

**MINUTES OF THE SIXTEENTH MEETING**  
**REGIONAL TELECOMMUNICATIONS PLANNING**  
**ADVISORY COMMITTEE (Reconstituted)**

DATE: November 14, 2006  
TIME: 2:00 P.M.  
PLACE: Commissioners' Conference Room  
Regional Planning Commission Offices  
W239 N1812 Rockwood Drive  
Waukesha, Wisconsin

Members Present

Kurt W. Bauer Chairman	Executive Director Emeritus, SEWRPC
William R. Drew Vice Chairman	Vice-Chairman, SEWRPC; Executive Director, Milwaukee County Research Park
Bob Chernow	Chairman, Regional Telecommunications Commission
Michael Falaschi	President, Wisconsin Internet
Barry Gatz	Network Supervisor, CenturyTel
Michael E. Klasen	Director, Regulatory Affairs, AT&T
J. Michael Long	Attorney-at-Law, Murn and Martin, SC
Jeff Mantes	Commissioner of Public Works, City of Milwaukee
George E. Melcher	Director, Office of Planning and Development, Kenosha County
Paul E. Mueller	Administrator, Washington County Planning and Parks Department
Steven L. Ritt	Attorney at Law, Michael Best & Friedrich
James W. Romlein	Managing Director, MVLabs, LLC
Darryl Winston	Director of Data Services, City of Milwaukee Police Department
Gustav W. Wirth, Jr.	SEWRPC Commissioner

Members Absent

David L. DeAngelis	Village Manager, Village of Elm Grove
Roger Caron	President, Racine Area Manufacturers and Commerce
Jeff M. Lowney	Vice President/General Manager, Time Warner Telecom
Rob N. Richardson	Director, Racine County Information Systems
Bennett Schliesman	Director, Kenosha County Emergency Management /Homeland Security
Michael Ulicki	Vice President and Chief Technology Officer, Norlight Telecommunications
Dale R. Shaver	Director, Waukesha County Department of Parks and Land Use

Staff

Philip C. Evenson	Executive Director, SEWRPC
Kenneth J. Schlager, PhD	Chief Telecommunications Engineer, SEWRPC
Lynn G. Heis	Staff Secretary, SEWRPC

## **CALL TO ORDER AND ROLL CALL**

Chairman Bauer called the meeting to order at 2:00P.M. Roll call was taken by circulating an attendance signature sheet, and a quorum was declared present.

Chairman Bauer noted that all Committee members should have received, with the agenda for the meeting, a copy of SEWRPC Planning Report No. 51, *A Wireless Antenna Siting and Related Infrastructure Plan for Southeastern Wisconsin* dated September, 2006. He noted that the plan documented in this report was formally adopted by the Commission at its meeting held on September 13, 2006, and that the Commission was in the process of distributing the report to its constituent Federal, State, County and municipal units and agencies of government for consideration. He again, on behalf of the Commission and Commission staff, thanked the Committee members for their contribution to the preparation of this Commission report.

## **CONSIDERATION OF THE MINUTES OF THE MEETING OF AUGUST 29, 2006**

Chairman Bauer noted that copies of the minutes of the fifteenth meeting of the Reconstituted Regional Telecommunications Planning Advisory Committee held on August 29, 2006, had been distributed to all members of the Committee for review prior to the meeting. He asked the Committee to consider approval.

There being no corrections or additions, on a motion by Mr. Drew, seconded by Mr. Wirth, and carried unanimously, the minutes of the meeting of August 29, 2006, were approved as submitted.

## **CONSIDERATION OF PRELIMINARY DRAFT OF CHAPTER V "TELECOMMUNICATIONS BROADBAND INFRASTRUCTURE INVENTORY FINDINGS" OF SEWRPC PLANNING REPORT NO. 53, *A REGIONAL COMPREHENSIVE BROADBAND TELECOMMUNICATIONS PLAN FOR SOUTHEASTERN WISCONSIN.***

Chairman Bauer noted that a copy of the preliminary draft of Chapter V "Telecommunications Broadband Infrastructure Inventory Findings" of SEWRPC Planning Report No. 53, *A Regional Comprehensive Broadband Telecommunications Plan For Southeastern Wisconsin*, had been provided to all members of the Committee for review prior to the meeting.

Chairman Bauer then asked Dr. Schlager to undertake a page by page review of the preliminary draft with the Committee.

Mr. Klasen called attention to the last line of the first paragraph on page 2 which stated that fiber-to-the premises was presently installed only in one residential area within the Region, and indicated that this statement was incorrect. He suggested, and the Committee agreed, that the phrase concerned be struck.

Mr. Klasen then suggested, and the Committee agreed, that text be added in an appropriate location describing the status of satellite telecommunication services within the Region.

[Secretary's Note: The following paragraph was added as the second paragraph on page 2:

"Wireless broadband communication service may also be provided through high speed, satellite-based, facilities. Although generally slower and more expensive than other available alternatives, satellite broadband service has the advantage of universal coverage. All areas in the Region may be serviced by satellite broadband. Such coverage is particularly important in

rural areas where no other alternative broadband service is available. It is reasonable to expect however, that rural parts of Southeastern Wisconsin will eventually be offered other wireless, or wireline, broadband communication services. The satellite alternative is referenced here only to provide a comprehensive description of all of the broadband technologies available within the Region.”]

Mr. Klasen suggested, and the Committee concurred, that the reason why major service providers were unwilling to provide service area delineation maps be added to the text.

[Secretary’s Note: The following phrase was added to the end of the third sentence of the fourth full paragraph on page 2:

“...the providers regarding such maps as comprising confidential competitive information.”]

Mr. Chernow called attention to the criteria for the extension of cable service given in the second paragraph on page 4. He suggested, and the Committee concurred, that a statement be added to the text that the application of the cited criteria was community specific, depending upon the existence and conditions specified in contracts between the communities and cable service providers concerned.

[Secretary’s Note: The following sentence was drafted for insertion as the last sentence of the second paragraph on page 4:

“It should be noted that the application of the afore-referenced criteria is community specific, and not universal, depending upon the existence and conditions of contracts entered into between cable service providers and the municipal governments concerned.”]

In answer to a question by Mr. Falaschi, Dr. Schlager indicated that the white areas on Map 1 indicated the communities which had not, as of 2006, entered into franchise agreements with service providers. He indicated further that the map was not intended to imply that there was no cable service provided within the communities concerned; however, any such service would presumably be provided without a franchise agreement.

Mr. Klasen suggested, and the Committee agreed, that the eighth, ninth, and tenth sentences of the last paragraph which begins on page 4 and ends on page 7 be rewritten to read as follows:

“The growth pattern correlates well with the broadband cable service coverage in the Town. Lacking definitive service coverage information from the two regional cable providers, this correlation between urban growth patterns and broadband cable coverage was used as a basis for estimating the geographic extent of broadband cable coverage within the Region. Map 3 indicates the urban development pattern within the Region as of the year 2000, and is believed to represent an approximate delineation of the current areas served by broadband cable coverage within the Region.”

Mr. Evenson indicated that the green shaded areas on Map 2, page 6, indicated the actual extent of urban residential development within the Town of Ottawa as delineated by the latest – year 2000 – Commission land use inventory.

Chairman Bauer indicated that proper legends, and as may be necessary, revised titles would be added to all of the maps to be included within the chapter. In this respect, Mr. Klasen suggested that Map 4 should be entitled "Estimate of Cable Service Coverage with Southeastern Wisconsin – 2000."

In answer to a question by Mr. Falaschi, Mr. Evenson indicated that the extent of urban development as delineated on Map 4, was indeed based upon density criteria. He indicated these criteria would be provided in the minutes of the meeting.

[Secretary's Note: The Commission criteria used in the delineation of urban development on Map 4 is that:

1. There be at least ten residential structures over a maximum distance of one-half mile located along a linear feature such as a roadway or lake shore; or at least ten structures located in a compact group within a residential subdivision.
2. In addition, the concentration of buildings with their associated yards, parking and service areas must have a combined area of at least five acres.]

It should be noted that these criteria are almost identical to those used by the cable service providers cited in the text. A brief discussion ensued upon which it was agreed that Map 4 should be revised to eliminate the historic aspect of the presentation, using a single color for the extent of urban development within the Region in 2000, and as such, the estimated extent of cable service.

Mr. Klasen suggested, and the Committee agreed, that the parenthetical phrase or words attached to item numbers 4, 5, and 6 on page 7 be struck.

Mr. Klasen called attention to the penultimate paragraph on page 9 indicating that the delineation of digital subscriber line service based on 18,000 foot radius circles around central office locations was a simplification that required explanation. He noted that the service distances concerned were related to the level of service provided, and that this should be explained in the text. He noted that the situation was further complicated by tier pricing related to the level of service desired and the attendant distance from a central office. He suggested, and the Committee agreed, that the paragraph concerned be revised in its entirety. He indicated further that a preliminary redraft of the paragraph could be submitted to him and to Mr. Gatz for review and comment prior to incorporation in the minutes.

[Secretary's Note: The paragraph concerned has been redrafted and two new paragraphs were added to read as follows:

"AT&T is the major Incumbent Local Exchange Carrier (ILEC) telephone and DSL broadband service provider in the Region, providing service in parts or all of the seven counties, and in total services about 73 percent of the land area of the Region. Neither AT&T nor any of the other five regional ILECs agreed to provide maps of their DSL service coverage areas. Four of the six carriers – excluding Verizon and Telephone and Data Systems, Inc. – provided estimates of the percentage DSL coverage of their ILEC areas. Lacking DSL service area information from most ILECs, a Regional DSL coverage map was prepared as Map 4 which delineates the DSL coverage areas of all regional carriers based on 18,000 foot radius circles around each of the central offices of the various providers. Regionwide, DSL coverage for all providers based

on central offices locations approximates 64 percent of the Region. For AT&T, central office-based DSL coverage is estimated at about 55 percent of the total AT&T service area, and 40 percent of the total area of the Region. Map 5 provides additional graphic information concerning the AT&T service area.

It is recognized that the 18,000 foot radius centered on central offices as a basis for the delineation of DSL service represents an over-simplification of the actual situation. Asymmetric digital subscriber line (ADSL), which represents the predominant version of DSL service, is a distance sensitive technology. Signal quality and throughput decrease as the connection length increases. The distance limit for DSL service, however, is typically defined as 18,000 feet to be consistent with the downstream speeds of 1.5 megabits per second generally offered to DSL users.

At shorter connection lengths, signal levels will be elevated, and faster throughput speeds are possible. For example, at distances of about 6,000 feet, downstream data rates of 8 megabits per second are achieved. ADSL performance is governed by the same Shannon's Law previously referenced in this report with respect to wireless communication links. This law identifies bandwidth and signal/noise ratio as the primary determinants of channel capacity. In DSL, as in wireless links, signal quality - signal-to-noise ratio - varies with link distance. The 18,000 feet link distance defines a level of signal quality consistent with upstream and downstream data rates defined as the service offering by the wireline carrier. Distances longer than 18,000 feet will result in signal quality levels and channel capacities below this service quality standard. Other versions of DSL are sometimes offered by wireline carriers. One version, very high bit rate digital subscriber line (VDSL) service, is capable of higher data rates but at reduced link distances. Other versions of DSL, such as rate-adaptive digital subscriber line, adjust link speeds depending on the length and quality of the connection.”]

Mr. Klasen suggested, and the Committee agreed, that the use of acronyms such as ILEC, should at the time introduced in the text, be preceded by the phrase represented, as in the case of ILEC, Incumbent Local Exchange Carrier.

[Secretary's Note: Mr. Klasen's suggestion has been followed throughout the text.]

Mr. Klasen noted that the text was silent with respect to service provided by Competitive Local Exchange Carriers – CLECs. He noted that AT&T was required to provide space in the central offices for CLEC equipment, and to lease AT&T wireline capacity so that the CLECs could provide service from the central office locations. He suggested, and the Committee agreed, that a paragraph be added to the text describing this situation and its implications with respect to the inventory. Mr. Wirth agreed and indicated that under some conditions providers can also utilize AT&T facilities at a “wholesale” price and then “retail” services to subscribers. Mr. Klasen observed that historic market and regulatory decisions were indeed the basis for much of the existing service situation.

[Secretary's Note: The following three new paragraphs were drafted for insertion on page 15 of the text:

The foregoing description of DSL deployment in Southeastern Wisconsin deals only with the services provided by Incumbent Local Exchange Carriers (ILECs). ILEC is an acronym derived from the Telecommunications Act of

1996 to describe existing local telephone companies such as AT&T, Century Tel or Verizon North. The term also includes smaller regional service providers such as the Sharon Telephone Company. ILEC service providers typically own the wireline network infrastructure with particular emphasis on the connections from the various central offices to DSL subscribers.

A second class of wireline service providers was created by the Telecommunications Act of 1996, the Competitive Local Exchange Carrier or CLEC. The CLEC concept involved the authorization of new local telephone companies that would compete with the incumbents in the telephone service market place. CLECs were granted access to the ILEC's infrastructure including the connections to each subscriber. This leased infrastructure was termed unbundled network element (UNE) and was intended to allow the CLEC to compete on an equal basis with the ILEC. The concept behind the Act also contemplated the development of new CLEC infrastructure as the CLECs prospered as economically viable local telephone and data service competitors. The reality in practice was quite different. CLECs found it very difficult to market an undifferentiated service with only a marginal price advantage. The end result was that most of the CLEC telephone companies failed, and CLEC competitive offerings are no longer a major factor in the regional end user communications marketplace. CLECs also did not create any new access network infrastructure, the primary focus of this planning report.

Nevertheless, a competitive wireline infrastructure has been created in the form of core networks. Companies such as Time Warner Telecom and Norlight have deployed high capacity fiber optic networks that can serve as alternative Internet connection vehicles for new broadband wireless networks that may be developed within the Region.]

A discussion ensued in which Mr. Falaschi noted that AT&T was in a unique position with respect to having to provide access to its network by competitors, a position which was not shared by smaller companies such as State Long Distance, Verizon North, and Century Tel. Mr. Klasen observed that the situation was complex in that some of these smaller firms have filed alternative regulatory plans with the State that have requirements that they also provide a wholesale service.

Mr. Klasen noted that the central office location in the North Lake / Merton area of Waukesha County shown on Map 5 should be deleted, the office having been replaced by a remote terminal. He noted further that the central office shown just west of the Union Grove office should also be deleted from Map 5. Mr. Klasen indicated that Map 5 should be further revised by terminating the 18,000 foot radius circles drawn around the central offices at the exchange boundaries shown on the map. This would, he said, also require a recomputation of the area served.

Mr. Klasen suggested, and the Committee agreed, that Map 6 was redundant and should be dropped from the Chapter, and that consideration be given to combining Maps 7a and 7b. Mr. Ritt observed and Chairman Bauer agreed that all of the maps should be provided with proper legends as well as carefully worded proper titles.

[Secretary's Note: In response to the Committee's direction, the staff has reconsidered the need for, and revised both the content and titles of, the maps to be included in Chapter V to the following effect:

1. The original Map 1, entitled "Broadband Cable Franchise Areas Within Southeastern Wisconsin: 2006," has been retained as Map 1 on page 5 of the revised Chapter.
2. The original Map 2, entitled "Broadband Cable Service Deployment, Town of Ottawa, Waukesha County, Wisconsin," has been dropped from the Chapter.
3. The original Map 3, entitled "Urban Growth Pattern, Town of Ottawa, Waukesha County, Wisconsin: May, 2000," becomes the new Map 2 entitled "Urban Growth Pattern and Broadband Cable Service Deployment, Town of Ottawa, Waukesha County, Wisconsin, May 2000." An appropriate legend has been added to the map denoting the meaning of the green colored areas of the map and the meaning of the red lines.
4. The original Map 4, entitled "Historic Urban Growth in the Region: 1850-2000," becomes the new Map 3 entitled "Estimated Broadband Cable Service Areas in Southeastern Wisconsin: 2000." An appropriate legend has been added to the map indicating that the gray shaded areas represent the extent of urban development within the Region in 2000 and that these areas are presented as surrogates for the estimated extent of actual broadband cable service areas within the Region.
5. The original Map 5, entitled "DSL Broadband Deployment in the Southeastern Wisconsin Region," becomes the new Map 4 entitled "ADSL Broadband Deployment in Southeastern Wisconsin: 2006." The circular service areas have been adjusted to fit the central office service area boundaries and the legend has been expanded to identify the lines used to delineate the ADSL service areas.
6. The Former Map 6, entitled "AT&T ILEC Service Area," has been dropped from the text.
7. The former Map 7a, entitled "AT&T Co-Based DSL Service Area," has been dropped from the text.
8. The former Map 7b, entitled "AT&T Co-Based Service Area," has been replaced with a new Map 5 entitled "Estimated AT&T Central Office Based ADSL Service Area in Southeastern Wisconsin: 2006." The areas served have been recomputed and the correct figures are reflected in the text. A legend has been added to the Map indicating the significance of the symbols and colors used.
9. The original Map 8, entitled "Sprint Radio Signal Coverage," has been revised to become a new Map 6 entitled "Sprint Radio Signal Coverage in Southeastern Wisconsin: 2006."
10. The former Map 9, entitled "Sprint Wireless Service Quality Coverage," has been revised to become the new Map 7 entitled "Estimated Sprint Wireless Service Quality Coverage in Southeastern Wisconsin: 2006."
11. The former Map 18, entitled "Nextel Radio Signal Coverage," becomes the new Map 8, entitled "Nextel Radio Signal Coverage in Southeastern Wisconsin: 2006."
12. The former Map 19, entitled "Nextel Service Quality Coverage," becomes the new Map 9, entitled "Estimated Nextel Service Quality Coverage in Southeastern Wisconsin: 2006."
13. The former Map 10, entitled "Verizon Radio Signal Coverage remains Map 10, retitled "Verizon Wireless Radio Signal Coverage in Southeastern Wisconsin: 2006."

