cellular providers – What steps are you taking now or in the future to improve the issues (coverage, reliability) raised by our survey respondents?

For those who are not yet licensed we asked about the **barriers to entry into the market**. These responses pertain only to broadband service providers.

To become a Competitive Local Exchange Carrier (CLEC) that can provide high speed internet using telephone infrastructure, you need to have a hearing before the Public Utilities Commission and be licensed. A CLEC must have filed a petition and obtained approval from the Public Utilities Commission in order to operate in the state of Maine. Axiom currently resells services through an existing CLEC. There are additional innovative deployment solutions that Axiom wishes to investigate that it cannot engineer as a reseller. By the time this report is finalized, Axiom will have acquired CLEC authorization through a merger with their underlying carrier, Cornerstone Communications, so that Axiom can begin investigating and engineering innovative solutions to rural broadband problems. There also are Independent Local Exchange Carriers (ILECs). These companies own the lines (Verizon, TDS).

We heard that the biggest barrier to entry for CLEC's is the cost of deployment including, first, the actual cost of infrastructure and of interconnecting with Verizon, and second, the cost of maintaining the regulatory regime to do business. Other interviewees indicated that much of Washington County lacks broadband availability because of the distance from the DSL switch for many communities. There is a lack of money to build infrastructure and the customer base in some locations is too small.

Wireless providers operate on unlicensed radio frequencies and experience three basic barriers to expand service. The first, as with any new business, is securing the funding to get started. It is estimated to take approximately three years before it is profitable. Wabanaki Wireless was supported by the Passamaquoddy Tribe in order to overcome this initial hurdle. The second is finding affordable leases on existing towers or prime sites for inexpensively constructing new towers. In some cases market rates for leasing space make it more cost effective to build new towers. Costs range for different types of service and vary from site to site depending on height, access, site work, power needs and regulation. In order to afford new tower construction it is often necessary to pre-sell leases.

The third barrier is licensed frequencies. As noted above wireless providers operate on unlicensed frequencies, but if the FCC takes steps to free up some currently unused licensed frequencies it would be a huge benefit. By switching to licensed frequencies wireless high speed internet providers could broadcast farther, offer larger bandwidth packages and reduce install costs.

A final barrier encountered was delay in obtaining land use approval for a new tower construction because the town had no tower ordinance. Given their lack of preparedness the town provided a building permit to proceed with construction and continued to review the permit for basic health, safety and welfare issues.

Next we shared our survey and mapping results with interviewees and asked **what it would take to fill the gaps.**

All providers acknowledge that there are gaps in broadband service in the region, which are well mapped and that some technologies already exist to fill some gaps. As described above Axiom can deploy a form of DSL that can be done anyplace in Maine for business clients; but not for residential clients at the cost they want (\$30 per month). In order to service these residential subscribers, Axiom needs to establish a co-location point as described above in Broadband Infrastructure Assessment<sup>12</sup>. There are 14 Central Offices in Washington County. Axiom works off two, currently, and are contemplating a third in Jonesport.

All broadband providers plan to fill as many of the gaps as they can. The rate at which this can be accomplished is the question. It depends on several factors, the biggest of which is funding. Subscription rates need to grow quickly and cooperation is needed among other broadband ISPs so that one area is not flooded with providers while neglecting to serve some areas.

Those broadband providers who own their own tower(s) are working with cellular telephone companies to provide repeaters on their towers. Several providers noted that another means of avoiding the high lease rates on towers is to trade lease space for DSL or wireless internet service.

Cellular providers indicate that the bottom line is the economics of the market. Any company may have \$X million capital budget in any year, but rural counties (not just Washington) are competing with more populated counties. The firm must make an investment choice based on the potential market. Costs vary depending on location but may range between \$300,000 to \$400,000 per tower. Most firms like to own their own towers. Each tower can cover 3-4 mile radius based on line-of-sight available. Some wireless providers are investigating construction of repeater structures at a cost of \$8,000 to \$10,000 in order to push their signal another 20 miles and into areas that are underserved. They are also investigating cooperative sharing of Canadian towers.

