

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

DATE: March 1, 2005

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
Kenneth Brown	RF Engineer, Nextel Communications, Inc.
Michael Falaschi	President, Wisconsin Internet
Barry Gatz	Network Supervisor, CenturyTel
Michael E. Klasen	Director, Regulatory Affairs, SBC Wisconsin
J. Michael Long	Attorney-at-Law, Murn and Martin, SC
Jody McCann	Network Domain Manager, Wisconsin Department of Administration, BadgerNet
Paul E. Mueller	Administrator, Washington County Land Use and Park Department
Steven L. Ritt	Attorney at Law, Michael Best & Friedrich
Bennett Schliesman	Director, Kenosha County Emergency Management /Homeland Security
Paul R. Schumacher	Program Manager, Tricounty Business Partnerships
Michael Biaigoli	Information Systems Manager, Waukesha County, Representing Dale R. Shaver, Director, Waukesha County Department of Parks and Land Use
Gustav W. Wirth, Jr.	SEWRPC Commissioner

Members Absent

William R. Drew Vice Chairman	Vice-Chairman, SEWRPC; Executive Director, Milwaukee County Research Park
Roger Caron	President, Racine Area Manufacturers and Commerce
Bob Chernow	Chairman, Regional Telecommunications Commission
David L. DeAngelis	Village Manager, Village of Elm Grove
Brahim Gaddour	Director of Network Operations, Time Warner Telecom of Wisconsin
Jeff Mantes	Commissioner of Public Works, City of Milwaukee
George E. Melcher	Director, Office of Planning and Development, Kenosha County
James W. Romlein	Managing Director, MVLabs, LLC
Michael Ulicki	Vice President and Chief Technology Officer, Norlight Telecommunications
Darryl Winston	Director of Data Services, City of Milwaukee Police Department

Staff

Kenneth J. Schlager, PhD
Lynn G. Heis
Philip C. Evenson

Chief Telecommunications Engineer, SEWRPC
Staff Secretary, SEWRPC
Executive Director, 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.

CONSIDERATION OF THE MINUTES OF THE MEETING OF DECEMBER 14, 2004

Chairman Bauer noted that copies of the minutes of the fourth meeting of the Reconstituted Regional Telecommunications Planning Advisory Committee held on December 14, 2004, had been distributed to all members of the Committee for review prior to the meeting; and asked that the Committee consider approval of those minutes.

There being no questions, comments, or corrections, on a motion by Mr. McCann, seconded by Mr. Wirth, the minutes of the meeting of December 14, 2004, were unanimously approved as published.

Consideration of preliminary draft of SEWRPC Planning Report No. 51, A Wireless Antenna Siting and Related Infrastructure Plan for Southeastern Wisconsin.

Chapter I – Introduction

Chairman Bauer noted that a copy of the preliminary draft of Chapter I, Introduction, of SEWRPC Planning Report No. 51 had been distributed to all members of the Committee for review prior to the meeting. He then undertook a page by page review of the draft chapter with the Committee.

Mr. Klasen indicated that it was not apparent to the reader that the plan concerned is to have a design year 2015. He suggested that this important fact be prominently included in the text of this introductory chapter. A brief discussion ensued in which Mr. Evenson suggested, and the Committee agreed, to insert a section into the text just before the section entitled “Scheme of Presentation” on page 15 setting forth the design year to be used in the planning effort.

Secretary’s Note: The following section is proposed to be inserted in the text of Chapter I on page 15 immediately preceding the section entitled “Scheme of Presentation”.

“PLAN DESIGN YEAR

The wireless antenna siting and related infrastructure plan for the Southeastern Wisconsin Region is to have a plan design year 2015. This design year was selected to correspond with a set of the new land use and transportation system plans being prepared for the Region, which plans are to have a design year 2035 with appropriate ten year stagings. The plan design year of 2015 was also selected to provide a long-range, as opposed to a short-range, basis for the planning effort. Because of the rapidly changing economic, technological, regulatory, and market conditions concerned, private sector telecommunications planning efforts tend to be relatively short range, a five year time horizon often being used. A longer time horizon – 10 years – was selected for the antenna

siting and related infrastructure planning effort in order to permit the planning to reflect probable new technologies, including fourth generation (4G) wireless technology, and new versions of the Internet. The wireless antenna siting and related infrastructure plan is also staged to reflect the introduction of 3G technology, an anticipated evolutionary stage to the 4G end state technology of the plan.”