14. The former Map 11, entitled "Verizon Wireless Service Quality Coverage" remains Map 11, retitled "Estimated Verizon Wireless Service Quality Coverage in Southeastern Wisconsin: 2006."
15. The former Map 12, entitled "Cingular Radio Signal Coverage" remains Map 12, retitled "Cingular Radio Signal Coverage in Southeastern Wisconsin: 2006."
16. The former Map 13, entitled "Cingular Service Quality Coverage," remains Map 13, retitled "Estimated Cingular Service Quality Coverage in Southeastern Wisconsin: 2006."
17. The former Map 14, entitled "U.S. Cellular Radio Signal Coverage," remains Map 14, retitled "U.S. Cellular Radio Signal Coverage in Southeastern Wisconsin: 2006."
18. Former Map 15, entitled "U.S. Cellular Service Quality Coverage," remains Map 15, retitled "Estimated U. S. Cellular Service Quality Coverage in Southeastern Wisconsin: 2006."
19. Former Map 16, entitled "T-Mobile Radio Signal Coverage," remains Map 16, retitled "T-Mobile Radio Signal Coverage in Southeastern Wisconsin: 2006."
20. Former Map 17 entitled "T-Mobile Service Quality Coverage," remains Map 17, retitled "Estimated T-Mobile Radio Signal Coverage in Southeastern Wisconsin: 2006."

Mr. Klasen indicated, and the Committee agreed, that there were statements made on page 14 -- now page 12 of the revised text -- that were both questionable and conclusionary and as such, inappropriate in an inventory chapter. He suggested, and the Committee agreed, that the third and fourth sentences in the first paragraph on page 15 be struck.

Mr. Klasen suggested that the last paragraph on page 14 -- now pages 12 and 13 of the revised text -- and the first paragraph on page 15 be struck as including speculative or impolitic statements, or as being out of context in an inventory chapter. Mr. Mueller asked that the Committee's position in this respect be determined by a vote. Accordingly, Mr. Klasen moved, and Mr. Chernow seconded, that the last paragraph on page 14 and the first paragraph on page 15, be struck. The motion was carried with Mr. Mueller voting no.

Mr. Klasen suggested, and the Committee concurred, that the second paragraph on page 15 -- now page 14 of the revised text -- be revised to include the fact that AT&T is providing fiber optical cable service to residential premises in a number of residential subdivisions within the Region, in addition to the Pabst Farms subdivision cited in the text. He indicated that he would provide to the staff information on the number of such subdivisions for inclusion in the corrected text. Mr. Klasen indicated further that AT&T was developing an Internet protocol known as fiber-to-the node, and that this should be noted in the text. Mr. Klasen noted further that the last sentence of the paragraph concerned should be omitted from the revised paragraph as conclusionary and inappropriate in an inventory chapter.

[Secretary's Note: The first full paragraph on page 15 -- now page 14 of the revised text -- has been revised to read as follows:

Although the Pabst Farms development in Waukesha County may be the only publicly disclosed Fiber-To-The-Premises (FTTP) broadband access network service area in Southeastern Wisconsin, AT&T, the major ILEC in the Region, has initiated the deployment of FTTP and Fiber-To-The-Node (FTTN) access network service to other as yet undisclosed areas within Southeastern



Wisconsin. Based on documents furnished by AT&T, this service provider is following a mixed FTTN-FTTP broadband deployment strategy within the Region. In the Fiber-To-The-Node approach being developed by AT&T, fiber optic cables are extended out to neighborhood locations providing nodes which can then service a significant number of copper wire-linked users with higher speed versions of DSL having throughputs as high as 25 megabits per second in a service area lying within a radius of approximately 3,000 feet of a node. The FTTN approach significantly reduces the capital investment required, while still offering the bandwidth necessary for high speed voice, data and various forms of video services. At the same time, an FTTN broadband deployment allows for later expansion to a full scale FTTP network in which fiber-based bandwidth is deployed directly to user premises.

Mr. Falaschi called attention to the penultimate sentence of the penultimate paragraph on page 15 wherein it is indicated that there was a lack of commitment on the part of Verizon to serve rural areas and questioned the basis for this statement. A brief discussion ensued upon the conclusion of which it was agreed that the sentence concerned should be struck. Chairman Bauer noted that this action would be consistent with the action taken by the Commission with respect to the third and fourth sentences in the first partial paragraph on page 15.

Mr. Wirth observed that the cable service providers were also supplying fiber optic cable to the premises in some areas of the Region, noting that the Commission's building in which the meeting was being held was served by Time-Warner Telecom fiber optic cable facilities. A brief discussion ensued in which it was agreed that the role of the cable companies in providing fiber optic cable service to the premises should be noted in the text on page 15.

[Secretary's Note: The following paragraph was drafted for insertion on page 15 follows:

Cable service providers utilize a hybrid fiber coaxial (HFC) cable network topology, in which the user connection is provided by a coaxial cable link. Fiber optic lines are brought to a geographic area in the same manner as the telephone system Fiber-To-The Node (FTTN) configuration described above. The HFC cable method differs from the FTTN network structure in that it does not provide a direct nodal connection to each user in the manner of FTTN. Rather the HFC cable network deploys a bus type architecture in which a node – known as a “headend” - is provided to serve a set of subscribers through an access line – known as a “bus” – serving a number of subscribers through coaxial cable connections from the bus. Such an architecture has the disadvantage of any shared medium in that performance degrades as more subscribers share the common lines – the bus. The fiber link serving the headend is also shared, but a fiber channel has such great capacity that it does not limit system performance. Cable service providers do not generally provide direct fiber links to individual subscribers.]

Mr. Falaschi suggested that care be taken in the text to properly identify Time-Warner Telecom or Time-Warner Cable as the text may require. Mr. Ritt also requested that wherever the wireless service segment of the company is concerned, it be identified as Verizon Wireless, as opposed to Verizon North if the land line segment of the company is concerned.

A lengthy discussion ensued speculating on the reasons for the relatively poor performance of U.S. Cellular within the Region as indicated by the area coverage maps. Chairman Bauer asked that the discussion be curtailed in that it was not the intent of the Commission to become involved in critiques, or analyses, of the factors underlying the performance of the systems of the providers serving the Region.

In answer to a question by Mr. Ritt, Dr. Schlager indicated that it was still incumbent on the Commission to provide separate inventory data for the Sprint and Nextel networks even though those networks were now being operated by a single company. It was likely, Dr. Schlager opined, that given the different technologies involved in the two networks, it would be a substantial period of time before they could be combined. Mr. Wirth suggested, and the Committee agreed, that given the situation, the maps and text relating to the service provided by these two companies be placed next to each other in the chapter rather than separated by maps and text relating to other companies.

Mr. Romlein suggested, and the Committee agreed that the text provided in the Addendum to Chapter 5 -- now page 35 of the revised text -- be prefaced with a paragraph describing the historic development of the telephone subscriber network and the reasons for the development of points of presence in the networks.

[Secretary's Note: The following paragraph has been drafted for insertion as an introduction to the text provided in the Addendum.

Historically, points of presence (POPs) were the interexchange carriers' (IXC) equivalent of the local telephone company central offices. All long distance calls were routed through the IXC's POP facilities. In a traditional circuit-switched network, local exchange carrier calls would be provided a line -- or channel -- for the duration of the call. In the packet-switched networks of concern here, the POP provides an Internet connection to a fiber optic cable network capable of transporting the packet set to its destination. For incumbent local exchange carriers, the POP point is often located at a central office. The decentralized nature of packet-switched networks, and the ability of such networks to access outside of the POP locations makes traditional points-of-presence less important to advanced wireless communications systems as described below.]

Mr. Falaschi questioned the assumption that the cable service providers will permit connections to their fiber optic cable networks by other users. A lengthy discussion ensued upon the conclusion of which it was agreed that the staff would request a letter statement from the two major cable providers within the Region -- Time-Warner and Charter -- with respect to access to their fiber optic cable networks.

[Secretary's Note: Commission staff have been in contact with representatives of both Time-Warner and Charter, cable broadband service providers within the Region. Representatives of both companies have indicated a willingness to work with the Commission and its constituent counties and municipalities to provide Internet access gateways for broadband wireless telecommunications. Neither company, however, expressed a willingness to provide a letter statement concerning company policy in this respect.]

Mr. Romlein suggested, and the Committee agreed, that the fifth sentence in the last paragraph beginning on page 35 and continuing on page 36 of the Addendum be revised to read as follows:

"One possible key to the future new broadband access network deployment, therefore, rests with connection to the hybrid fiber optic coaxial cable networks."

Mr. Ritt suggested that given the extent of the changes which the Committee has requested be made in the draft chapter, action on the chapter be postponed to the next meeting so that the Committee members would be provided with a draft to review the revised chapter as a whole. The Committee concurred.

[Secretary's End Note: Following an initial revision of Chapter V as prepared by the staff in response to the direction of the Committee given at the meeting of November 14, 2006, the revised draft was submitted to Messrs. Klasen and Gatz for review and comment. This submittal was in accordance with the Committee's approval thereof as noted on page 6 of these minutes. Based upon his review of the initial redraft, Mr. Gatz had no comments to submit to the staff. Mr. Klasen, however, submitted written comments, all of which have been incorporated into the redraft of the Chapter attached to these minutes. Mr. Klasen's comments are identified in the redraft by means of asterisks used to mark the beginning and the end of either text inserts or text deletions suggested by Mr. Klasen.]

### **CORRESPONDENCE**

Chairman Bauer reported that there was no correspondence to be brought to the attention of the Committee.

### **DATE AND TIME OF NEXT MEETING**

Chairman Bauer then asked the Committee to consider the date and time for the next Committee meeting. After brief discussion, it was agreed that the next meeting of the Committee would be held on Tuesday, January 16, 2007, at the Commission offices beginning at 2:00PM.

### **ADJOURNMENT**

There being no further business to come before the Committee, on a motion by Mr. Chernow, seconded by Mr. Melcher, and carried unanimously, the meeting was adjourned at 4:15 PM.

Respectfully Submitted,

Lynn G. Heis  
Committee Secretary

***PRELIMINARY DRAFT***

**SEWRPC Planning Report No. 53,  
A REGIONAL COMPREHENSIVE BROADBAND TELECOMMUNICATIONS PLAN  
FOR SOUTHEASTERN WISCONSIN**

**Chapter V**

**TELECOMMUNICATIONS BROADBAND  
INFRASTRUCTURE INVENTORY FINDINGS**

**INTRODUCTION**

Reliable planning data are essential for the formulation of workable development plans. Consequently, an inventory of existing conditions is the first step in the planning process. The crucial nature of factual information in the planning process should be evident, since no reliable forecasts can be made or alternative courses of action evaluated without knowledge of the current state of the system being planned. The necessary inventory not only provides data describing the existing conditions, but also provide a basis for identifying existing and potential problems in the planning area and opportunities for development. The inventory data are also crucial to the forecasting of future facility and service needs, formulating alternative plans, and evaluating such plans.

Chapter IV presented data on the existing demography and economy; the existing land use pattern; and the existing transportation system of the planning area. These factors provide the setting for the telecommunication facilities and services of an area, and affect the configuration of the demand upon those facilities and services, and the configuration of the facilities and services themselves. The sound development of a telecommunications facilities and services plan must also consider: telecommunications technologies currently employed within the Region; emerging technologies that may displace these current technologies; the planimetry and hypsometry of the Region that has a major impact on the deployment of wireless communications systems displayed as canopy data; and the existing telecommunications infrastructure within the Region. The performance of that existing infrastructure must also be monitored. The results of the monitoring is reported in a later chapter.

SEWRPC Planning Report Number 51, *A Wireless Antenna Siting and Related Infrastructure Plan for Southeastern Wisconsin*, dated September 1, 2006 previously published presenting the findings of a wireless infrastructure inventory conducted by the Commission. The inventory consisted of a compilation of antenna sites that serve mobile cellular/PCS and fixed users within the Region. This inventory data will not be republished herein. This report will focus on an inventory of the geographic areas of the Region serviced by either wireless or wireline broadband communications services. Broadband wireline services were inventoried under three technology categories: (1) Digital subscriber line (DSL) services provided by telephone incumbent local exchange carriers (ILECs) and competitive local exchange carriers (CLECs) in the Region; (2) Hybrid fiber coaxial cable services provided by cable companies in the Region; and (3) fiber-to-the-premises: *\*\*and, (4) fiber-to-the-node.\*\** ~~presently installed only in one residential area within the Region.~~

*Wireless broadband communication service may also be provided through high speed, satellite-based, facilities. Although generally slower and more expensive than other available alternatives, satellite broadband service has the advantage of universal coverage. All areas in the Region may be serviced by satellite broadband. Such coverage is particularly important in rural areas where no other alternative broadband service is available. It is reasonable to expect however, that rural parts of Southeastern Wisconsin will eventually be offered other wireless, or wireline, broadband communication services. The satellite alternative is referenced here only to provide a comprehensive description of all of the broadband technologies available within the Region.*

The inventory of interest in this chapter pertains only to the geographic coverage of each of the above technologies. The performance of these three classes of communications technology will be inventoried in a subsequent chapter based upon standard measurements of availability, throughput, response time, and accuracy. These same four performance parameters will be used to evaluate both the wireline and wireless networks.

Each of the service area inventories has its limitations based on the accuracy of the data sources used in its compilation. The broadband cable service area inventory is based on a combination of comprehensive infrastructure and service information for a single community – the Town of Ottawa, Waukesha County – an inventory of community cable service franchise agreements within the Region, and an historic urban growth map of the Region that indicates areas that meet widely accepted economic criteria for broadband cable deployment. This approach to the inventory of cable service deployment resulted from the refusal of either of the two cable service providers to make available maps of the areas in which they actually provide service, *the providers regarding such maps as comprising confidential, competitive information.* Having comprehensive cable service layout information for a typical urban fringe area community provided a check

on the validity of the urban growth approach to defining cable service areas. The procedure also had the advantage that it can be used to forecast future potential broadband cable service deployments.

Telephone line-based digital subscriber line (DSL) broadband service areas were developed indirectly based on telephone company central office locations. A generally accepted service radius of 18,000 feet centered on the central office locations was used to define DSL service areas. DSL providers have extended their service areas beyond these radii by providing fiber-linked remote terminals. Requests for the location of these remote terminals were made by the Commission to all incumbent local exchange carriers and (ILEC) DSL service providers, but the requests were uniformly denied.

## **BROADBAND WIRELINE SERVICE AREA INVENTORY**

There are three types of broadband wireline service networks deployed within the Region: hybrid fiber coaxial; provider based DSL broadband services; and fiber to the premises.

### **Hybrid Fiber Coaxial Networks**

In 2006, the technology for broadband services in Southeastern Wisconsin with the largest market share was hybrid fiber coaxial cable. This technology, as the name implies, involves a combination of fiber optic and coaxial cabling with the bandwidth capability necessary to achieve throughput as high as five megabits per second in the download direction, and 384 kilobits per second in the upload direction. Performance of these cable networks, however, varies significantly with network loading. The architecture of these cable networks requires a reduction of bandwidth to each user as more users access the medium. Current network performance is described in Chapter VI of this report.

Cable networks were originally designed to deliver broadcast television signals to subscribers' homes. To provide data services, cable operators have invested heavily to convert one-way cable television signal delivery systems into modern two-way networks to support broadband, high-speed Internet access. It is estimated that by mid-2004, cable operators within the United States had upgraded over 90 percent of the homes served to support Internet access. To provide broadband cable communications services to an area, the cable operator must deploy this advanced form of cable services to each subscriber.

Determining the broadband cable service areas for Southeastern Wisconsin required the multi-path approach described previously. Implementation of this approach involved the following activities:

1. Franchise Area Mapping

The lists of the communities serviced by each of the two regional carriers operating within the Region, Time Warner Cable and Charter Communications, were obtained and mapped. It is important to note that the mapped areas represent potential service areas, not actual service areas, since the carriers are not legally obligated to serve all of their franchise areas.

## 2. Comprehensive Analysis of a Franchised Cable Community

Since unserved, and under-served, subscribers located within the franchise areas tend to be concentrated in rural areas of the Region, a single cable service-franchised civil division, the Town of Ottawa in Waukesha County, was studied in some detail to determine the basis for broadband cable deployment by the major cable operator within the Region. More specifically, the Town was studied to determine the economic basis of new cable deployment in terms of population density. The decision rule concerned is set forth in Section 22.25 of the Town franchise agreement which reads as follows:

### Conditions of Required Line Extensions

- a. Grantee shall, within sixty (60) days of the acceptance of this franchise, file a plan with the Town for the initial installation of cable. Following such initial installation, the Grantee shall not be obligated to extend its cable network to additional subscribers, unless the proposed subscribers shall be located within thirty (30) feet of the existing network or at least nineteen (19) additional subscribers will be serviced per mile of cable extension required. *It should be noted that the application of the afore-referenced criteria is community specific, and not universal, depending upon the existence and conditions of contracts entered into between cable service providers and the municipal governments concerned.*
- b. In instances where the Grantee is not required to provide service pursuant to this section, the Grantee and subscriber may nevertheless contract to have service provided on terms and conditions agreeable to both the subscriber and Grantee.

Based upon the conditions set forth in the Town of Ottawa franchise agreement -- conditions which further have been confirmed with a selected sample of fringe area civil divisions within the Region - indicated that similar decision rules were employed by the carriers concerned in approving areas of new cable deployment.