We then asked whether there was **sufficient additional subscription (market) in Washington County to justify investment.**

Costs depend on the area of deployment. It is not unheard of to deploy DDSL for startup of \$15,000, plus monthly costs to maintain of about \$1,000. CLEC's have to pre-sell service and get customer commitments before they can make the infrastructure investments. Some sort of gap financing is needed to put the infrastructure in place. In some cases, there is absolutely no private funding sources because there are no upfront

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<sup>12</sup> Axiom's Remote Collocation technology is proprietary in nature. They are currently the only CLEC in New England that has successfully deployed collocation at a remote terminal in Charleston, Maine. Axiom seeks to deploy Remote Collocation in more communities in Maine, provided it can obtain sufficient financing or public funding. They predicts that this technology will expand DSL coverage to unserved communities by an order of magnitude.

funds to serve those towns. It's a "but for" situation: But for public funds to support the infrastructure, they cannot provide service to a community. Broadband providers indicated they need either public funding or a change in the cost structure (Verizon) to serve these communities. Verizon has a \$7,000 application fee to put a co-location spot in a town. That is over and above engineering fees and rights fees. So it is cost prohibitive with the exception of a few places. Population density is a concern, but so is the "take" rate (what percentage of potential subscribers will sign up for service). The take rate could be higher than normal in some of the lower density areas because of the lack of options. So take rate is a factor in addition to density.

Determining how many subscribers are needed in order to serve an area varies across the service area. It is relatively inexpensive to buy and install wireless broadcast equipment (approximately \$8,000) on an existing tower. The variable is the tower rent or construction of a tower. With a reasonable tower rent a wireless provider will serve an area with an initial commitment of as little as 15 subscribers. Another hurdle for wireless services is the cost of the equipment at the subscriber end. It costs about \$500 per customer. Some providers absorb this cost others pass lease the equipment and pass the leasing cost on to the customer in the monthly rate. Bulk purchasing with other wireless internet service providers (WISP) or some form of government subsidies to lower this cost would allow a much faster rate of expansion. Initial investments in infrastructure for the Wabanaki Wireless operation were supported by the tribe and will be paid back through government grants that are exclusively available to tribal communities. This kind of support for initial investment generates positive cash flow and allows for expansion.

Cellular telephone representatives indicated that it is more and more critical to encourage firms to co-invest in towers, sharing capital costs and then competing for customers in the area of the tower(s). A potential source of funds to assist with this infrastructure where subscriber enrollment is low is the Universal Services Fund to subsidize capital costs in rural areas.

We asked providers if they had **priority areas for expansion**.

Different firms felt more or less comfortable divulging this information. Obviously most would like to sell their services in every town they could get. But the reality is that the larger towns with higher populations are a priority (because of the customer base). However towns where broadband options are limited or non-existent are also prime targets for the smaller companies with targeted and innovative solutions. A priority right now for Axiom is to find a local company or a community itself that wants broadband services and will work to help them put it in place.

Wabanaki Wireless indicated that they are looking to expand in cooperation with CCP Wireless and will create an LLC and a Board. Their primary service areas are the three tribal communities. After that they seek to expand into the bigger metro areas including Machias and Milbridge, along the coast to Ellsworth, then to Bangor and back out along route 9 with a grid to cover the area in between. CCP Wireless plans to branch out from their current sites both north and west towards Bangor as well as into the Canadian

market. They believe that it would be in the best interests of all to work with other ISP's to plan target areas.

Experience with **leasing of structures** including the following:

Companies described lease arrangements with churches and prime sites. As noted above many seek to obtain a lease on a building or tower in exchange for providing the owner with broadband service. Some simply talk to the people who live on the highest hill in an area. Others are working with the public sector to pay land taxes if the tower goes up or with a local police force who will have wireless service provided in the tower coverage. Some are leasing their towers to other providers.

We asked everyone what they see to be the **opportunities looking forward**.

Most were very positive about future improvements in broadband service and availability. Some see Washington County as a test area for rural Maine and the rest of the rural U.S. and that the rollout here will be a proving ground. All reiterated the need for some kind of gap financing to help with initial investments. While there was excitement and optimism there was also frustration because there is a huge demand and need for the expansion of this infrastructure in rural Maine but to this point there is very little governmental assistance for small broadband ISP to expand.