Messrs. Ritt and Brown expressed concern about the negative tone of the paragraph beginning on the bottom of page 9 and carried over to the top of page 10 concerning the effects of wireless antenna structure locations on land use and on perceived property values; on the use of the term “haphazard” concerning the location of wireless antenna sites in the absence of a public planning effort; and on the reference to disruption and conflict created by antenna structure site locations. A lengthy discussion ensued in which Messrs. Mueller, Schlager, and Wirth supported the original wording of the paragraph as reflecting reality at the local municipal level. Mr. Mueller stressed that, contrary to Mr. Ritt’s view, county and local planners must frequently deal with perceptions and county and local elected officials -- who are not experts -- respond to such perceptions which in the environment of local decision making are indeed real. Mr. Schlager noted that there were 376 antenna tower sites within the Region, clearly the result of truly haphazard siting since far fewer than 376 antenna sites would be adequate to serve the Region. Upon the conclusion of the discussion, it was the consensus of the Committee that the paragraph concerned be revised to read as follows:

“Wireless communication requires above ground antenna structures and related infrastructure. In certain instances the location of these structures and associated support equipment may have impacts on land use and on perceived property values. These impacts and perceptions may be positive or negative depending upon the site specific situations. The coming third generation of wireless telecommunications may be expected to require a larger number of antenna sites with smaller cellular coverage. This projected increase in antenna site requirements contributes to a need for areawide planning of the required future antenna site network. Site planning, if properly carried out in a cooperative manner by the public and private sector interests involved, can assist in avoiding the potential haphazard location of a multitude of future wireless antenna sites; maintain a harmonious relationship between private sector antenna site planning and county and local land use planning; and help to avoid needless conflicts over antenna structure siting and local land use development. Also in this respect, it is necessary to look beyond the current state of telecommunication networks and their supporting technologies, to the possibilities for the development of better wireless and wireline networks within Southeastern Wisconsin. Areawide plans must recognize the implications of new technologies, including fourth generation (4G) wireless technology, new versions of the Internet, and the anticipated blending of telecommunication networks into one operationally integrated but diverse multimedia system.”

With respect to item No. 6 on page 13, Mr. Falaschi asked how the Commission intended to assist communities with respect to telecommunications system development. Chairman Bauer responded that such assistance would probably be provided through both the Commission Community Assistance and Telecommunication Planning Divisions, and could range from development of model zoning and permitting ordinances relating to telecommunication facility location and development; the provision of assistance in drafting such ordinances; providing technical assistance to counties, municipalities, and providers in dealing with telecommunications development problems; and providing planning assistance in public sector telecommunication facility and services development.

Mr. Schliesman expressed concern with respect to item No. 7 on page 14, noting that the Federal Communications Commission (FCC) is currently requiring all police, fire, and emergency medical related

telecommunications to be provided through narrow band technology and that federal grant programs required radio and other purchased equipment be narrow band and restricted to use by first responders in emergency situations. A lengthy discussion ensued concerning the apparent conflict between this federal requirement and the movement to broadband technologies for these kinds of telecommunications facilities. Mr. Biagoli agreed with Mr. Schleisman's observation. Messrs. Schlager and Wirth expressed concern over the Federal requirement, indicating that the narrow band technology being required may be expected to rapidly become obsolete. At the conclusion of the discussion, it was the consensus of the Committee that a new paragraph be added under Item No. 7 on page 14 addressing the apparent conflict.

Secretary's Note: The following paragraph was drafted for insertion under item No. 7 on page 14.

"While long-term trends emphasize the move to higher frequencies for broadband capability, short-term considerations for interoperable communications in public safety agencies (police, fire, and emergency medical services) restrict local governments to lower band spectrum for voice communications. For example, both 150 MHz and 800 MHz are popular public safety bands in Wisconsin. Until at least 3G based voice over internet protocol services are widely available, there is little choice but to remain at lower frequencies for interoperable public safety voice communications. Realistically, only the advent of public sector 4G networks will allow for a universal public safety transformation to broadband frequencies."

Mr. Long expressed concern about the statement made in the penultimate sentence of the paragraph beginning on the bottom of page 14 concerning minimization of the number of antenna sites within the Region. A brief discussion ensued upon the conclusion of which it was the consensus of the Committee that the sentence concerned be revised to read as follows:

"Particular attention in the memorandum was focused on the optimization of antenna site location with the Region with the objective of encouraging the co-location of antenna on supporting structures, and minimizing the number of single user antenna sites while providing full coverage of high quality service throughout the Region."

Chairman Bauer noted that with respect to the Scheme of Presentation, a revision would be required to reflect the preparation of a separate chapter -- Chapter IV -- presenting background demographic, economic, land use, and transportation information important to any consideration of telecommunications planning; and a separate chapter -- Chapter V-- documenting the findings of the wireless communication infrastructure inventory essential to the planning effort.

There being no further questions or comments, on a motion by Mr. Wirth, seconded by Mr. Brown and carried unanimously, Chapter I, Introduction of SEWRPC Planning Report No. 51 was approved as amended (copy of amended Chapter I attached as Appendix I to these Minutes).

Chapter II – Basic Principles and Concepts

Chairman Bauer noted that a copy of the preliminary draft of Chapter II, Basic Principles and Concepts, of SEWRPC Planning Report No. 51 had been distributed to all members of the Committee for review prior to the meeting. He then asked Dr. Schlager to undertake a page by page review of the draft chapter with the Committee.