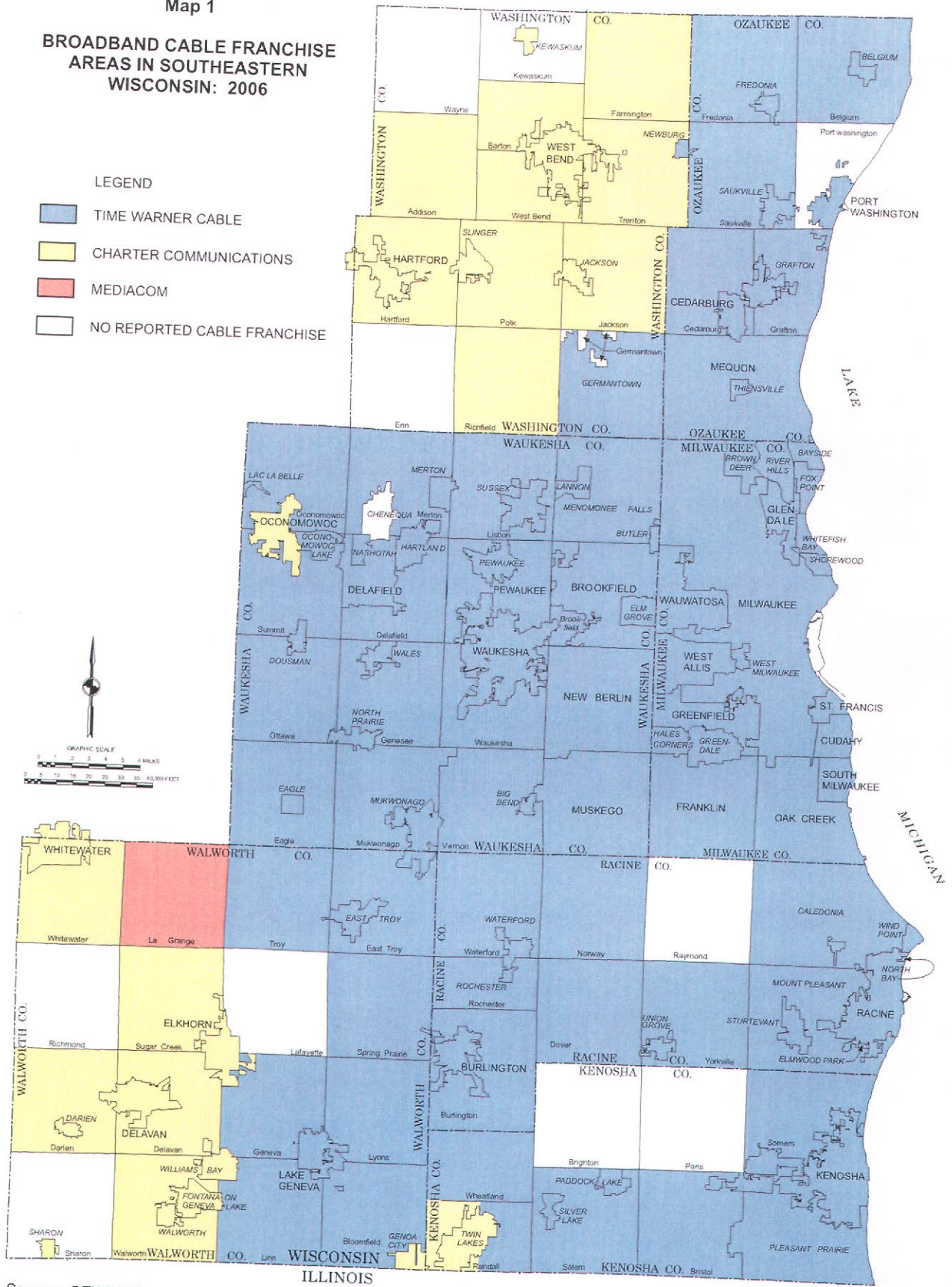
The regional broadband cable franchise areas for Time Warner Cable, ~~and Charter Communications,~~ and *Mediacom* are shown ~~in~~ on Map 1. Time Warner Cable is the dominant cable service provider in the Region. It is important to reemphasize that franchise areas do not equate with service areas. This disparity is illustrated in the Waukesha County Town of Ottawa where complete information on cable deployment is available for this community. ~~Map 2 illustrates the sectional coverage of the Town with cable service areas colored blue while sections lacking broadband cable coverage are white. In total, 19 of 36 townships meet the above criteria for broadband coverage for a total coverage of 53 percent. Map 3 2 illustrates the urban~~

Map 1

**BROADBAND CABLE FRANCHISE  
AREAS IN SOUTHEASTERN  
WISCONSIN: 2006**

LEGEND

- TIME WARNER CABLE
- CHARTER COMMUNICATIONS
- MEDIACOM
- NO REPORTED CABLE FRANCHISE



Source: SEWRPC.

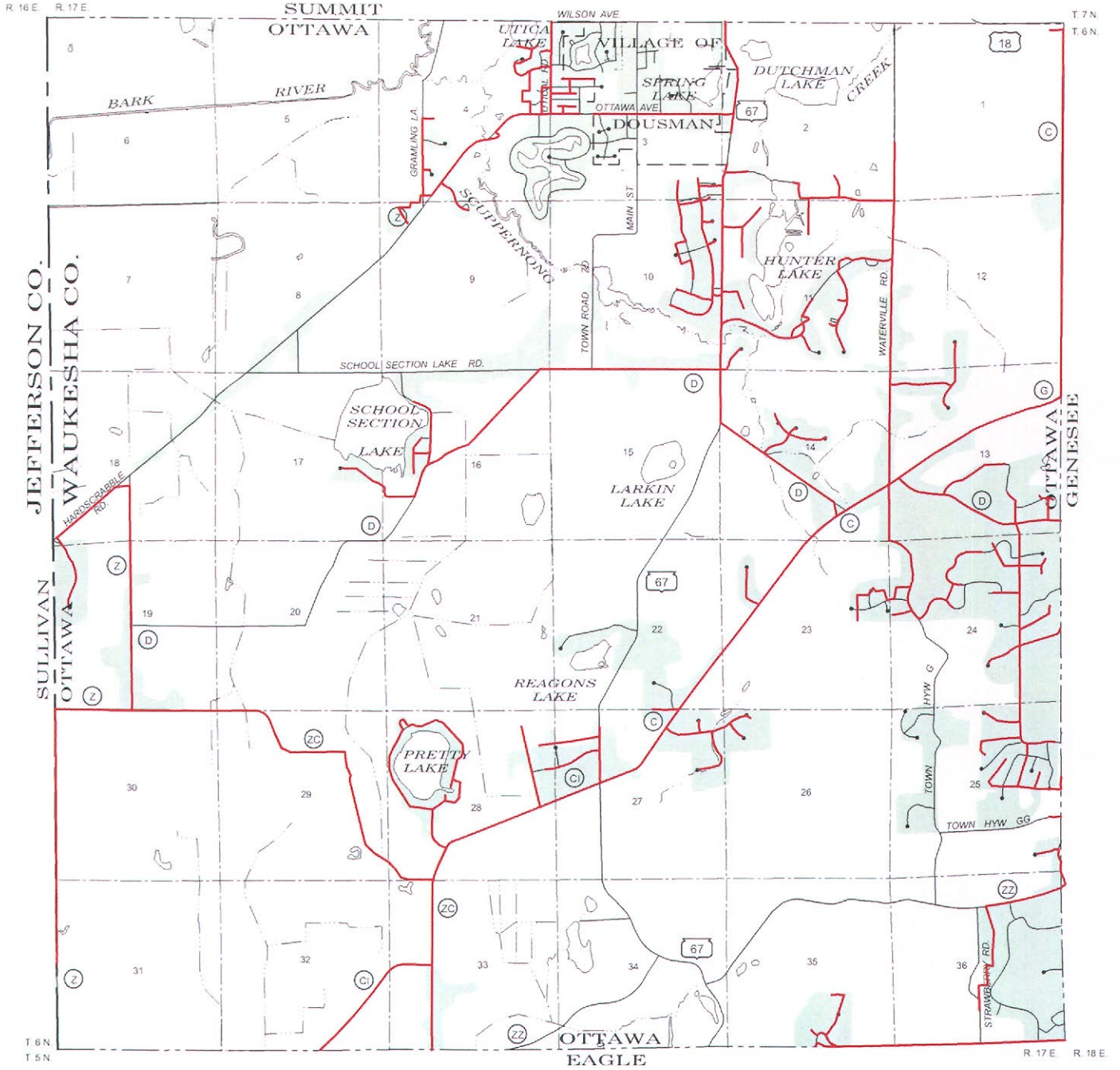
ILLINOIS

PRELIMINARY DRAFT



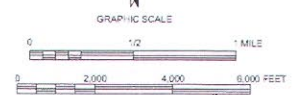
Map 2

URBAN GROWTH PATTERN, AND BROADBAND CABLE SERVICE DEPLOYMENT  
TOWN OF OTTAWA, WAUKESHA COUNTY, WISCONSIN: MAY 2000



LEGEND

- AREAS OF URBAN DEVELOPMENT 2000
- CABLE DEPLOYMENT 2006



Source: SEWRPC.

growth pattern for the year 2000 as determined by Commission inventories within the Town of Ottawa together with the broadband cable deployment. ~~The This growth pattern corresponds~~ *correlates well* closely with the broadband cable service coverage in the Town. ~~Lacking service coverage information from the two regional cable providers, this correlation between urban growth patterns and broadband cable coverage was used as the basis for estimating regional broadband cable coverage in Map 4. This map indicates urban growth pattern within the Region as of year 2000, and is believed to represent the current or potential practicable range of broadband cable coverage in the Region. Lacking definitive service coverage information from the two regional cable providers, this correlation between urban growth patterns and broadband cable coverage was used as a basis for estimating the geographic extent of broadband cable coverage within the Region. Map 3 indicates the urban development pattern within the Region as of the year 2000, and is believed to represent an approximate delineation of the current areas served by broadband cable coverage within the Region. Whatever the precision and accuracy of these map estimations, it is evident that broadband cable did not provide universal broadband coverage for the Region. Provision of universal broadband communication service must therefore, look to other communication technologies.~~

#### **Telephone Provider Based DSL Broadband Services**

Regional telephone companies provide a broadband data communication service known as Digital Subscriber Line (DSL) of which the most common form is ADSL where the prefix A indicates asymmetrical data throughput. ~~ADSL DSL~~ service, like broadband cable service, is not symmetrical with download speeds much faster than upload speeds by a factor as high as ten to one.

Six *Incumbent Local Exchange Carrier (ILEC)* telephone companies provide broadband DSL services in the Region:

1. AT&T
2. Century Tel
3. Verizon North
4. Telephone and Data Systems, Inc. (~~TDS Metrocom~~)
5. State Long Distance Telephone Co. (~~Elkhorn~~)
6. Sharon Telephone Co. (~~Sharon~~)

Map 3

**ESTIMATED BROADBAND  
CABLE SERVICE AREAS IN  
SOUTHEASTERN WISCONSIN: 2000**

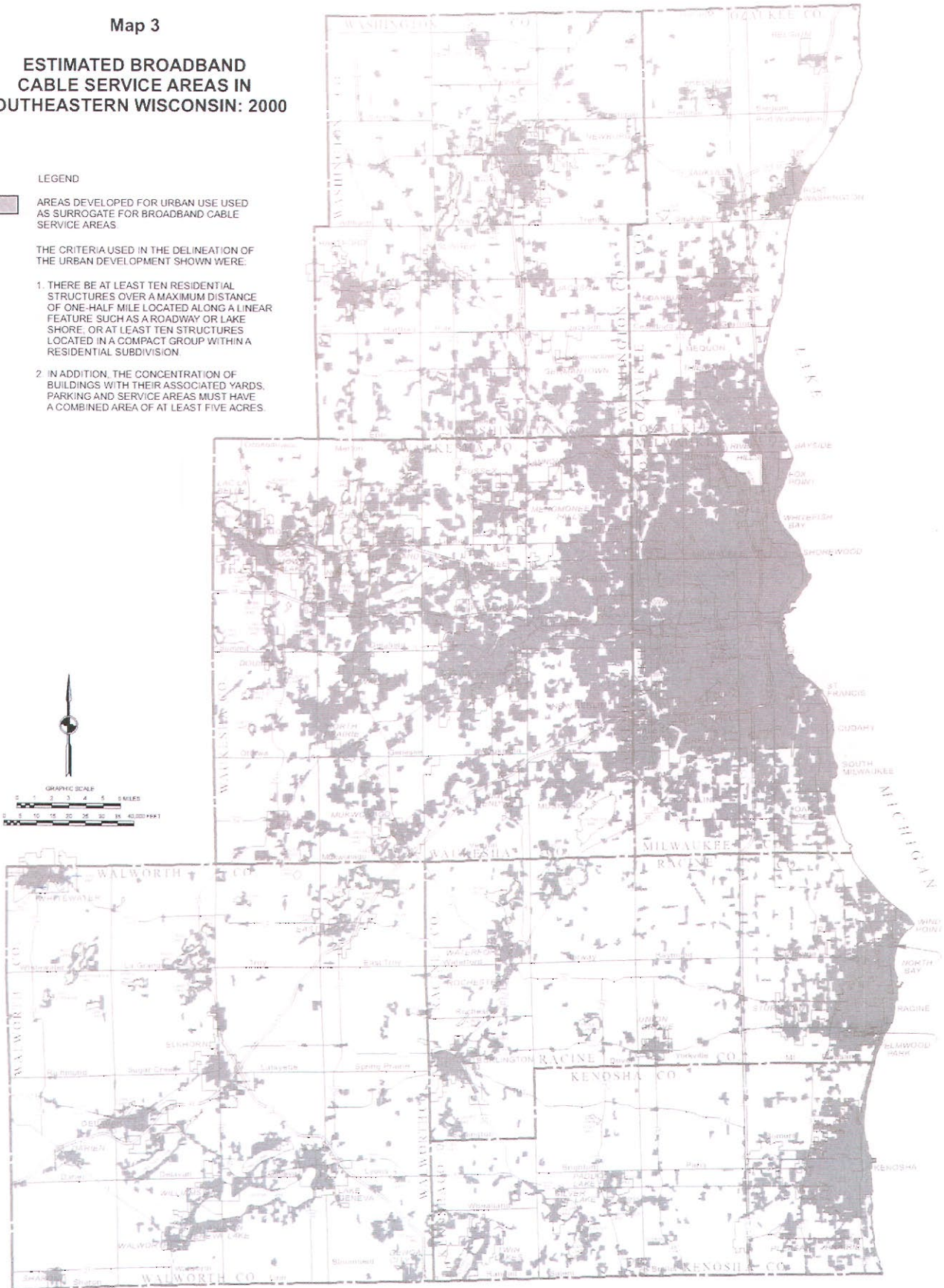
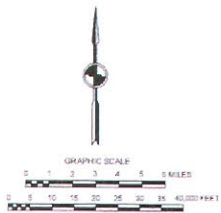
LEGEND



AREAS DEVELOPED FOR URBAN USE USED AS SURROGATE FOR BROADBAND CABLE SERVICE AREAS

THE CRITERIA USED IN THE DELINEATION OF THE URBAN DEVELOPMENT SHOWN WERE:

1. THERE BE AT LEAST TEN RESIDENTIAL STRUCTURES OVER A MAXIMUM DISTANCE OF ONE-HALF MILE LOCATED ALONG A LINEAR FEATURE SUCH AS A ROADWAY OR LAKE SHORE, OR AT LEAST TEN STRUCTURES LOCATED IN A COMPACT GROUP WITHIN A RESIDENTIAL SUBDIVISION.
2. IN ADDITION, THE CONCENTRATION OF BUILDINGS WITH THEIR ASSOCIATED YARDS, PARKING AND SERVICE AREAS MUST HAVE A COMBINED AREA OF AT LEAST FIVE ACRES.



Source: SEWRPC.

*AT&T is the major Incumbent Local Exchange Carrier (ILEC) telephone and DSL broadband service provider in the Region, providing service in parts or all of the seven counties, and in total services about 73 percent of the land area of the Region. \*\*Citing concerns regarding making competitive information public, neither\*\* AT&T nor any of the other five regional ILECs agreed to provide maps of their DSL service coverage areas. Four of the six carriers - excluding Verizon and Telephone and Data Systems, Inc. - provided estimates of the percentage DSL coverage of their ILEC areas. Lacking DSL service area information from most ILECs, a Regional DSL coverage map was prepared as Map 4 which delineates the DSL coverage areas of all regional carriers based on 18,000 foot radius circles around each of the central offices of the various providers. Regionwide, DSL coverage for all providers based on central offices locations approximates 64 percent of the Region. For AT&T, central office-based DSL coverage is estimated at about 55 percent of the total AT&T service area, and 40 percent of the total area of the Region. Map 5 provides additional graphic information concerning the AT&T service area.*

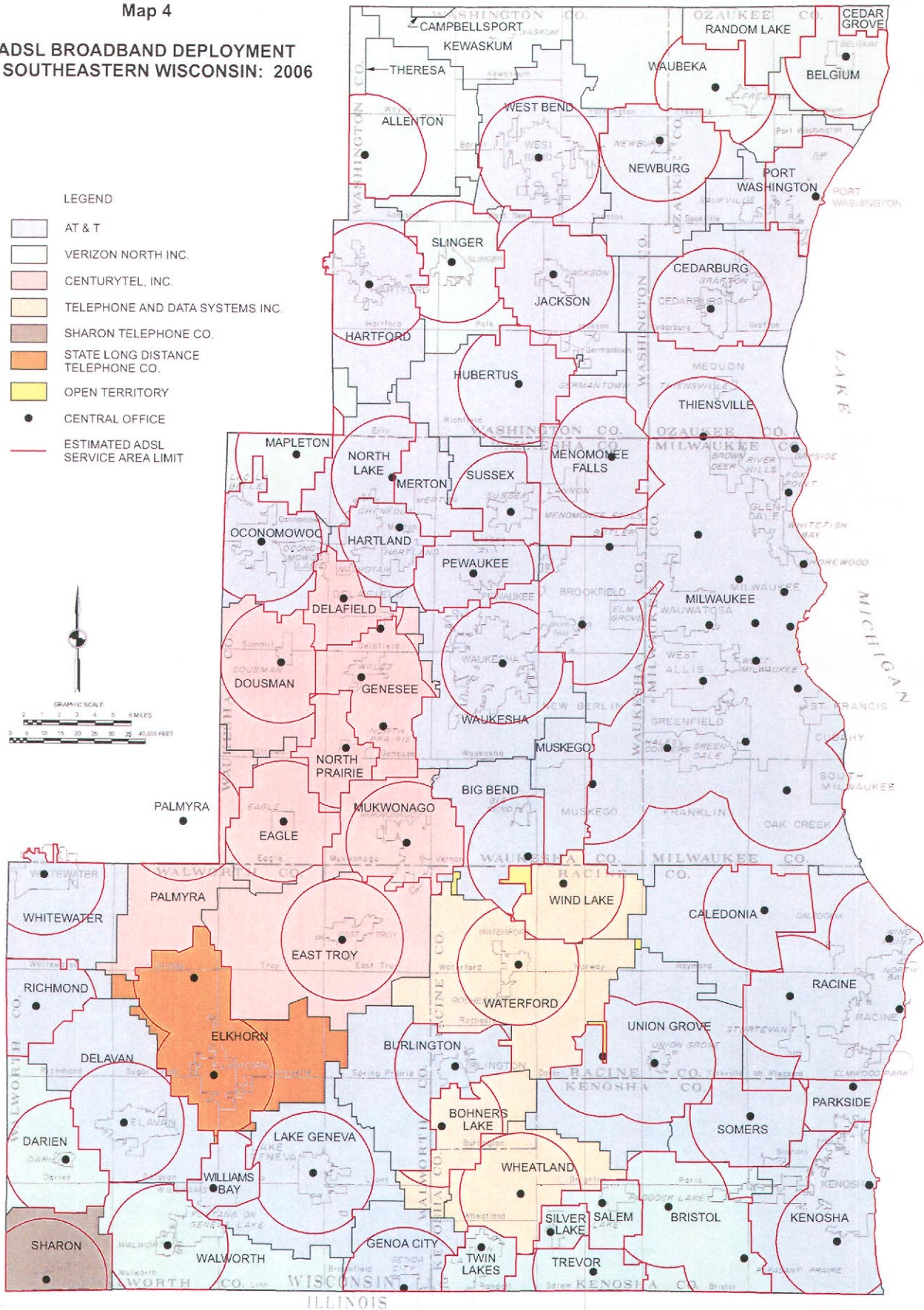
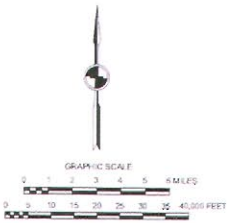
*It is recognized that the 18,000 foot radius centered on central offices as a basis for the delineation of DSL service represents an over-simplification of the actual situation. Asymmetric digital subscriber line (ADSL), which represents the predominant version of DSL service, is a distance sensitive technology. Signal quality and throughput decrease as the connection length increases. The distance limit for DSL service, however, is typically defined as 18,000 feet to be consistent with the downstream speeds of 1.5 megabits per second generally offered to DSL users.*