*It is our belief that it will be the small ISP's that want to and will fill the gaps in rural Maine and across the country. We hope that this project will raise awareness of the challenges we are encountering and encourage those who read this report to contact us so we can discuss in more detail our plans and concerns.*

*We would also like to acknowledge Pioneer Wireless, who we have molded our business after. They are Maine's first and largest broadband WISP, located in Houlton, ME. They serve customers from Lincoln to Madawaska and have been the true pioneers of this industry in Maine.*

*Bill Barnett, CCP Wireless*

In response to the question about the **steps being taken now to improve cellular coverage** we heard the following:

In May, 2005 US Cellular added a new repeater to the new Wabanaki Wireless tower in Perry.

## **Conclusions and Recommendations from Private Sector Interviews**

Interviews included questions and issues about both high speed internet issues and cellular telephone access. However the bulk of the responses concern high speed internet.

The most significant barriers to entry are associated with initial capital costs for start up or expansion ventures. Costs are associated with interconnection fees to Verizon, lack of DSL functionality on Verizon lines, affordable lease rates on existing towers, construction of new towers, and installation of wireless reception equipment on individual homes.

Providers acknowledge that while there is a limited customer base there is also very low market saturation, high demand and a variety of innovative solutions. Thus, the most important need to fill the gaps in service is funding for initial capital costs. All providers, high speed and cellular, recognize the need to share infrastructure to spread the capital burden. High speed internet providers need and anticipate fast growth in subscription with initial capital development assistance. Smaller firms developing new services are targeting high population areas and dispersed rural areas (the so-called “last mile”) with low market saturation. Most are optimistic about growth potential and see Washington County as a state and national test area for rural broadband deployment. Frustration over the lack of gap financing in rural areas to “jumpstart” the sector is very common.

#### RECOMMENDATIONS:

*Develop and expand public and private funding sources to assist with initial capital equipment costs to develop high speed internet capacity in rural areas that will extend service beyond existing infrastructure constraints.*

*Explore subsidies for bulk purchase of wireless reception devices on individual residences and businesses.*

*Facilitate sharing of infrastructure to spread capital costs across public and private sector and across telecommunications service needs (broadband, cellular, radio).*

#### **State Level Efforts to Improve Service**

The need to coordinate public and private infrastructure is essential statewide to support public safety and as an engine of economic growth. In telephone interviews with Lieutenant Ray Bessette (February 11, 2005) at the State Police Headquarters in Augusta and Chief Information Officer Dick Thompson (February 28, 2005) we learned of the two recent efforts to bring the public safety infrastructure, constructed in the 1960s and 1970s, with a lifespan of 15-20 years, into the 21<sup>st</sup> century:

- 2001 Macro Corporation study that recommended a robust statewide microwave system with an estimated cost of \$220 million,
- proposed addition (not included) to the 2005 Governor’s Bond package for a statewide narrow band system with an estimate of between \$30 and \$50 million,

As part of what the Governor is calling the Connect Maine initiative, outlined in his State of the State address in January of 2005, several other initiatives are also underway including:

- Creation of the Governor’s Wireless Telecommunications Infrastructure Board (EO 2205) under newly re-organized Office of Information Technology to examine how all state services, including public safety, can be improved through cooperation with the cellular telephone providers networks,
- The Maine Public Utilities Commission web site is hosting an interactive map that identifies the types, and providers, of broadband available in any given town in the state. The ArcIMS based service provides an easy to use map interface for query, search, access and feedback to MEPUC tabular data on broadband deployment

available to Internet browsers,

<http://megisims.state.me.us/website/broadband/viewer.htm>.

- The Maine Office of the Public Advocate is hosting a map on their web site called “You can’t hear me now” (<http://www.state.me.us/meopa/indexpages/cellular.html>) where cell phone users can provide areas where their cell phones do not work. These are mapped according to the cell phone service provider and the location.
- Another interactive Internet map service shows point locations of public wireless Internet hot spots in Maine. Like the broadband map the ArcIMS provides a service to query, search, and access MEPUC information on wireless Internet hot spots available to Internet browsers, <http://megisims.state.me.us/website/broadband/viewer.htm>.
- Creation by Executive Order of the PK-20 Telecommunications and Technology Infrastructure Board, the Broadband Infrastructure Board and the Telecommunications Infrastructure Steering Committee to prioritize, coordinate and implement the necessary enhancements and accessibility of wireless telecommunications and broadband technology.