Mr. Long objected to the use of the phrase “a single integrated system” in the penultimate line of the first numbered paragraph on page one and expressed concern that use of this phrase implied the creation of a single, perhaps public, entity to develop and operate telecommunication facilities within the Region. Messrs. Falaschi and Ritt agreed, and Mr. Falaschi suggested, and the Committee agreed, to substitute the word “interoperable” for “integrated”.

Chairman Bauer pointed out that the planning process as described, beginning on page 2, was in effect an outline of the classic systems engineering process taught in engineering colleges. Mr. Ritt agreed, and noted that each private provider engages in this process with respect to its own system.

Mr. Ritt suggested, and the Committee agreed, that the word “definitive” be struck from the penultimate line of the second numbered paragraph on page 3.

Mr. Brown expressed concern with paragraph No. 4 on page 2, indicating that in his opinion the structuring of the various networks should be the province of the providers which own and operate those networks. Mr. Ritt agreed with Mr. Brown. A lengthy discussion ensued, upon the conclusion of which it was moved by Mr. Brown, seconded by Mr. Ritt, and carried unanimously, to strike the fourth numbered paragraph on page 2 concerning the desirability of having a hierarchal structure for telecommunications networks.

Mr. Ritt indicated that text should be added to the chapter acknowledging that public telecommunications planning must take into consideration the fact that significant providers of wireless telecommunication services are private sector companies that are charged by Congress to independently develop their own networks and levels of service and that are to compete for market share. He indicated he did not believe that this important fact should be ignored in setting forth basic principles underlying the regional telecommunication planning process. A brief discussion ensued upon the conclusion of which it was the consensus of the Committee that a new fourth principle be drafted by the staff, replacing the principle previously directed to be struck from the text on page 2; the new principle indicating that private providers plan their own networks, therefore, any meaningful public planning effort must be conducted in cooperation with the private providers.

Secretary’s Note: The following principle was drafted by the staff in accordance with the Committee’s direction for insertion on page 2 of the chapter.

“No. 4: Private sector companies are significant providers of telecommunications services within the Region. These private sector companies independently prepare plans for the development of their networks; independently develop their own levels of service; and independently provide competitive services. Meaningful public telecommunication planning effort must recognize the existence of these private sector planning efforts; and pursue the public planning effort in close cooperation with the private providers, actively involving these providers in the public planning process.”

Mr. Ritt called attention to the first sentence of the fifth paragraph on page 4 which called for a regional set of antenna sites that will provide adequate coverage, capacity, and quality of service; and asked by whom and how such adequate coverage, capacity, and quality were to be defined. Chairman Bauer indicated that such definitions were extended to be provided by the objectives and standards set forth in the next chapter of the report. After a brief discussion, it was the consensus of the Committee that the phrase “as such coverage, capacity, and quality of service are defined by the objectives and standards set forth in this report” be added to the first sentence of the fifth paragraph on page 4.

There being no further questions or comments, on a motion by Mr. Schleisman, seconded by Mr. Wirth and carried unanimously, Chapter II, Basic Principles and Concepts, of SEWRPC Planning Report No. 51 was approved as amended (copy of amended Chapter II attached as Appendix II to these Minutes).

Chapter III – Objectives and Standards

Chairman Bauer noted that a copy of the preliminary draft of Chapter III, Objectives and Standards, of SEWRPC Planning Report No. 51 had been distributed to all members of the Committee for review prior to the meeting. He then asked Dr. Schlager to undertake a page by page review of the chapter with the Committee.

Mr. Ritt suggested, and the Committee agreed, that the design year of the proposed plan again be called to the reader's attention just before the restatement of the proposed objectives, principles, and standards.

Secretary's Note: The following sentence was added to the fourth full paragraph on page 2.

“The following objectives, principles, and standards are intended to be used in the formulation and evaluation of alternate design year 2015 regional wireless antenna siting and related infrastructure plans and in the preparation of a recommended plan.”

Messrs. Ritt and Brown expressed concern over the possible misinterpretation of the standards as proposed public regulations governing the private providers. A brief discussion ensued upon the conclusion of which was the consensus of the Committee that a paragraph be drafted by the staff for insertion before the heading "Objective, Principles, and Standards" on page 3 clearly stating that the objectives and standards were not intended in any way as proposed regulatory measures, but were formulated solely for use in plan preparation and evaluation.

Secretary's Note: The following paragraph was prepared by the Commission staff for insertion on page 2 of the chapter as directed by the Committee:

"Given the important role of the private sector in providing telecommunications facilities and services within the Region, and given the concern of these providers about the continued freedom to operate independently in a competitive market, it is important to note that the following objectives, principles, and standards are not intended to have any regulatory implications, but are intended for use solely in plan preparation and evaluation.”