*At shorter connection lengths, signal levels will be elevated, and faster throughput speeds are possible. For example, at distances of about 6,000 feet, downstream data rates of 8 megabits per second may be achieved. ADSL performance is governed by the same Shannon's Law previously referenced in this report with respect to wireless communication links. This law identifies bandwidth and signal/noise ratio as the primary determinants of channel capacity. In DSL, as in wireless links, signal quality -- signal-to-noise ratio -- varies with link distance. The 18,000 foot link distance defines a level of signal quality consistent with upstream and downstream data rates defined as the service offering by the wireline carrier. Distances longer than 18,000 feet will result in signal quality levels and channel capacities below this service quality standard. Other versions of DSL are sometimes offered by wireline carriers. One version, very high bit rate digital subscriber line (VDSL) service, is capable of higher data rates but at reduced link distances. Other versions of DSL, such as rate-adaptive digital subscriber line, adjust link speeds depending on the length and quality of the connection.*

Map 4

ADSL BROADBAND DEPLOYMENT  
IN SOUTHEASTERN WISCONSIN: 2006

- LEGEND
- AT & T
  - VERIZON NORTH INC.
  - CENTURYTEL, INC.
  - TELEPHONE AND DATA SYSTEMS INC.
  - SHARON TELEPHONE CO.
  - STATE LONG DISTANCE TELEPHONE CO.
  - OPEN TERRITORY
  - CENTRAL OFFICE
  - ESTIMATED ADSL SERVICE AREA LIMIT



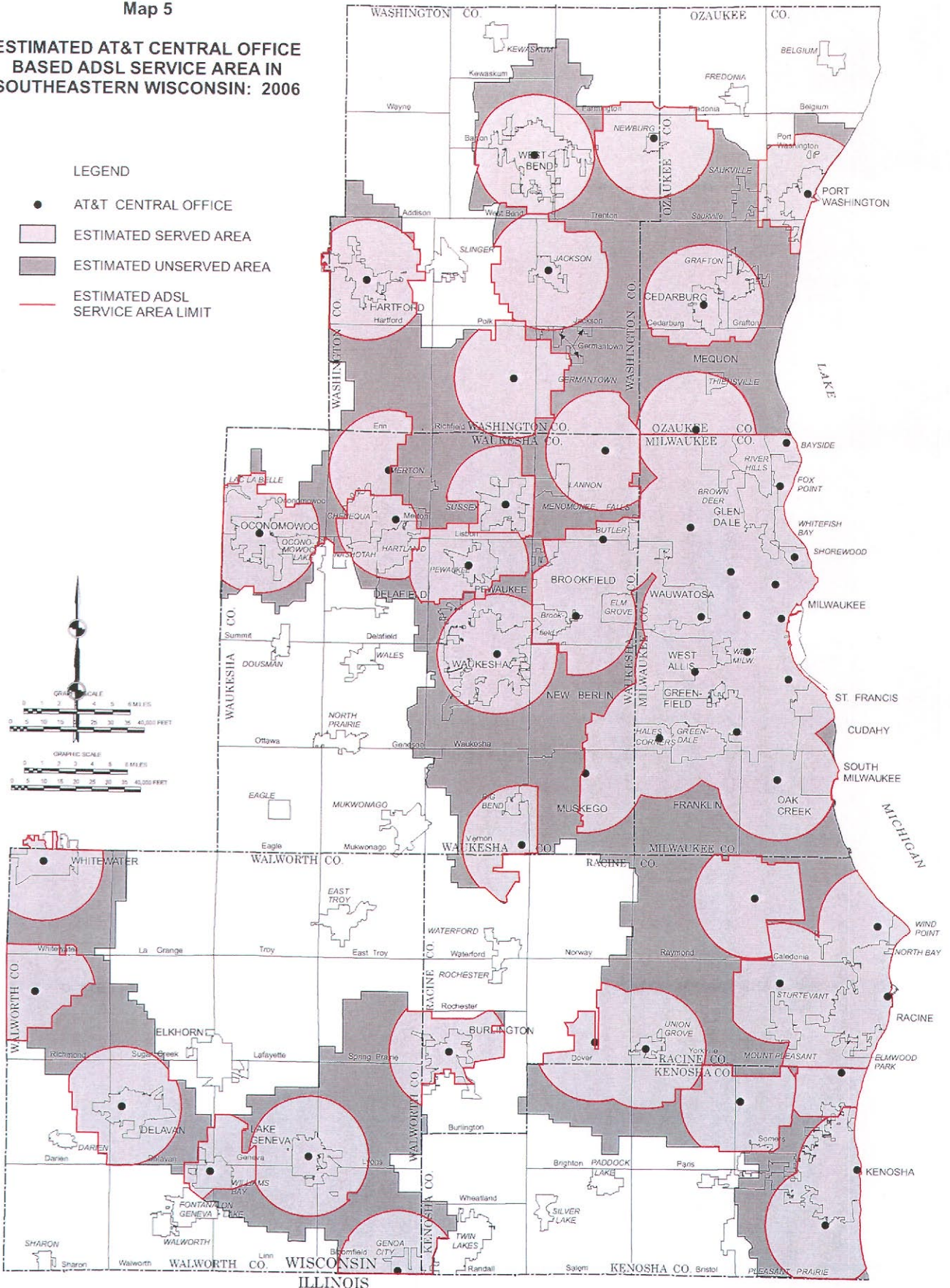
Source: Wisconsin Department of Administration Office of Land Information Services and SEWRPC.

Map 5

**ESTIMATED AT&T CENTRAL OFFICE  
BASED ADSL SERVICE AREA IN  
SOUTHEASTERN WISCONSIN: 2006**

LEGEND

- AT&T CENTRAL OFFICE
- ◻ ESTIMATED SERVED AREA
- ◻ ESTIMATED UNSERVED AREA
- ESTIMATED ADSL SERVICE AREA LIMIT



Source: Wisconsin Department of Administration Office of Land Information Services and SEWRPC.

Century Tel is the second largest ILEC DSL service provider in the Region, covering parts of Waukesha County and Walworth County. With their 11 central offices in the region, the company covers over 72 percent of their ILEC area. An additional central office located outside of the Region near Palmyra provides additional coverage in Walworth County. Based on information from the Company, DSL coverage has been extended to cover additional territory based on deployed fiber-linked remote terminals, *known as Digital Subscriber Line Access Multiplexers (DSLAMs)*<sup>†</sup> that extend DSL coverage to previously unserved areas. The company estimated that in 2006 about 81 percent of the Century Tel territory is eligible for DSL service. Uncovered areas are limited to parts of the Towns of Ottawa, Troy and East Troy.

Verizon North, Inc. is the ILEC service provider in many urban fringe areas located along the extreme north and south boundaries of the Region as shown in Map 5 4. Verizon purchased these properties from General Telephone and Electronics (GT&E) when Verizon was formed as part of the merger between Bell Atlantic and NYNEX in 1997. ~~Verizon is in the process of selling off these former GT&E properties that are concentrated in rural areas. Based on the divestiture status of these service areas, little or no future Verizon investment in these properties is expected.~~ Operating 17 central offices in the Region, Verizon could offer DSL service in about 60 percent of 16 service areas concerned.

Telephone and Data Systems, Inc. would not furnish any information for this inventory. Based on central office locations, TDS should offer service to about 67 percent of its ILEC area.

State Long Distance Telephone Company is a local provider headquartered in Elkhorn (Walworth County). It was ~~very~~ cooperative in providing DSL coverage information for this inventory. Based on central office locations alone, the Company could offer service to about 60 percent of its ILEC area. Deployment of remote DSLAMs has increased coverage to about 95 percent of their ILEC area.

Sharon Telephone Company was also ~~extremely~~ cooperative in providing information on their DSL deployment. From Map 5 4, it is evident that this single central office of this provider is able to serve over 90 percent of their ILEC area. Company management stated that these unserved areas will be provided DSL service within the next six months.

~~Overall, the Commission experience in the conduct of an inventory of the broadband service areas in the Region is typical of other similar studies conducted elsewhere in the United States. A report on such studies given at a rural telecommunications congress held in Little Rock, Arkansas on October 25, 2006 indicated that large ILEC service providers such as AT&T, Verizon, or Bell South as a matter of policy do not cooperate in providing information on their DSL coverage. Medium scale service providers such as Century Tel and TDS Metrocom cooperate about 50 percent of the time. Small local service providers such as~~

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<sup>†</sup>Digital Subscriber Line Access Multiplexer

~~Sharon Telephone Company and State Long Distance almost always provide full DSL coverage information. An important reason for the cooperation of these smaller carriers relates to their excellent record of providing full coverage of their ILEC areas. The major national carriers have generally not provided universal DSL service to their entire ILEC service areas. Middle sized carriers have a mixed record in providing full area coverage. In general, telephone ILECs that provide full area coverage are most cooperative in providing broadband service area information to the public.~~

~~To obtain a complete and accurate inventory of broadband communications deployment in a region, legislative action is usually required to compel major ILECs to provide such information. The State of Kentucky, has enacted legislation to compel such cooperation. All wireline and wireless communications service providers in Kentucky must now reveal their network footprint for public record. This comprehensive infrastructure inventory has established the foundation for a statewide broadband deployment program.~~

*The foregoing description of DSL deployment in Southeastern Wisconsin deals only with the services provided by Incumbent Local Exchange Carriers (ILECs). ILEC is an acronym derived from the Telecommunications Act of 1996 to describe existing local telephone companies such as AT&T, Century Tel or Verizon North. The term also includes smaller regional service providers such as the Sharon Telephone Company. ILEC service providers typically own the wireline network infrastructure with particular emphasis on the connections from the various central offices to DSL subscribers.*

*A second class of wireline service providers was created by the Telecommunications Act of 1996, the Competitive Local Exchange Carrier or CLEC. The CLEC concept involved the authorization of new local telephone companies that would compete with the incumbents in the telephone service market place. CLECs were granted access to the ILEC's infrastructure including the connections to each subscriber. This leased infrastructure was termed unbundled network element (UNE) and was intended to allow the CLEC to compete on an equal basis with the ILEC. The concept behind the Act also contemplated the development of new CLEC infrastructure as the CLECs prospered as economically viable local telephone and data service competitors. The reality in practice was quite different. CLECs found it very difficult to market an undifferentiated service with only a marginal price advantage. The end result was that most of the CLEC telephone companies failed, and CLEC competitive offerings are no longer a major factor in the regional end user communications marketplace. \*\*Some of the CLEC service providers created their own network facilities, while others operated as re-sellers of services using ILEC facilities. The former were generally more successful in the marketplace. Even those CLECs that provided their own central office facilities\*\* did not create any new access network infrastructure, the primary focus of this planning report.*



*Nevertheless, a competitive wireline infrastructure has been created in the form of core networks. Companies such as Time Warner Telecom and Norlight have deployed high capacity fiber optic networks that can serve as alternative Internet connection vehicles for new broadband wireless networks that may be developed within the Region.*

### **Fiber to the Premises Broadband Deployment**

Major wide area deployments of fiber to the premises broadband services are currently underway by Verizon Communications in the eastern parts of the United States. Such deployments are typically confined to metropolitan areas such as Boston, New York or Philadelphia. Some small communities in the Midwest, particularly in Minnesota, have deployed fiber to the premises networks. Reedsburg, Wisconsin deployed such a fiber network in 2003. The only known residential deployment of fiber to the premises in Southeastern Wisconsin is by AT&T in the new Pabst Farms Subdivision in the Oconomowoc area of Waukesha County. *\*\* The company, however, is planning to deploy such access networks to an additional 24 land subdivision developments within the Region.\*\** Current services offer throughput performance of 2 to 4 megabits per second. This fiber network is based on architecture known under the designation PON -- for passive optical network. Such networks provide faster service than cable networks that feature a tree-like architecture that requires primary fiber links to be shared with multiple users. Such fiber network architectures are in contrast with AON -- active optical networks -- topologies that provide a direct fiberlink to every subscriber. ~~AON networks are believed to have better potential of realizing the vast bandwidth of fiber optic channels.~~

*Although the Pabst Farms development in Waukesha County may be the only publicly disclosed Fiber-To-The-Premises (FTTP) broadband access network service area in Southeastern Wisconsin, AT&T, the major ILEC in the Region, has initiated the deployment of FTTP and Fiber-To-The-Node (FTTN) access network service to other as yet undisclosed areas within Southeastern Wisconsin. Based on documents furnished by AT&T, this service provider is following a mixed FTTN-FTTP broadband deployment strategy within the Region. In the Fiber-To-The-Node approach being developed by AT&T, fiber optic cables are extended out to neighborhood locations providing nodes which can then service a significant number of copper wire-linked users with higher speed versions of DSL having throughputs as high as 25 megabits per second in a service area lying within a radius of approximately 3,000 feet of a node. The FTTN approach significantly reduces the capital investment required, while still offering the bandwidth necessary for high speed voice, data and various forms of video services. At the same time, an FTTN broadband deployment allows for later expansion to a full scale FTTP network in which fiber-based bandwidth is deployed directly to user premises*

### **Wireline Broadband Inventory Summary**

DSL broadband wireline coverage of the Region is broad and comprehensive since all of the incumbent telephone-based carriers have offered DSL services in their respective ILEC areas. Potential coverage based

on original central office locations is estimated at 73 percent. Deployment of DSLAM remote terminals is estimated to have expanded that coverage to an estimated 82 percent overall. Century Tel reports its DSL areal coverage at an estimated 81 percent. AT&T, the major ILEC in the Region also publishes-reports a current DSL coverage figure of 81 percent. Since their original central office coverage was estimated at 72 percent, the incremental addition from DSLAM deployment is about 9 percent. ~~Although Verizon has an extensive number of central offices in their ILEC area, their lack of commitment to rural telephony has probably compromised their DSL deployment.~~ Smaller carriers such as Sharon and State (Elkhorn) tend to service their areas earlier and more completely than the larger carriers with both reporting coverage over 90 percent.

*Cable service providers utilize a hybrid fiber coaxial (HFC) cable network topology, in which the user connection is provided by a coaxial cable link. Fiber optic lines are brought to a geographic area in the same manner as the telephone system Fiber-To-The Node (FTTN) configuration described above. The HFC cable method differs from the FTTN network structure in that it does not provide a direct nodal connection to each user in the manner of FTTN. Rather the HFC cable network deploys a bus type architecture in which a node – known as a “headend” -- is provided to serve a set of subscribers through an access line – known as a “bus” – serving a number of subscribers through coaxial cable connections from the bus. Such an architecture has the disadvantage of any shared medium in that performance degrades as more subscribers share the common lines – the bus. The fiber link serving the headend is also shared, but a fiber channel has such great capacity that it does not limit system performance. Cable service providers do not generally provide direct fiber links to individual subscribers.*

Broadband cable coverage presents a much different situation. Ten townships representing about 324 square miles or about 12 percent of the land area of the region are without any cable service lacking a franchise agreement with any cable provider. An additional eleven townships with population densities under 100 persons per square mile tend to be underserved even though they have franchise agreements. These underserved areas accrue to a total of about 700 square miles, or about 26 percent of the Region. Prospects for further broadband cable franchising and coverage depend on future residential urban development.