The 122<sup>nd</sup> legislature has also considered three pieces of legislation (LD 789, LD 1128 and LD 1440) that would influence broadband capacity in Maine.

LD 789 (tabled and voted ought not to pass on April 26, 2005) would have changed state policy to ensure that the PUC pursue the expansion of affordable, high speed internet service throughout the State. The Governor’s goal in the January, 2005 was rather “to ensure that 90% of Maine Communities have broadband access by 2010; 100% of Maine Communities have quality wireless service by 2008”.

LD 1128 (voted ought to pass by a divided report on May, 2005) directs the State Planning Office, in conjunction with the PUC and the Department of Economic and Community Development, to study the economic, technological and funding issues associated with municipalities providing wireless internet services to their communities. The Advisory Committee for this study (see Appendix A) is composed of several private service providers of high speed internet services as well as professional staff who provide technical assistance to rural municipalities in the areas of land use planning and regulation, economic development and downtown revitalization. All agreed that municipalities are not appropriate providers of wireless internet service for several fundamental reasons:

5. Municipalities, particularly rural communities where there is the greatest lack of reliable high speed internet service, often have insufficient or only enough capacity to conduct the administrative and regulatory requirements of their own affairs at current property tax levels.
6. Delivery of wireless internet services requires technical expertise that is rarely, if ever, among the qualifications of town clerks, administrators or managers.
7. As this study has described in detail, the private sector is already ready, willing and competent to provide wireless internet services to rural communities. What they lack is financing to get over initial capital investment needs.

8. Research in the Pittsburgh region (see Digital Rivers Final Report reference in Footnote 1) found that most municipalities do not pose significant obstacles for telecommunications infrastructure deployment due to fees and regulation as many had assumed. However, the study found significant obstacles at the municipal level because, even at the highest levels, officers of the municipality do not understand basic telecommunications issues. Many did not know if or how much, the municipality received from cable franchise agreements, whether the municipality had any regulations for telecommunications infrastructure, or whether telecommunications providers were even working in their area.

Therefore this study believes it an extremely poor use of State funds to conduct the study proposed in LD1128.

**RECOMMENDATION:**

*Focus state studies and capital investments on the private sector who have demonstrated a technical and entrepreneurial ability to provide high speed internet services.*

LD 1440 (voted to be carried forward to the second regular session of the 122<sup>nd</sup> Legislative session) would create a Maine Internet Access Authority within the PUC to encourage collaboration among providers, local governments and economic development groups. It would also require towns to accommodate wireless providers on their buildings for little or no cost, set up a State matching fund to encourage innovative solutions for providing high speed internet service and require publication of fees. This bill will be taken up in the next legislative session presumably with the input of the Governor's Telecommunications Boards and Telecommunications Infrastructure Steering Committees.

LD1440 identifies the Committee on Utilities and Energy as the authority to set membership, powers, duties and goals of the proposed Maine Internet Access Authority. Given the importance of internet access to economic development, a Joint Committee should include the Business, Research and Economic Development Committee as well as the Committee on Utilities and Energy. In addition emergency services personnel in Washington County report extremely high lease rates in order to place emergency radio equipment on privately owned towers. Thus any state mandated requirement that wireless equipment be allowed on municipal structures should be balanced by a similar mandate that accommodates the public sector.

**RECOMMENDATION:**

*Given the importance of internet access to economic development, the authority to set membership, powers, duties and goals of the proposed Maine Internet Access Authority should rest with the Joint Standing Committee on Utilities and Energy and the Joint Standing Committee on Business, Research and Economic Development.*

*Any state mandated requirement that wireless equipment be allowed at little or no cost on municipal structures should be balanced by a similar mandate that accommodates public sector needs for emergency services infrastructure.*

*Create the State Matching Fund to encourage and implement creative Internet access technologies as soon as possible. Include sufficient public funds for front end capitalization of private firms to implement business models that are already in place.*