Mr. Wirth expressed concern over the first standard set forth on page 3, suggesting that no upper limit be placed upon the desired transmission rate since the plan design year looked ten years into the future and the technology concerned was rapidly advancing. Mr. Long agreed. A lengthy discussion ensued in which Mr. Klasen indicated that the upper limit proposed in the standard concerned may be too high, rather than too low as implied by Mr. Wirth and Mr. Long's comments. Dr. Schlager indicated that a definitive range was required for use in the mathematical modeling to be used in plan preparation and evaluation. Upon the conclusion of the discussion it was the consensus of the Committee that no change be made in the standard concerned.

A lengthy discussion ensued concerning the second standard set forth on page 4 concerning network availability, the discussion focusing on both the proposed percentage of time available and on whether or

not the standard for wireless network availability should differ from a standard for wireline availability. Mr. Brown indicated that his company strove to meet the wireline standard with respect to the network being "up and running"; however, meeting this standard did not mean that during periods of peak utilization no calls will be blocked. Mr. Brown indicated that his firm also maintained data on calls attempted but not completed, a measure of availability. Mr. Klasen indicated that he did not believe it would be sound to set availability standards at the same level for wireless as for wireline service given the different technologies and different means of access involved. Dr. Schlager noted that the Commission would be monitoring system performance, including availability, and that the findings of the monitoring effort may warrant a revision in the proposed standard.

Mr. Falaschi expressed concern that if the proposed standards were not able to be met by private service providers, this might be used as a reason for creating a single public service provider. Mr. Falaschi's comment shifted the focus of the discussion to the potential impacts of the objectives and standards on private providers. Mr. Evenson responded by indicating that the objectives and standards were intended to help define what the Commission, as the official areawide planning agency for Southeastern Wisconsin, believes would be a desirable telecommunications system for the planning area. He indicated that the system should be the best that could be afforded. If the associated standards are not being met by the private sector, he said, it would not be unreasonable for the public sector to query the private sector providers as to why the standards are not being met and perhaps why the Region was falling behind other regions of the U.S. and world with respect to the quality of telecommunication service. This, he said, might lead to a reconsideration of the standards at issue or it might spur the private sector to undertake needed improvements. Mr. Schumacher indicated that there were areas of Kenosha County in which the business and industrial community believed the telecommunication services to be substandard; and in response the County has determined to use public funds to improve the infrastructure and attendant service. He indicated that practical and desirable objectives and standards should be an incentive for the private providers, an incentive which may not exist in the absence of a public plan which is based upon a set of sound objectives and standards.

At the conclusion of this lengthy discussion, it was the consensus of the Committee not to change the second standard set forth on page 4 of the text.

A lengthy discussion then ensued concerning the second objective as set forth on page 4 and the supporting standard as set forth on page 4. Mr. Klasen indicated that the minimum cost of \$60 per month for broadband wireless network coverage was not, in his opinion, an achievable standard unless accompanied by public subsidy such as that now provided for basic telephone service. In answer to a question by Chairman Bauer, Mr. Klasen indicated that the public subsidy program provided about \$8.00 per month toward a basic charge of about \$24.00 to economically disadvantaged households. In answer to a question by Mr. Klasen, Dr. Schlager indicated that four percent of gross monthly income of a household of four earning at the poverty threshold level was derived from the calculated \$60 per month minimum charge, a charge which he believed could be met with wireless service. Mr. Klasen indicated that he did not believe the computed charge was achievable and, moreover, he objected to the Commission proposing a social goal of universal broadband service defined not on the basis of geographic area but on the basis of household income. Mr. Ritt agreed with Mr. Klasen and suggested that the objective be revised by dropping that part of the sentence which follows the phrase geographic area; and by removing from the standard reference to households and costs.

Mr. Klasen indicated that the issue of affordability needs to be addressed at the national level when the Congress reviews the Federal Telecommunications Act, and that the Commission would be well advised not to address this issue at this time, but to await action at the national level. Mr. Wirth indicated that politically the Commission could not ignore the issue of universal service defined on the basis of cost to poverty level households. The issue, he acknowledged, was a complex one and very difficult to address

at this time in the form of a monetary standard. Dr. Schlager agreed, but noted that there was at least one existing program that addressed the issue involving the south side of the City of Chicago. That program, he said, provided Internet service – data and voice – on an experimental basis for about \$15.00 per month. Mr. Klasen indicated that for him to support the proposed affordability standard, the Commission staff would have to present the findings of additional research with respect to the “digital divide” as related to household income and the extent to which any available standard would require publicly subsidized service.

At the conclusion of the discussion it was the consensus of the Committee that Objective No. 2 be revised to read as follows: “The provision of broadband wireless telecommunication services to all geographic areas of the Region”;

and that the attendant principle be revised to read as follows:

“Residents and organizations of the Region, regardless of geographic location, should be offered an equal access to broadband telecommunication services in order to promote the social and economic welfare of the Region”;

and that attendant supporting standard should be revised to read as follows:

“Broadband wireless network coverage should be provided in all geographic areas of the Region and should be available to all residences, business, industries, and organizations of the Region.”