Referencing the fourth generation communications standards set forth in Chapter III of this report, none of the cable ~~or DSL~~ broadband networks are capable of achieving the throughput standard of 20 megabits per second. *\*\* The hybrid fiber coaxial networks of the cable providers are, moreover, filling up and slowing down under a heavy load of users. Such a throughput standard of 20 megabits per second\*\** is still modest compared to Japan’s 2008 target standard of 100 megabits per second for every potential user in that country. Current ~~DSL ADSL and~~ cable network technologies are reaching, or have reached, the limit of their performance capabilities. *\*\*AT&T, however, has announced a new program called Project Lightspeed that is intended to upgrade ADSL technology in the form of VDSL technology which will provide throughput speeds of 20 megabits per second. ~~DSL twisted wire pair augmented by advanced digital signal~~*

~~processing has pushed its performance to the limit, and\*\* the hybrid fiber coaxial networks of cable providers are filling up and slowing down with a heavy load of users.~~

~~The next step in the wireline broadband access evolution \*\* may be expected to be a combination of fiber-to-the-node and fiber to the premises technologies. is fiber to the premises deployment. Such a deployment would represent a major investments on the part of telephone and cable providers. an investment unlikely to occur anytime soon in Southeastern Wisconsin. Even if AT&T were to follow Verizon's lead with a major initiative in fiber based access networks, Southeastern Wisconsin would probably not be high on the priority investment list. Similarly, Time Warner has much better return on investment opportunities in metropolitan areas larger in both population and higher in disposable income than Southeastern Wisconsin. If the Chapter III standards on throughput and coverage are-is to be achieved, as received by the standard set forth in Chapter III, then the Region must look elsewhere evaluate other -for high speed, universal broadband telecommunications alternatives to provide the desired universal coverage within the Region. to close the global digital divide with Japan, South Korea and the rest of Asia.\*\* The Region must take a proactive stance, and plan an aggressive broadband deployment program in both wireline and wireless broadband communications.~~

## **BROADBAND WIRELESS SERVICE AREA INVENTORY**

The wireless service area inventories require explanation from two viewpoints:

### **1. Broadband Performance Standard**

The FCC defines of broadband service as service providing a throughput exceeding 200 kilobits per second. Some of the wireless service areas do not meet this performance standard. All of the wireless carriers however, are either contemplating, or executing third generation (3G) conversion plans which will comply with the FCC broadband standard. These 3G conversions will be based primarily on existing antenna base station sites. For these reasons, the defined service areas will represent a mixture of 2G and 3G performance, trending, however toward broadband communications standards.

### **2. Network Parameters**

The wireless geographic service areas herein presented are based on radio propagation modeling. Accurate results from such modeling requires information on the power output and sectoral organization as well as the height and location of the antennae comprising the network. The height and location data are well known for the great majority of antenna sites. Technical data on radiated power and sectoral organization on specific sites are less well known and are guarded as confidential data by the cellular-PCS carriers. The wireless communications technologies are well understood, however, so that radio coverage maps prepared with estimated average power levels should closely approximate wireless carrier service areas.

## **Infrastructure Inventory Data Sources and Models**

The comprehensive telecommunications infrastructure inventory compiled in this report is based on a combination of wireless and wireline telecommunications data sources. The original wireless data sources used in the antenna site and related infrastructure inventories presented in SEWRPC Planning Report No. 51 were also utilized in the geographic service inventory reported here. These sources include:

1. **FCC Database**

This database provided the starting point for the antenna site inventory, particularly with respect to the cellular 800-900 MHz band. It was less useful and comprehensive for the higher 1900 MHz PCS band.

2. **Local Units of Government**

The county and municipal governments provided the primary and most dependable source for antenna site location and height data. These sources, however, were not able to provide much data on the technical characteristics of the antenna and the supporting base station.

3. **Wireless Service Providers**

Wireless service providers in general were unwilling to provide antenna site and related infrastructure data for their antenna base station sites. Exceptions were Sprint and Nextel. Sprint PCS furnished network site all for all counties except Kenosha which is managed as part of their Chicago region. Nextel, which is now part of Sprint furnished geographic site data but no attendant technical data on all of the Region.

Data from the afore referenced sources were compiled into the antenna site and related infrastructure inventory reported in SEWRPC Planning Report Number 51. These data were then used in radio propagation simulation modeling to appropriate the geographic coverage provided by each of the antenna base station sites.

To understand the basis of the mapped wireless geographic service areas, it is necessary to understand radio propagation modeling in a functional sense with respect to the inputs, processes and outputs involved. Avoiding a technical discussion of the theory of radio wave propagation or the mathematical aspects, it is possible to appreciate basic model operation and to make judgments concerning the validity of the coverage maps produced.

The radio propagation modeling used was based on the EDX Signal Pro™ software package provided by EDX Wireless of Eugene, Oregon. This software package provides for a variety of radio propagation model-based area coverage, point-to-point path analysis and route studies for use in wireless network design. The area coverage studies were considered applicable for the generation of the geographic area

maps developed for this planning report. To develop a geographic service area map for a set of wireless antenna base station sites, the following mathematical model and data inputs that model were required.

1. Propagation model used:

The Anderson 2Dv1.00 model was used. This is a physical model used by wireless communications engineers world wide.

2. Quality of service level selection

This model input determines the percentage of time the signal level and the resulting quality of service will be provided. The 90 percent level was selected.

3. Topographic database

With a choice of terrain data, clutter loss data, or canopy data, the clutter database was selected for use with the model. This data base most realistically reflects the radio propagation environment, since it provides for signal attenuation due to trees and structures.

4. Transmitter site data

The data required for each transmitter site – base station – included: site elevation; antenna height; site coordinates expressed in State Plane Coordinates, North American Datum of 1927; antenna type - sectoral or omnidirectional; antenna sectoral orientation; transmitter power; antenna pattern; and receiver parameters.

5. Remote site data

The data required for each remote site – included: site elevation; antenna height; site coordinates expressed in State Plane Coordinates, North American Datum of 1927; antenna type - sectoral or omnidirectional; antenna sectoral orientation; transmit power; antenna pattern; antenna gain; and receiver parameters.

Based on the afore listed input data, the selected radio propagation model will generate a geographic service coverage area map for each antenna base station site. This coverage map will indicate the radio frequency signal level at various distances from the antenna site. Because of terrain and ground clutter variations, these signal levels will not be uniform in all directions from the antenna site. Areas characterized by dense woodlands or extensive building structures will attenuate signal levels within the areas concerned and beyond. In extreme circumstances, the signal level may drop below the noise floor preventing effective communication in a given area.

Employing the infrastructure data collected and analyzed in SEWRPC Planning Report No. 51, supplemented by estimates of data on antennae transmitter powers and patterns, the wireless service area maps herein presented were developed.

## **Mobile Cellular/PCS**

### **Geographic Coverage Inventory**

The mobile cellular geographic coverage inventory defines the signal level coverage of each of six wireless service providers operating within Southeastern Wisconsin. Based on these signal levels, the 90 percent availability and quality of service level and upon the capabilities of user cell phone devices, the border lines of service areas may be delineated. The defined coverage areas will provide the specified quality of service for both data and voice services. Based on earlier experience with both the Sprint and Nextel networks, estimated service levels were delineated showing levels of good service, marginal service and no service. These radio propagation maps together with the original signal level propagation maps for each provider defines cellular-PCS service levels in the Region.

Base station locations and antenna heights for all six cellular-PCS providers are fairly well known from the antenna site and related infrastructure inventory. Technical data on radiated power levels and sectoral orientations are known only for Sprint. Estimated power levels and 120 degree sectoral orientations were used for the other five providers based on their individual technologies -- CDMA, GSM or iDEN. A justification for the common treatment of all wireless providers with some modification for wireless lies in the limiting factor present in all wireless networks – the user equipment, here the cellphone. Limited in both receiver sensitivity and transmitter power, the cellphone establishes the limits of cellular coverage. While there are differences in cell phone technology and performance, transmitter power is limited by FCC regulation to 0.6 watts and receiver sensitivity differences are believed to be small.

### **Regional Wireless Service Coverage – Sprint**

Sprint was selected first for evaluation because Commission staff had access to definitive network information for this carrier, has worked with the Company on an antenna site location project, and understands some of carrier's criteria for site selection. Sprint employs CDMA technology and operates in the 1931 to 1935 MHz frequency band. A transmit power of 2.4 watts was used in the modeling for all base stations with antenna gains of 15.5 to 22.5 – (dBi). Map 8- 6 indicates the regional signal level coverage starting with an initial signal level over –76.9 dBmW and ending with a signal level less than –109.1 dBmW. The color pattern on Map 8- 6 indicates the signal level range within the Region. Map 9 7 provides a simplified view of service quality at three levels:

1. Green for good service  
Signal over –91.9 dBmW
2. Yellow for marginal service  
Signals between –91.9 dBmW and –109.1 dBmW
3. White for no service  
Signals below –109.1 dBmW

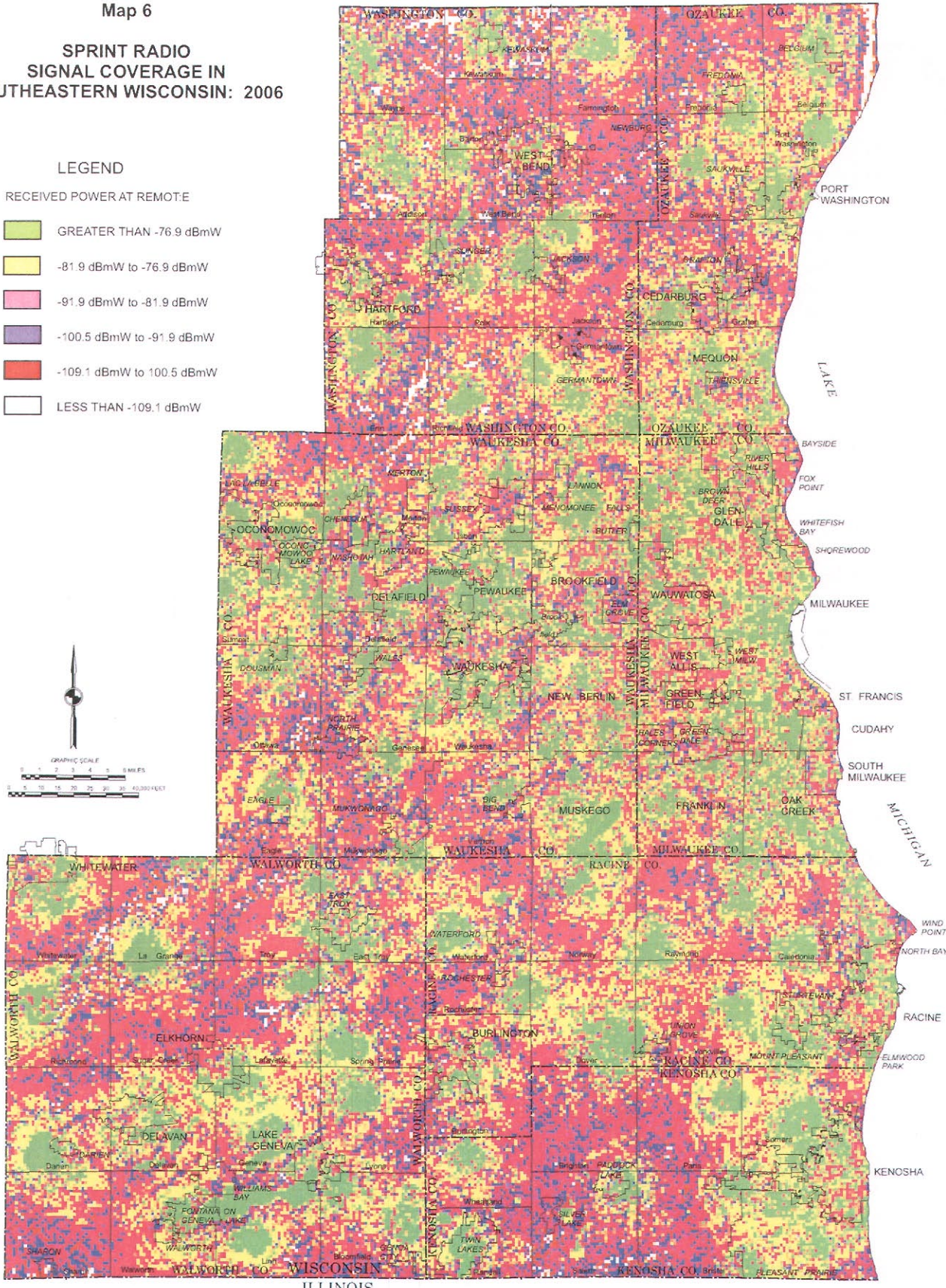
Map 6

**SPRINT RADIO  
SIGNAL COVERAGE IN  
SOUTHEASTERN WISCONSIN: 2006**

**LEGEND**

RECEIVED POWER AT REMOTE

- GREATER THAN -76.9 dBmW
- 81.9 dBmW to -76.9 dBmW
- 91.9 dBmW to -81.9 dBmW
- 100.5 dBmW to -91.9 dBmW
- 109.1 dBmW to 100.5 dBmW
- LESS THAN -109.1 dBmW



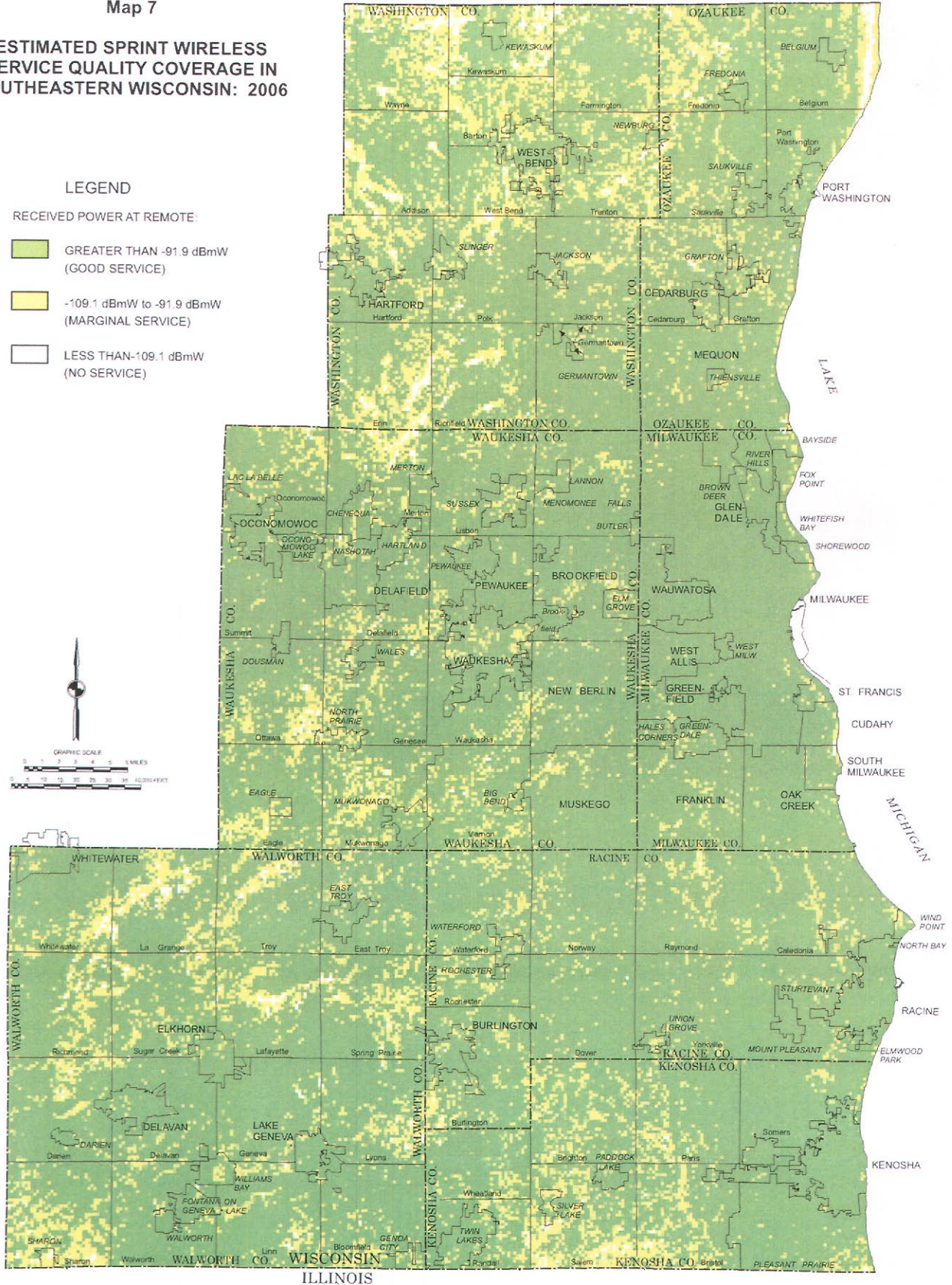
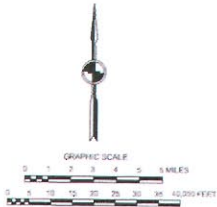
Map 7

**ESTIMATED SPRINT WIRELESS SERVICE QUALITY COVERAGE IN SOUTHEASTERN WISCONSIN: 2006**

**LEGEND**

RECEIVED POWER AT REMOTE:

-  GREATER THAN -91.9 dBmW (GOOD SERVICE)
-  -109.1 dBmW to -91.9 dBmW (MARGINAL SERVICE)
-  LESS THAN -109.1 dBmW (NO SERVICE)





A review of Map 9 7 indicates the presence within the Region of some areas of marginal performance, and some areas of no coverage. Operating in the 1900 MHz frequency band, results in greater radio path attenuation, than operating in the 800 to 900 MHz band.

#### **Regional Wireless Service Coverage - Nextel**

Although Nextel was acquired by Sprint in 2005, it still operates as a separate network with a different technology, iDEN, which features push-to-talk communications and is especially popular with public safety agencies and with industries having mobile employees. iDEN, which is an acronym for Integrated Dispatch Enhanced Network, was developed by Motorola for dispatch-oriented communications, but has become a popular wireless network for a variety of users. It employs a TDMA modulation method which is becoming obsolete for third generation wireless communications. Nextel service coverage within the Region is robust with few areas of marginal performance. Maps 18 8 and 19 9, display signal level and service quality performance respectively for the provider.

#### **Regional Wireless Service Coverage – Verizon Wireless**

Map 10 displays the radio propagation signal levels of Verizon's network, and Map 11 the three levels of service indicated by these signal levels. Like Sprint, Verizon employs CDMA technology so similar antenna output parameters to those used for the Sprint system were used in the radio propagation modeling for the Verizon system. Map 11, indicates that Verizon provides a good level of service to a higher proportion of its service area than does Sprint with the same technology. Verizon, however, lacks a good level of service coverage of major areas in western Walworth and Waukesha County, and of some of the northern areas of Ozaukee and Washington Counties. Some lack of good rural coverage also exists in parts of Kenosha County.

#### **Regional Wireless Service Coverage – Cingular Wireless**

Maps 12 and 13 constitute the radio coverage maps for Cingular Wireless. The uniformly high quality green signal levels -- above -76.9 dBmW -- are evident throughout the Region. Consistent with GSM base station practice, the power levels were set at 45 watts in each 120 degree sector. Marginal service quality areas were found to be limited to the extreme southwest corner of Waukesha County, and to small areas of Washington and Ozaukee Counties. The GSM technology used by Cingular is the standard technology throughout most of the world.

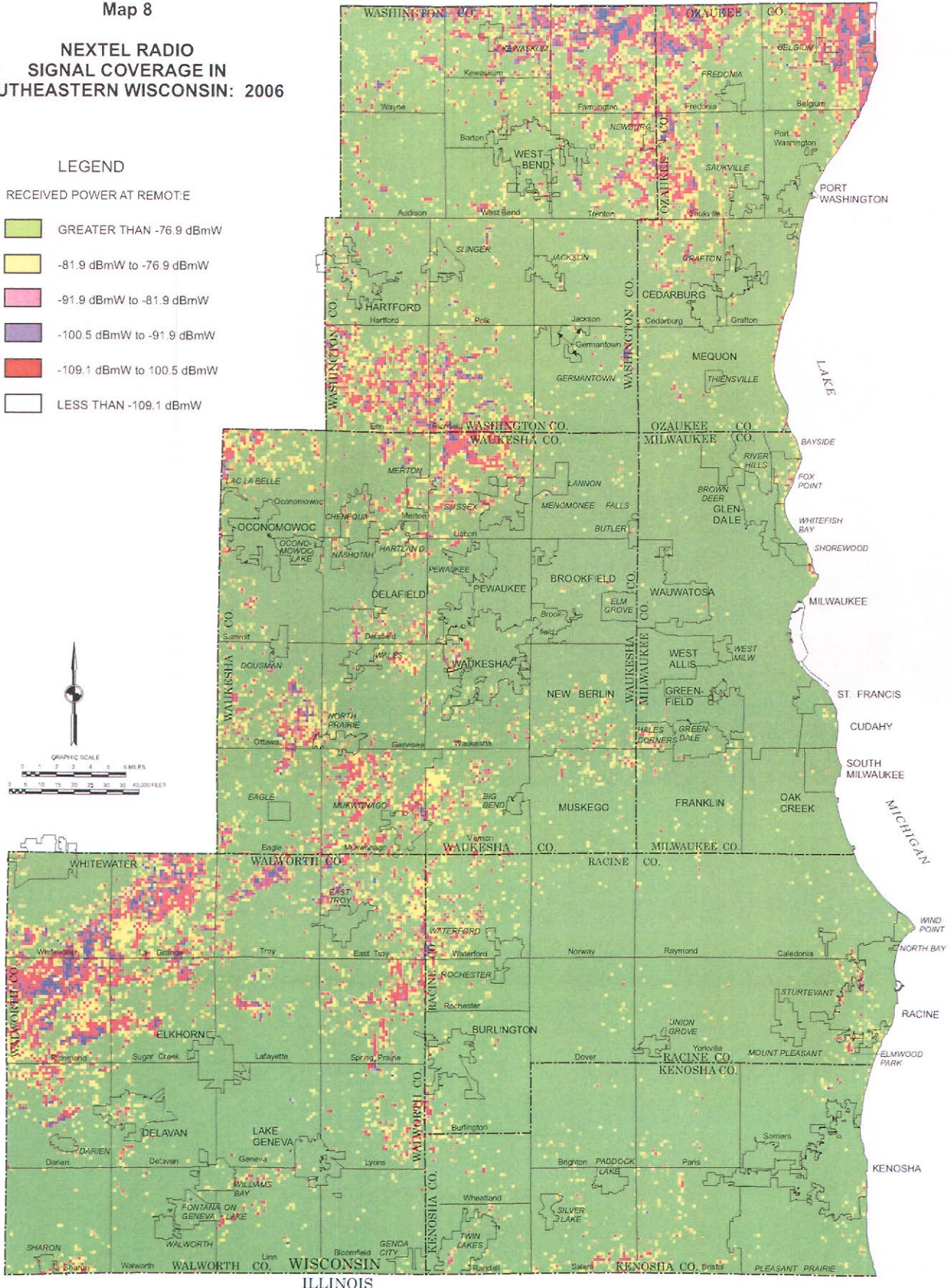
Map 8

**NEXTEL RADIO  
SIGNAL COVERAGE IN  
SOUTHEASTERN WISCONSIN: 2006**

**LEGEND**

RECEIVED POWER AT REMOTE

- GREATER THAN -76.9 dBmW
- 81.9 dBmW to -76.9 dBmW
- 91.9 dBmW to -81.9 dBmW
- 100.5 dBmW to -91.9 dBmW
- 109.1 dBmW to 100.5 dBmW
- LESS THAN -109.1 dBmW



Source: SEWRPC.

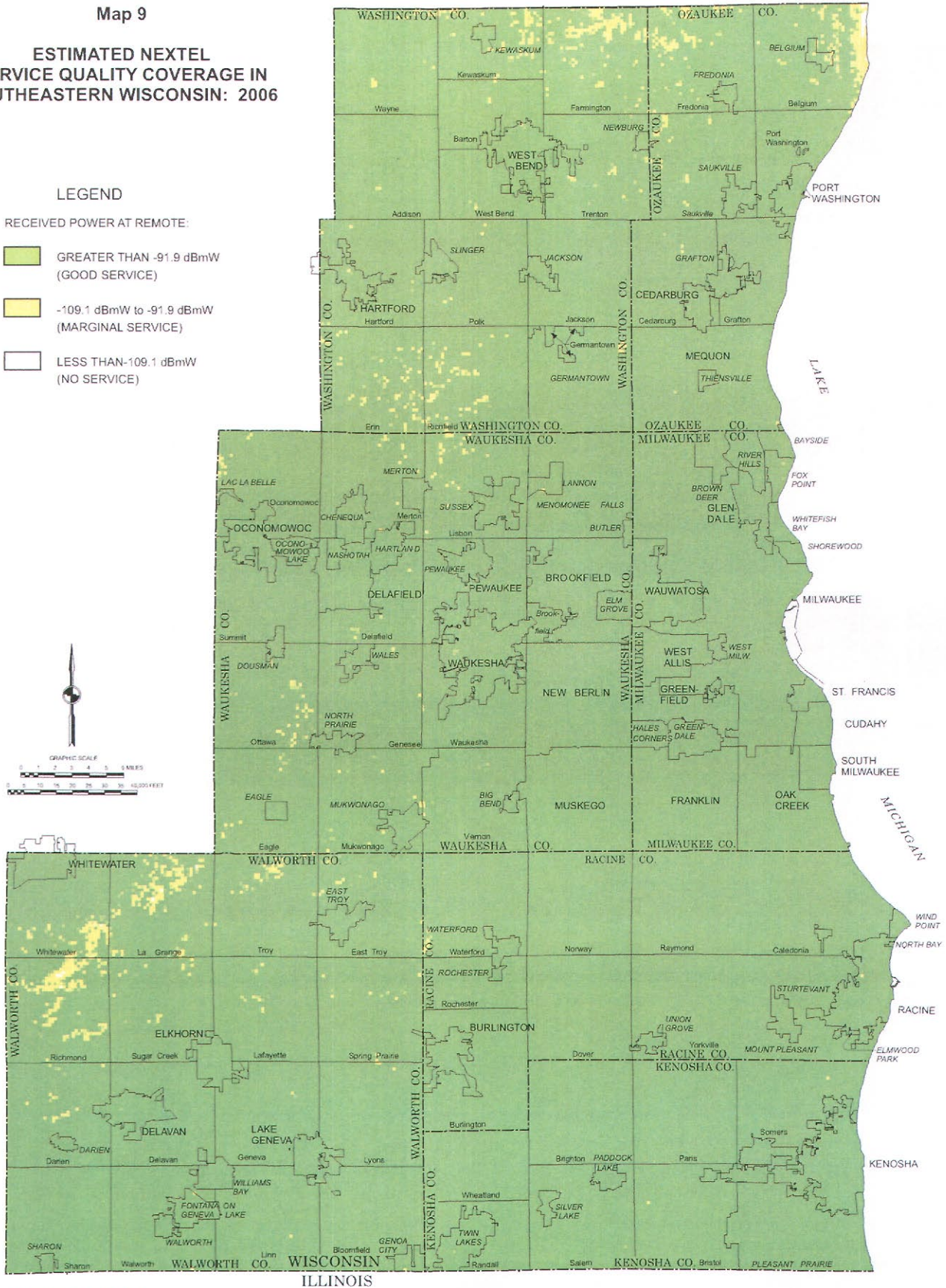
Map 9

**ESTIMATED NEXTEL  
SERVICE QUALITY COVERAGE IN  
SOUTHEASTERN WISCONSIN: 2006**

**LEGEND**

RECEIVED POWER AT REMOTE:

-  GREATER THAN -91.9 dBmW  
(GOOD SERVICE)
-  -109.1 dBmW to -91.9 dBmW  
(MARGINAL SERVICE)
-  LESS THAN -109.1 dBmW  
(NO SERVICE)



Source: SEWRPC.

ILLINOIS

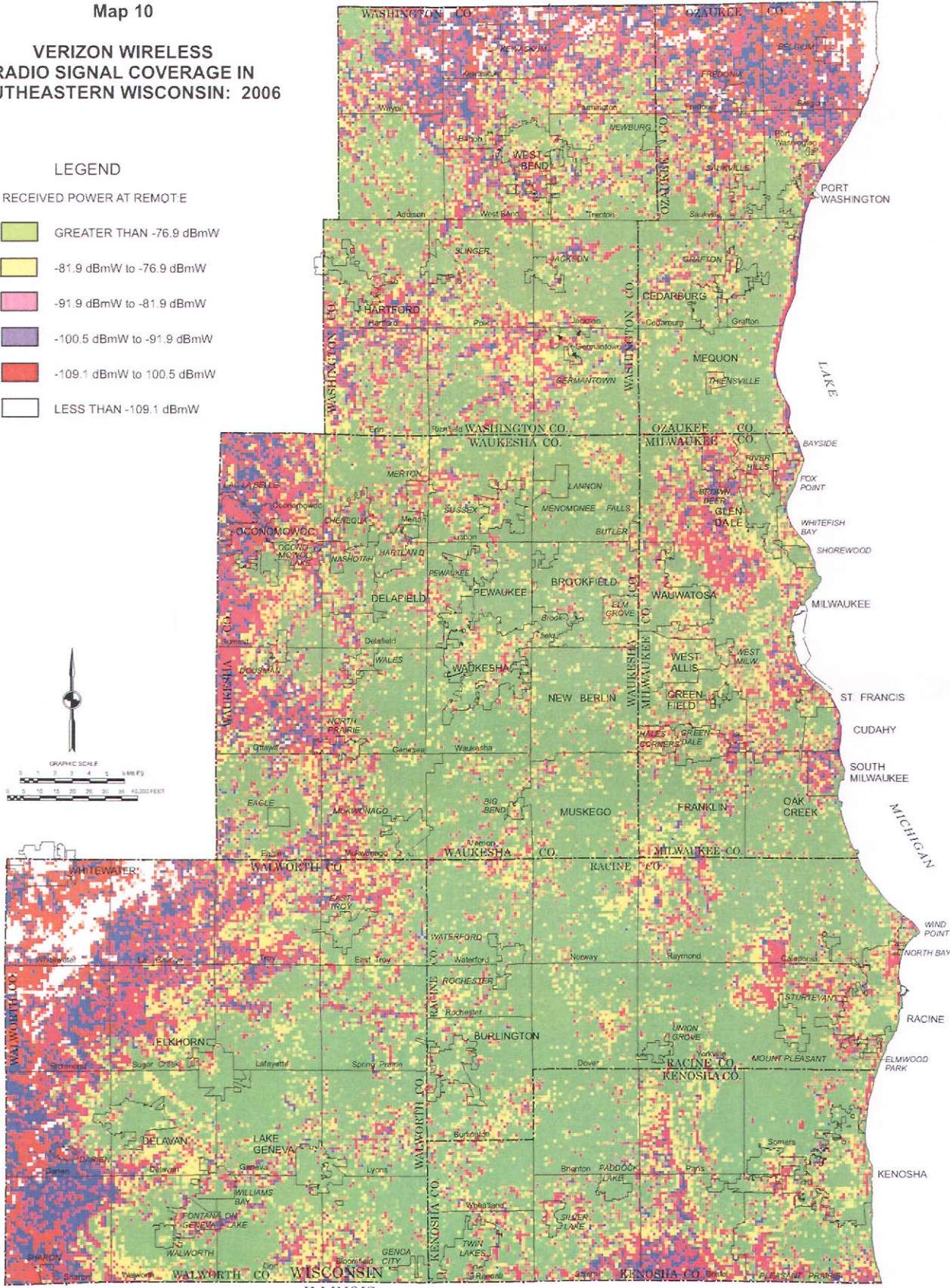
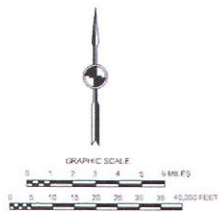
Map 10

**VERIZON WIRELESS  
RADIO SIGNAL COVERAGE IN  
SOUTHEASTERN WISCONSIN: 2006**

LEGEND

RECEIVED POWER AT REMOTE

- GREATER THAN -76.9 dBmW
- 81.9 dBmW to -76.9 dBmW
- 91.9 dBmW to -81.9 dBmW
- 100.5 dBmW to -91.9 dBmW
- 109.1 dBmW to 100.5 dBmW
- LESS THAN -109.1 dBmW






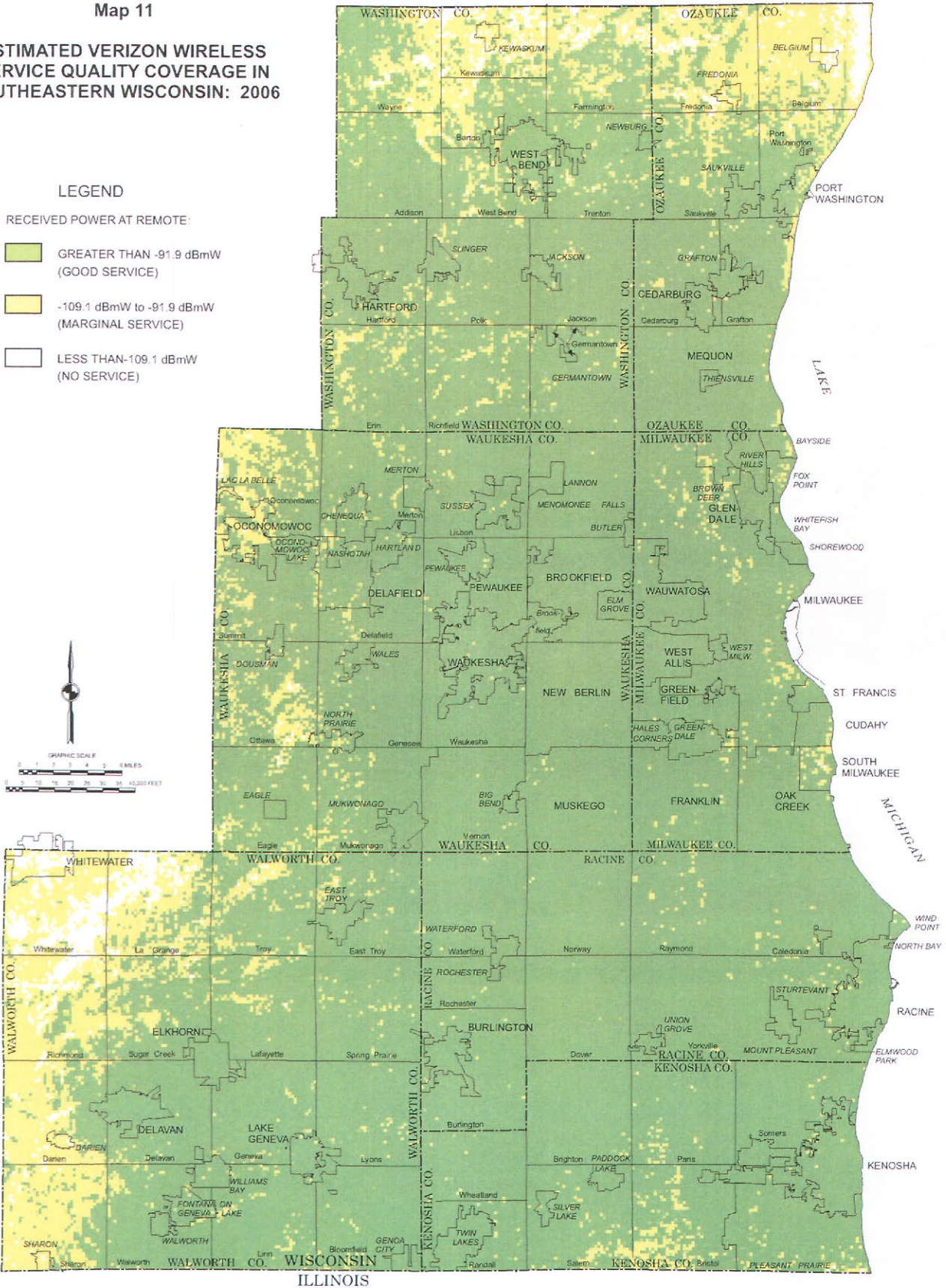
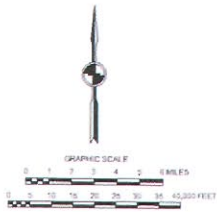
Source: SEWRPC.

PRELIMINARY DRAFT

Map 11

**ESTIMATED VERIZON WIRELESS SERVICE QUALITY COVERAGE IN SOUTHEASTERN WISCONSIN: 2006**

- LEGEND**
- RECEIVED POWER AT REMOTE:
-  GREATER THAN -91.9 dBmW (GOOD SERVICE)
  -  -109.1 dBmW to -91.9 dBmW (MARGINAL SERVICE)
  -  LESS THAN -109.1 dBmW (NO SERVICE)



Source: SEWRPC.