It was also agreed that Footnote No. 6 on page 4 should be struck, and in its place a paragraph added to the text indicating that the Commission recognized the need to consider universal service in terms of affordability relating to household income levels and feasible service costs, indicating further, however, that this important issue of affordability needs be addressed first at the national level since the universal affordability may require public subsidy.

Secretary’s Note: The following paragraph was prepared by the staff for insertion on page 7 immediately preceding the heading “Application – Specific Requirement”.

UNIVERSAL BROADBAND SERVICE AND AFFORDABILITY

The Commission Advisory Committee recognizes the need to define universal broadband telecommunications service in terms of affordability as well as geographic coverage. The Committee could not, however, agree on the proportion of gross monthly household income which should as a maximum be allocated to broadband telecommunication service; noting that a range from \$60 to \$125 a month would constitute from four to eight percent of the gross monthly income of a household of four earning \$18,850 per year, the poverty threshold as currently defined by the U.S. Bureau of Census. Given the number of private providers offering service within the Region; and the range of applications deemed essential for upward economic mobility, the attainment of a desired percentage of income allocated to telecommunication services might require public subsidy. The Committee concluded that the issue of affordability needs to be addressed by the Congress and the President at the national level and that adoption of an affordability standard by the Commission should await national action.

Mr. Brown expressed concern with respect to Objective No. 3 relating to redundancy indicating that the objective should not force the customers of one carrier to utilize another carrier’s network. A brief

discussion ensued upon the conclusion of which it was agreed that the term “individual providers” be inserted before the phrase “telecommunication networks”.

A lengthy discussion then ensued concerning Objective No. 4 in which Mr. Long observed that it was important to distinguish between the number of antenna sites and the number of antennas, with the term “site” referring to any place where the antenna may be located, whether on a free standing tower or on an existing or proposed structure of some other kind. After a brief discussion it was the consensus of the Committee that the text be carefully edited by the staff to assure proper use of the towers “antenna sites” and “antennas” within the context concerned.

Mr. Brown observed that Objective No. 4 – Antenna Site Number Optimization - as proposed directly conflicted with Objective No. 3 – Redundancy. He suggested, and the Committee agreed, that the term “minimization” with respect to Objective No. 4 be changed to “optimization”, and the principle accordingly revised.

Secretary’s Note: The supporting principle for Objective No. 4 was revised to read as follows:

“Optimization of the number of antenna sites within a planning area is consistent with minimization of infrastructure investment costs, with the provision of redundancy in the service of each individual provider, and with promotion of environmental protection and the pursuit of a high aesthetic quality in the land and cityscape.”

Mr. Ritt suggested that Objective No. 6 be stricken from the text, on the basis that cost minimization was an objective to be achieved by each of the wireless telecommunication service providers through private planning. Dr. Schlager indicated that an objective relating to cost minimization was essential to meet any sound systems planning or engineering effort since it would be illogical to propose a more costly system plan when a less costly plan was known to exist that would achieve the other objectives. Dr. Schlager observed further that if a Commission recommended plan was shown to be more cost effective than other alternatives, those private providers that concurred in the finding could adopt the plan or portions of the plan for use in their private planning efforts.

Mr. Brown expressed concern that the proposed objectives relating to redundancy and cost minimization seemed to imply a desire to develop a single telecommunications system to serve the Region, a situation quite contrary to the present system with competitive services by multiple providers. Mr. Brown indicated that it was his understanding that the purpose of the Commission planning effort was to have the public and private sectors work together to define an adequate level of service to be provided within the Region; and that the process was not to result in a public system plan that the private sector providers had to follow. Chairman Bauer indicated that it was indeed the intent of the planning process to work cooperatively with the private providers to identify a mutually acceptable plan. He said that he envisioned such a plan as consisting essentially of a plan map showing existing antenna sites within the Region - the number and locations of the sites having been checked and approved by the individual service providers, - a plan map showing the service coverage provided by those antenna sites as defined by radio propagation modeling using canopy data; and a plan map showing the antenna site configuration needed to provide 4G technology service by the design year 2015. He indicated further that such a plan was not intended to -- and should not -- constrain the individual providers in their planning, but would hopefully be helpful to those providers in their planning and in the further development of needed antenna sites within the Region. Clearly, he said, individual carriers who wanted to deviate from the Commission recommended antenna siting plan could do so. Mr. Evenson agreed with Mr. Bauer indicating that the existing competitive environment will continue to exist and the Commission’s plan is intended to be as

helpful as possible to both the county and local municipalities and to the private providers operating within that environment.

Chairman Bauer then asked Mr. Brown whether it would be helpful to his firm as a private provider to have identified in a public plan a configuration of publicly recommended 4G antenna sites, leaving to the firm's engineers to decide which of those sites to use, or whether to utilize other sites. Mr. Brown agreed that that would be advantageous and that was precisely why his firm was participating in the planning process. A brief discussion ensued upon the conclusion of which it was agreed that the term "system" in Objective No. 6 would be replaced by the term "networks".

With respect to the second Standard under Objective No. 7 Mr. Ritt suggested, and the Committee concurred, that the phrase "support structure" be inserted after the phrase "new antenna".

Mr. Brown suggested, and the Committee concurred, that the need for sound structural design practices be referenced in the principle.

Secretary's Note: The following sentence was added to the supporting Principle under Objective No. 7:

"In order to ensure public safety, careful attention must always be given to structural design principles and practices, including careful conformance to existing regulatory codes."

Mr. Ritt suggested, and the Committee concurred, that the fourth standard under Objective No. 7 be struck from the text. He indicated that the proposed standards should not make any stated preference for the type of support structure – such as free standing solid form, free standing lattice forms -- or guide wire forms -- leaving the selection of the forms to the local communities on the basis of site specific conditions.

Mr. Falaschi agreed that a standard relating to antenna structure heights was desirable, but suggested that the fifth standard under Objective No. 7 be struck from the text and a new standard written that properly addressed the issue, which issue was more complex than recognized by simply proposing the minimization of antennae support structure heights. Messrs. Ritt and Wirth agreed, indicating that such a standard should reference the ability to be expandable, and the ability to maximize co-location of antennas. Upon the conclusion of the discussion it was the consensus of the Committee that the staff draft a proposed standard reflecting the need to minimize antenna structure heights consistent, however, with the provision for maximization of antenna co-location and with the provision for high extension and capacity expansion.

Secretary's Note: The following standard was proposed as a fifth Standard under Objective No. 7:

"Antenna heights should be minimized consistent, however, with maximizing the potential for antenna co-location, and with providing a potential for height extension and capacity expansion."

Mr. Biaigoli expressed concern that the proposed objectives and standards were silent with respect to the need for preserving system capacity for use by police, fire, emergency medical, and homeland security agencies in times of public safety emergencies. He indicated that such public safety emergency traffic should take preference over consumer use traffic, and this need for preference will become more important as competition for bandwidth increases. A brief discussion ensued in which Dr. Schlager

noted that a bandwidth was currently set aside for public safety related uses. Mr. Biaigoli, however, noted that he was not concerned about voice transmission, but wireless broadband, packet switched traffic. Upon the conclusion of the discussion it was the consensus of the Committee that an additional objective with supporting principle and standard be drafted to reflect Mr. Biaigoli's concerns.

Secretary's Note: The following set of an objective, supporting principle, and supporting standard was drafted in response to the Committee's direction.

OBJECTIVE NO. 8 - PREFERENCE FOR USE IN PUBLIC SAFETY EMERGENCIES

A broadband wireless communication network that assures capacity for, and provides preference to police, fire, emergency medical, and homeland security agencies for use in times of public emergencies.

PRINCIPLE:

The potential for interagency communication by police, fire, emergency medical, and homeland security agencies in times of public emergencies -- such as national disasters including flooding and wind, snow and sleet storms, and freezing rain, and in times of culturally related disasters such as fire, explosions, nuclear electric power generation plant failures, and terrorist attack, must be protected and preserved.

STANDARD:

Public safety related multi-media traffic should be assigned the highest priority based on network port designation and assignment.

Chairman Bauer observed that the time was now well after 5 P.M., and that the Committee in its review had directed that a number of important substantive changes be made in Chapter III "Objectives and Standards" of SEWRPC Planning Report No. 51. He suggested, and the Committee concurred, that action on the Chapter be postponed until the next meeting when a revised Chapter could be reconsidered in its entirety.

DATE AND TIME OF NEXT MEETING

Chairman Bauer then asked the Committee to consider the date and time for the next Committee meeting. After some brief discussion it was determined that the next meeting of the Committee should be scheduled to be held on April 12, 2005, beginning at 2:00P.M. in the Commission offices.

ADJOURNMENT

There being no further business to come before the Committee, on a motion by Mr. Klasen, seconded by Mr. Brown, and carried unanimously, the meeting was adjourned at 5:32 P.M.

Respectfully Submitted,

Lynn G. Heis
Staff Secretary

Appendix 1

SEWRPC PLANNING REPORT NO. 51

**CHAPTER I,
INTRODUCTION**

PRELIMINARY DRAFT

**SEWRPC Planning Report No. 51,
A WIRELESS ANTENNA SITING AND RELATED INFRASTRUCTURE PLAN
FOR SOUTHEASTERN WISCONSIN**

Chapter I

INTRODUCTION

INTRODUCTION

The Southeastern Wisconsin Regional Planning Commission is charged by law with the function and duty of "making and adopting a master plan for the physical development of the Region." The permissible scope and content of this plan, as outlined in the enabling legislation, extend to all phases of regional development, implicitly emphasizing, however, the preparation of spatial designs for the use of land and for supporting transportation, and other utility facilities, including telecommunications facilities.