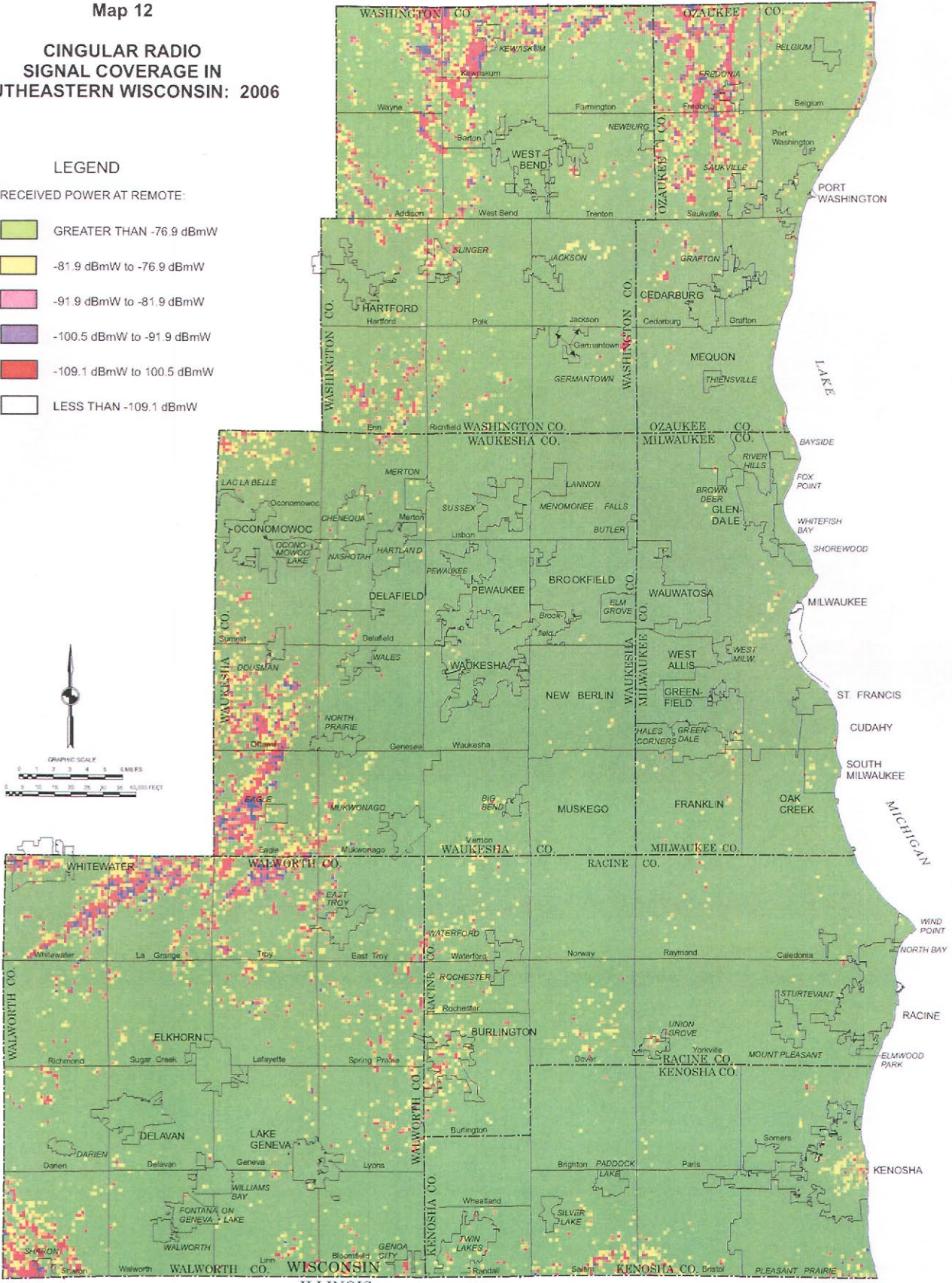
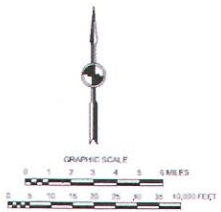
Map 12

**CINGULAR RADIO  
SIGNAL COVERAGE IN  
SOUTHEASTERN WISCONSIN: 2006**

**LEGEND**

RECEIVED POWER AT REMOTE:

- GREATER THAN -76.9 dBmW
- 81.9 dBmW to -76.9 dBmW
- 91.9 dBmW to -81.9 dBmW
- 100.5 dBmW to -91.9 dBmW
- 109.1 dBmW to 100.5 dBmW
- LESS THAN -109.1 dBmW



Source: SEWRPC.




ILLINOIS

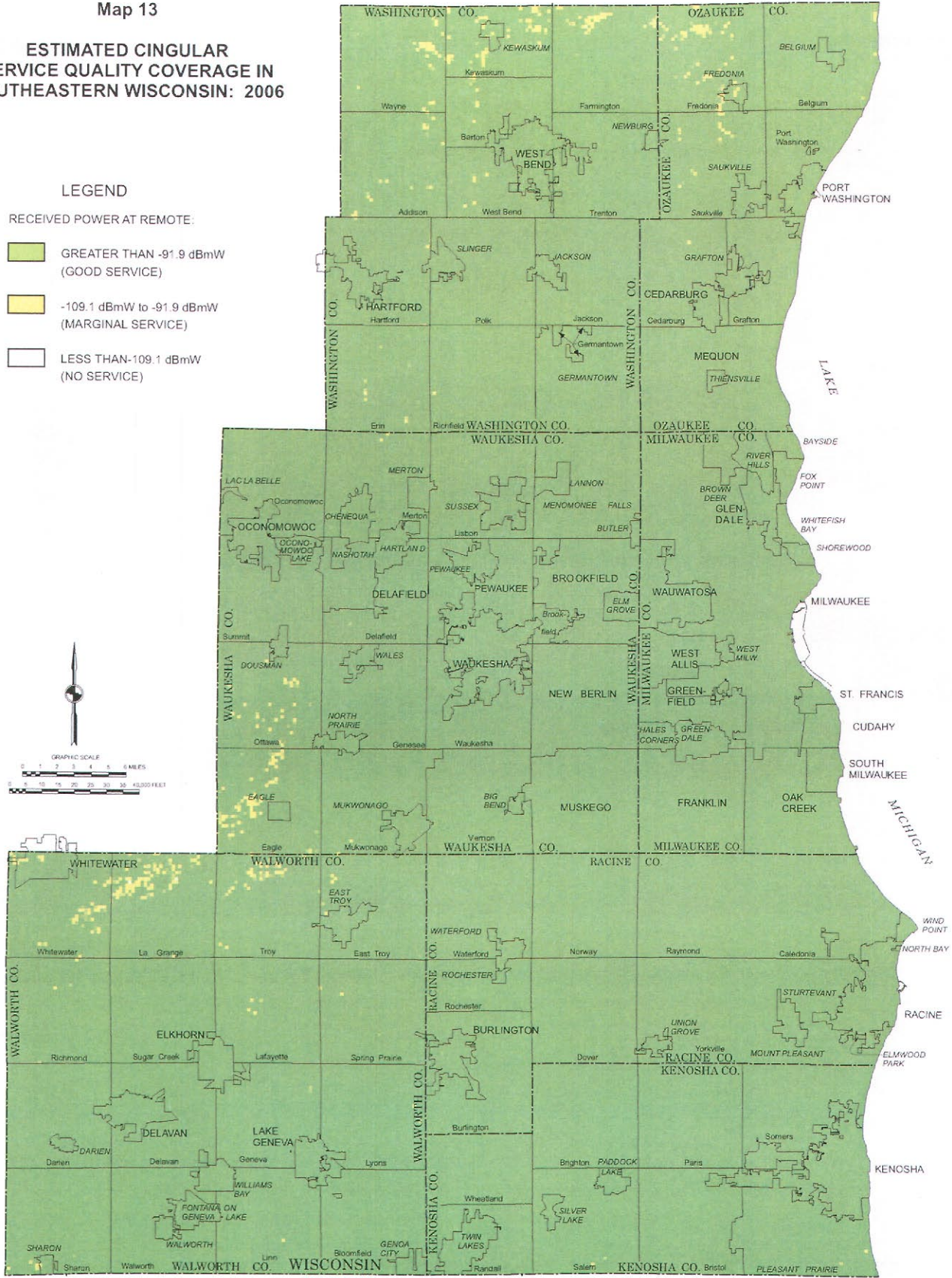
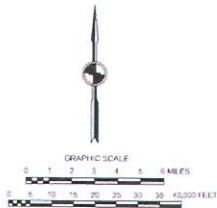
Map 13

**ESTIMATED CINGULAR SERVICE QUALITY COVERAGE IN SOUTHEASTERN WISCONSIN: 2006**

**LEGEND**

RECEIVED POWER AT REMOTE:

-  GREATER THAN -91.9 dBmW (GOOD SERVICE)
-  -109.1 dBmW to -91.9 dBmW (MARGINAL SERVICE)
-  LESS THAN -109.1 dBmW (NO SERVICE)



Source: SEWRPC.

ILLINOIS

### **Regional Wireless Service Coverage – U.S. Cellular**

U.S. Cellular is the third CDMA network provider within the Region considered. This provider is unique in having no circuit-switched component in its network. Maps 14 and 15 constitute the radio coverage maps for this provider. The maps indicate that there are numerous areas with marginal coverage located throughout the Region, with particular areas of deficiencies in Ozaukee, Washington, and Walworth Counties. The reasons for such scattered marginal performance apparently relates to network layout since U.S. Cellular has one of the largest number base stations in the Region. U.S. Cellular consistently showed the lowest availability rate of any of the six regional wireless service providers in recent performance monitoring by the Commission.

### **Regional Wireless Service Coverage – T-Mobile**

The coverage provided by T-Mobile, a second GSM wireless carrier operating within the Region, differs significantly from that provided by the first, Cingular, in the marginal nature of its coverage in many areas of the Region. This carrier provides poor or no coverage, in most of Walworth County and southwestern Waukesha Counties. The service also has significant gaps in Washington and Ozaukee Counties despite the fact that the common power levels were used for all providers in radio propagation modeling. The radio signal coverage is shown in Map 16 and the service quality coverage in Map 17.

### **Summary – Wireless Service Area Inventory**

The cellular-PCS wireless service inventory reveals a Region geographically well covered for mobile wireless voice communications. Five of the six regional wireless carriers provide mobile wireless services in all seven counties of the Region. The sixth carrier, T-Mobile, operates in six of the seven counties, with very limited service in Walworth County. Two of the carriers, Cingular and Nextel, have few areas with marginal coverage, and the remaining carriers provide quality service in the majority of the Region.

Data communications performance, however, is far below the objectives for fourth generation mobile wireless set forth in Chapter III of this report. The previous seven-county regional wireless network performance inventory recorded download performance of only 178.2 kilobits per second, and upload performance of 63.3 kilobits per second for 2G networks. 3G networks improved to 336.0 kilobits per second for download, and 78.9 kbps for upload. Only the 3G download throughput qualifies for “little broadband” status based on the Federal Communications Commission standard of 200 kilobits per second. Many developed nations of the world have a higher broadband standard of 1.5 megabits per second. All of these performances are far below the throughput objective of 20 megabits per second set forth in Chapter III.



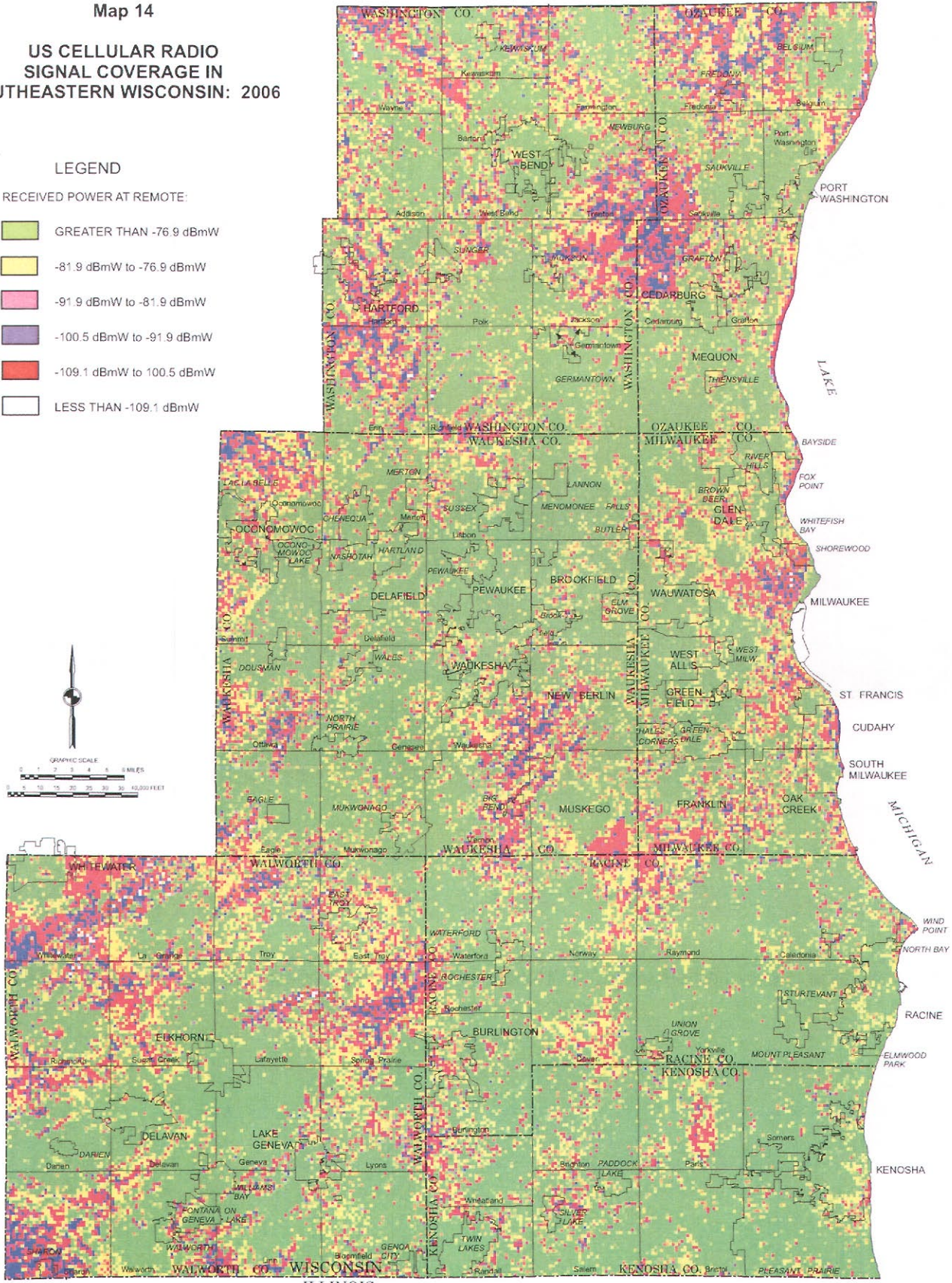
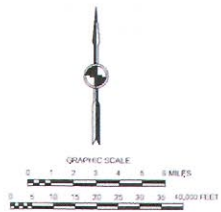
Map 14

US CELLULAR RADIO SIGNAL COVERAGE IN SOUTHEASTERN WISCONSIN: 2006

LEGEND

RECEIVED POWER AT REMOTE:

- GREATER THAN -76.9 dBmW
- 81.9 dBmW to -76.9 dBmW
- 91.9 dBmW to -81.9 dBmW
- 100.5 dBmW to -91.9 dBmW
- 109.1 dBmW to 100.5 dBmW
- LESS THAN -109.1 dBmW






Source: SEWRPC.

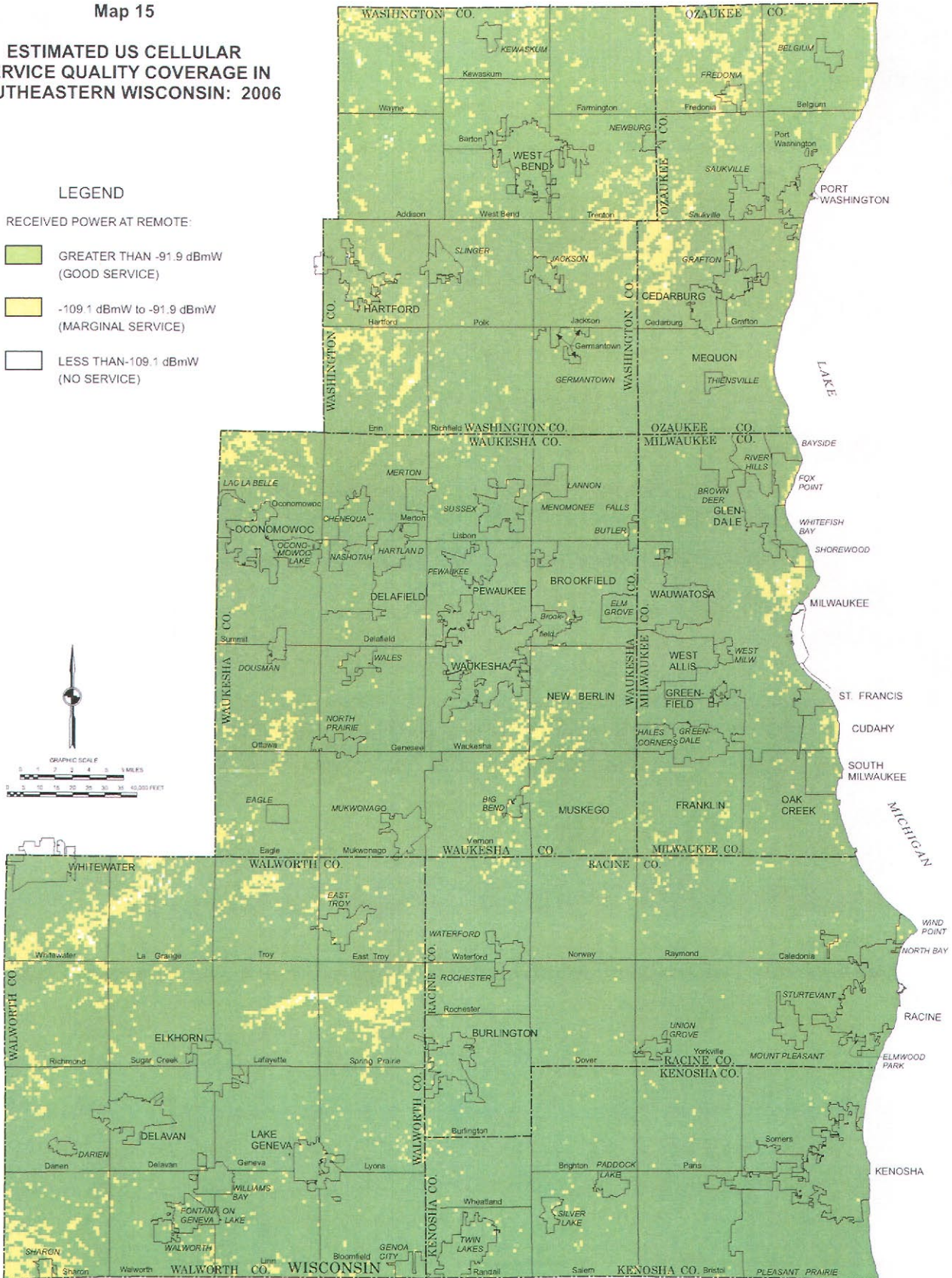
Map 15

**ESTIMATED US CELLULAR SERVICE QUALITY COVERAGE IN SOUTHEASTERN WISCONSIN: 2006**

**LEGEND**

RECEIVED POWER AT REMOTE:

-  GREATER THAN -91.9 dBmW (GOOD SERVICE)
-  -109.1 dBmW to -91.9 dBmW (MARGINAL SERVICE)
-  LESS THAN -109.1 dBmW (NO SERVICE)



Source: SEWRPC.