The scope and complexity of areawide development problems prohibit the making and adopting of an entire comprehensive development plan at one time. The Commission has, therefore, determined to proceed with the preparation of individual plan elements which together can form the required comprehensive plan. Each element is intended to deal with an identified areawide developmental or environmental problem. The individual elements are coordinated by being related to an areawide land use plan. Thus, the land use plan comprises the most basic regional plan element, an element on which all other elements are based. The regional wireless antenna site and related infrastructure plan is also strongly linked to the regional land use and transportation plans based on the relationship between land use patterns, major transportation facilities, and telecommunications traffic generation.

Because regional telecommunications planning comprises an integral part of a broader regional planning program, an understanding of the need for, and objectives of, regional planning and the manner in which these needs are being met in southeastern Wisconsin is necessary for a full understanding of the telecommunications planning process and of its findings and recommendations as presented in this report. To that end, this chapter describes the need for, and status of, the regional planning effort within the Southeastern Wisconsin Region.

NEED FOR REGIONAL PLANNING

Regional planning may be defined as comprehensive planning for a geographic area larger than a county but smaller than a state, united by economic interest, geography, and common areawide developmental and environmental problems. The need for such planning has arisen from certain important social and economic changes which, while national phenomena, have had far-reaching impacts on the problems facing local government. These changes include growth and redistribution of population and attendant urban development; changes in agricultural and industrial productivity, income levels, and leisure time; generation of mass recreational needs and pursuits; intensive use and consumption of natural resources; development of private water supply and sewage disposal systems; development of extensive electric power and communications networks; and development of limited-access highways and mass automotive transportation. Through the effects of these changes, entire regions like southeastern Wisconsin are being subjected to the widespread diffusion of urban development and are thereby becoming, large, mixed rural and urban socio-economic complexes. This urban diffusion, in turn, creates serious and complex areawide developmental and environmental problems.

The areawide problems which necessitate a regional planning effort in southeastern Wisconsin all have their source in the changes in population size, composition, and distribution and in the attendant urban diffusion occurring within the Region. These areawide problems include, among others: drainage and flooding; air and water pollution; increased demand for park and outdoor recreation facilities, sewerage and water supply facilities, and housing; traffic congestion; a growing demand for high speed, broadband telecommunications; and, underlying all of the foregoing problems, rapidly changing land use development. These problems are all truly regional in scope, transcending both the geographic boundaries and the fiscal capabilities of the local municipal units of government comprising the Region, and can be properly addressed only within the context of a continuing, cooperative, areawide, comprehensive regional planning effort.

THE REGIONAL PLANNING COMMISSION

The Southeastern Wisconsin Regional Planning Commission was created in August 1960, pursuant to the provisions of Section 66.0303 of the Wisconsin Statutes, to serve and assist the local, state, and federal units of government in solving areawide problems and in planning for the more orderly and more economic development of southeastern Wisconsin. The Commission's role is entirely advisory, and participation by local units of government in its work is on a voluntary, cooperative basis. The Commission is composed of 21 citizen members, three from each county in the Region. One Commissioner from each county is appointed to the Commission by the county board, one by the Governor from a list certified to him by the county board, and one by the Governor on his own motion.

The powers, duties, and functions of the Commission and the qualifications of the Commissioners are carefully set forth in the enabling legislation. The Commission is authorized to employ a staff and to appoint advisory committees to assist it in the execution of its responsibilities. Basic funding to support Commission operations is provided by the member counties, with the budget apportioned among the seven counties on the basis of relative equalized property valuation. The Commission is authorized to request and accept aid in any form from all levels and agencies of government to accomplish its objectives, and is authorized to deal directly with the state and federal governments for this purpose. The organizational structure of the Commission and its relationship to the constituent units and agencies of government comprising or operating within the Region is shown in Figure 1.