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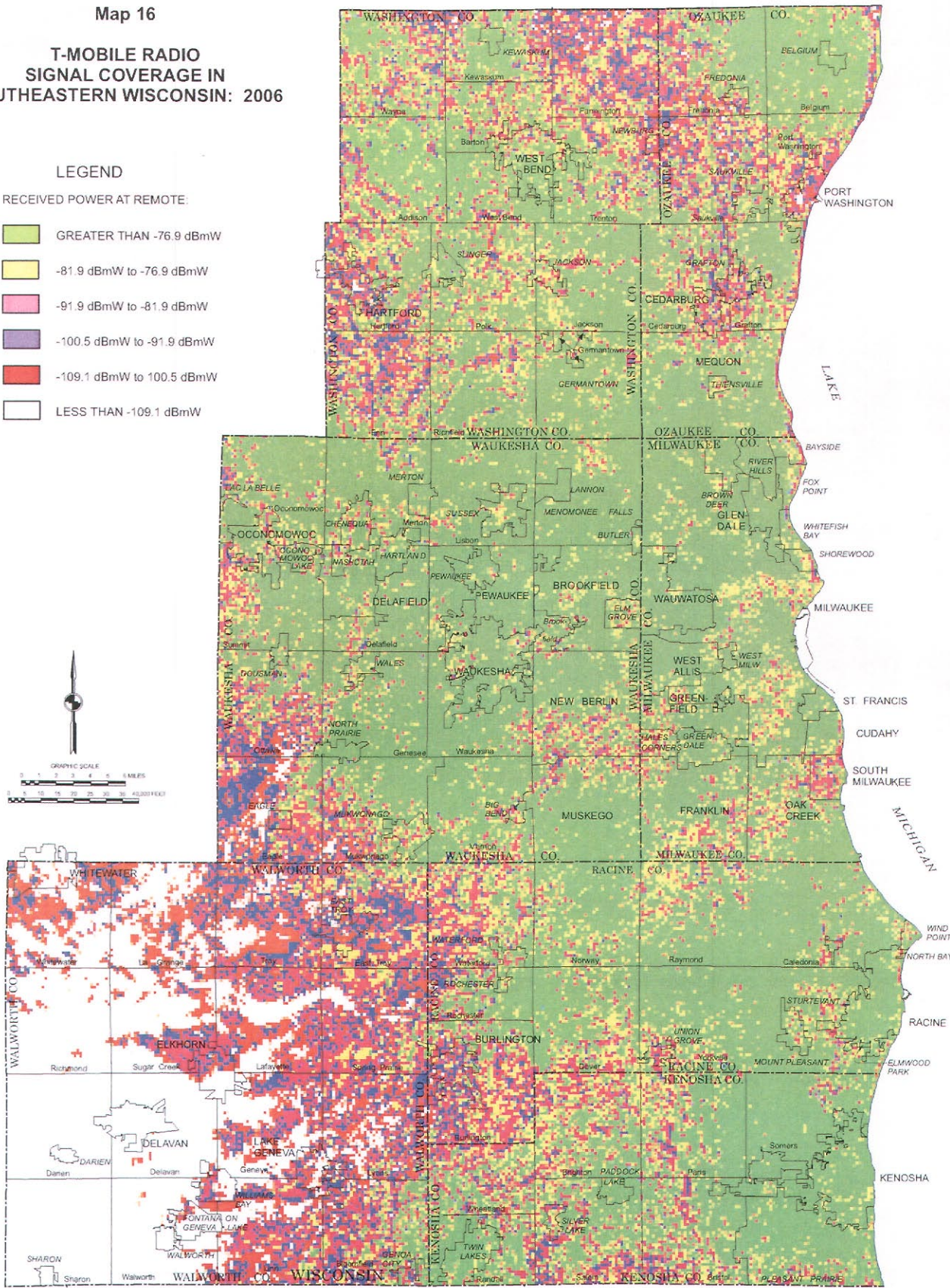
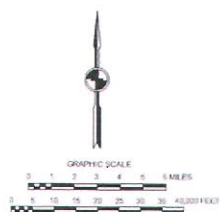
Map 16

### T-MOBILE RADIO SIGNAL COVERAGE IN SOUTHEASTERN WISCONSIN: 2006

#### LEGEND

RECEIVED POWER AT REMOTE:

-  GREATER THAN -76.9 dBmW
-  -81.9 dBmW to -76.9 dBmW
-  -91.9 dBmW to -81.9 dBmW
-  -100.5 dBmW to -91.9 dBmW
-  -109.1 dBmW to 100.5 dBmW
-  LESS THAN -109.1 dBmW



Source: SEWRPC.

ILLINOIS

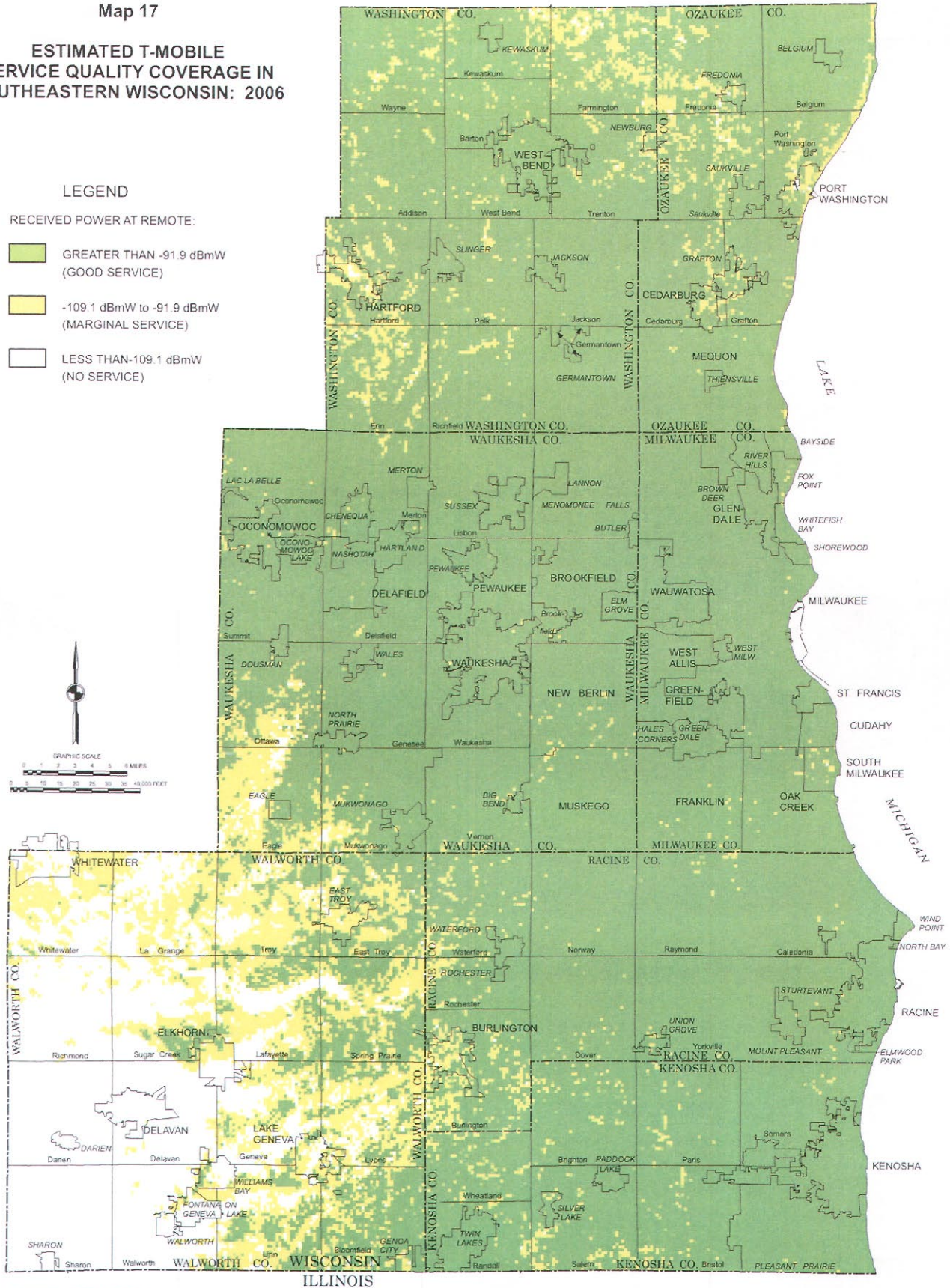
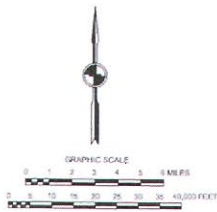
Map 17

**ESTIMATED T-MOBILE SERVICE QUALITY COVERAGE IN SOUTHEASTERN WISCONSIN: 2006**

**LEGEND**

RECEIVED POWER AT REMOTE:

- GREATER THAN -91.9 dBmW (GOOD SERVICE)
- 109.1 dBmW to -91.9 dBmW (MARGINAL SERVICE)
- LESS THAN -109.1 dBmW (NO SERVICE)



Source: SEWRPC.

ILLINOIS

None of the three mobile wireless technologies employed in the Region -- GSM, CDMA or iDEN -- is suitable for upgrade to 4G performance levels. The two current competing 4G-class mobile technologies are WiMAX (802.16e), an emerging industry standard, and P2P, a proprietary Qualcomm technology now under development. Sprint is the only Regional mobile wireless carrier to announce field trials with WiMAX. It is fair to assume that deployment of any fourth generation mobile wireless network in Southeastern Wisconsin is at least 3 to 4 years in the future.

**ADDENDUM TO  
CHAPTER V  
“TELECOMMUNICATIONS BROADBAND INFRASTRUCTURE  
INVENTORY FINDINGS” OF  
SEWRPC PLANNING REPORT NO. 53**

**November 13, 2006**

The following addendum should be added to the subject report beginning on page 34:

**CORE NETWORK INVENTORY**

*Historically, points of presence (POPs) were the interexchange carriers' (IXC) equivalent of the local telephone company central offices. All long distance calls were routed through the IXC's POP facilities. In a traditional circuit-switched network, local exchange carrier calls would be provided a line -- or channel -- for the duration of the call. In the packet-switched networks of concern here, the POP provides an Internet connection to a fiber optic cable network capable of transporting the packet set to its destination. For incumbent local exchange carriers, the POP point is often located at a central office. The decentralized nature of packet-switched networks, and the ability of such networks to access outside of the POP locations makes traditional points-of-presence less important to advanced wireless communications systems as described below.*

A partial core network inventory of existing points of presence (POP) locations was originally envisioned as a part of the regional telecommunications planning effort. Such POP points constitute important elements of any future broadband wireline or wireless communications system in the Region since they provide fiber optic connection to the Internet. There are numerous broadband fiber optic core networks in the Region with each having its own POP locations for interconnection with other networks. Some of these POP point locations are known and available for Internet gateway connection to existing or new broadband wireline or wireless networks. Others are not publicly available and are useable only by special private arrangements with the carrier. For a new broadband communications system to interconnect at a POP point, it must provide a wireline or wireless link to that POP point. Such links, particularly for fiber optic wireline links, can be quite costly. The initial and continuing costs of such links can significantly change the economics of network deployment. For this reason, a search was carried out for an alternative to established POP point Internet gateway access.

*One Such an alternative was -is found in the hybrid fiber coaxial networks of the two regional cable companies - Time Warner Cable and Charter Communications. Internet access through these cable networks can be implemented with an average link distance of only about one-half mile. For this reason, the concept of a POP gateway has little meaning in fiber coaxial cable networks. Both Time Warner*

Cable and Charter have literally thousands of "POP points" available wherever their networks are deployed in the Region. One possible key to future new broadband access network deployment, therefore, rests with connection to the hybrid fiber optic coaxial cable networks. ~~\*\*The current and future deployed layouts of these cable network are potentially the most cost effective core infrastructure, particularly for broadband wireless networks.~~ Other alternatives for Internet connection may exist in the core fibre optic cable facilities deployed by other service providers within the Region, such as AT&T, Norlight and Time-Warner Telecom.\*\* For this reason, a detailed inventory of fiber network POP points for non-cable networks as originally envisioned was not pursued.

### **SATELLITE BROADBAND COMMUNICATIONS SERVICES**

A number of service providers offer broadband satellite based Internet access communications within the Region and throughout the United States. Download speeds vary from 500 kilobits per second, to 3 megabits per second while upload speeds are much slower in the range of 128 kilobits per second to 1.5 megabits per second. Monthly service fees extend from \$50 per month at the low end to \$1,000 per month at the high end. Megabit per second performance generally calls for charges exceeding \$500 per month. For this reason, broadband satellite services can not compete with other broadband service alternatives when and where they are available. Most current satellite broadband service users reside in rural areas lacking other forms of broadband communications services.

Operating in the super high frequency SHF -- 2.5 to 22 GHz -- bands, satellite communications has the advantage of significant bandwidth allocation which generally allow for high throughput rates. This bandwidth must be shared, however, with a large body of other users to support the costs of launching and maintaining communications satellites in orbit. These low earth orbiting satellites to be effective on a 24-hour basis, must be continuously available on a line-of-sight basis throughout the service area. Such availability requires a large fleet of satellites for continuing coverage.

### **\*\*ENTERPRISE NETWORKS**

Modern communications networks in the United States and worldwide take two forms by way of organizational structure and clientele served utility networks and enterprise networks. Utility networks such as those operated by AT&T, Verizon, Time-Warner Cable and Charter communications are organized to serve the general public. These networks are owned and managed by the private service providers and offer a wide range of voice, video and data communications services to consumers, businesses, government entities and other organizations. Enterprise networks, in contrast, are owned and operated by individual enterprises to serve the needs of the enterprises. Enterprise networks do not typically offer communications services to the general public. Enterprise networks serve medium and large businesses, government, health care and educational institutions and other private and public enterprises. In developing and deploying

*their enterprise networks, organizations may lease facilities, particularly land line facilities, from service providers in lieu of constructing all elements of their networks. They also typically purchase other network equipment such as switches, routers and multiplexers for their exclusive network use. The key difference, however, is that enterprise networks are owned and operated by the enterprise to serve enterprise functions.*

*The regional telecommunications planning program has, as set forth in the Commission's prospectus used to constitute the program on only two classes of communications networks: utility networks that serve the general public; and public networks such as public safety networks to serve governmental functions. Enterprise networks, as defined above by their very nature are not a primary concern to a public planning agency such as the Regional Planning Commission since they do not serve the general public and do not directly support governmental functions.\*\**

## **SUMMARY AND CONCLUSIONS**

*Broadband wireline communications services in the Region are currently offered primarily by the major incumbent telephone company, AT&T, and the leading cable services provider, Time-Warner Cable. Other incumbent telephone companies, such as Century Tel and Verizon North also offer broadband communications services in some parts of the Region. Charter Communications, the other regional cable services provider, has deployed broadband cable networks in areas of Washington and Walworth counties and in the City of Oconomowoc.*

*Telephone-based service providers utilize a technology known as DSL - digital subscriber line - which transmits high speed data over twisted pair copper wires originally used for voice communications. Cable companies employ a hybrid communications technology that combines fiber optic cable links with traditional coaxial cable connections to deliver high speed data services.*

*None of the existing wireline broadband services networks in the Region offer throughput data rates that meet the Commission recommended performance standard of 20 megabits per second. All of the current wireline services are extremely asymmetrical, with upload speeds of 20 percent or less of download speeds. AT&T, the leading DSL service provider, is in the process of deploying a Fiber-to-the-Node technology (FTTN) that is designed to achieve the Commission recommended broadband service standard of 20 megabits per second. Advanced broadband service plans of the two cable service providers, Time-Warner Cable and Charter Communications, have not been revealed at this time. Similarly, the other DSL service providers have not announced plans for technologies designed to meet the 20 megabits per second throughput standard.*



*None of the major current wireline broadband service providers offer the universal geographic coverage objective recommended by the Commission. Cable services in many communities serve the large majority of the population, but there are still areas of the Region that do not meet the Commission recommended standards for extension of broadband cable services. DSL broadband services from telephone service providers are also not universally available from the wireline carriers in the Region. Furthermore, AT&T's plans for expanded broadband services target only 25 of the 116 local municipalities in Southeastern Wisconsin that AT&T serves. Although AT&T's post-2008 plans may expand this number, currently there is no information available on these plans.*

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