THE REGIONAL PLANNING CONCEPT IN SOUTHEASTERN WISCONSIN

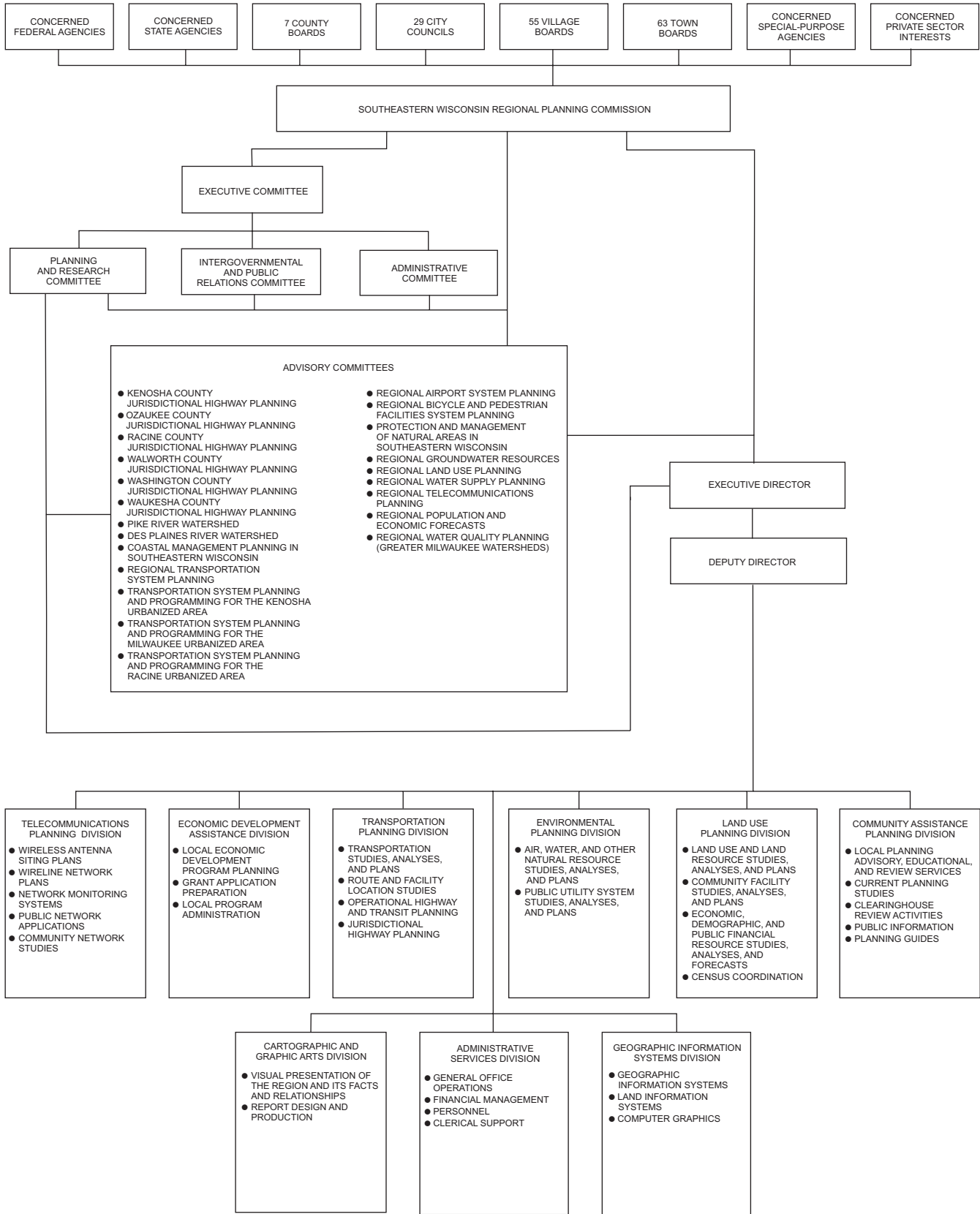
Regional planning, as conceived by the Commission, is not substitute for, but a supplement to, local, state, and federal planning. Its objective is to assist the various levels and units of government in finding cooperative solutions to areawide developmental and environmental problems which cannot be properly resolved within the framework of a single municipality or county. As such, regional planning has three principal functions:

1. Inventory: the collection, analysis, and dissemination of basic planning and engineering data on a uniform, areawide basis so that, in light of such data, the various levels and agencies of government and private investors operating within the Region can better make decisions concerning community development.
2. Plan Design: the preparation of a framework of long-range plans for the physical development of the Region, these plans being limited to functional elements having areawide significance.
3. Plan Implementation: promotion of plan implementation by providing a center to coordinate the planning and plan implementation activities of the various levels and agencies of government in the Region and by providing the introduction of information on areawide problems, recommended solutions to these problems, and alternatives thereto, as part of the existing decision-making process.

The work of the Commission, therefore, is seen as a continuing planning process providing outputs of value to the making of development decisions by public and private agencies and to the preparation of plans and plan implementation programs at the local, state, and federal levels. It emphasizes close cooperation between the governmental agencies and private enterprises responsible for the development and maintenance of land uses in the Region and for the design, construction, operation, and maintenance of the supporting public and private facilities. All Commission work programs are intended to be carried out within the context of a continuing overall planning program which provides for periodic reevaluation of the plans produced and for the extension of planning information and advice necessary to convert the plans into action programs at the local, regional, state, and federal levels.

Figure 1

SEWRPC ORGANIZATIONAL STRUCTURE: 2005



THE REGION

The Southeastern Wisconsin Planning Region, as shown on Map 1, is comprised of Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha Counties. Exclusive of Lake Michigan, these seven counties have a total of 2,689 square miles, or about 5 percent of the total land and inland water area of Wisconsin, and a total resident population of about 1.93 million people. About 36 percent of the population of the State lives in these seven counties, which contain three of the fifteen metropolitan statistical areas which are wholly or partially located in Wisconsin. The seven counties provide about 1.18 million jobs, or about 36 percent of the total employment of the State. The Region contains real property valued at about \$133.5 billion as measured in equalized valuation, or about 37 percent of all of the tangible wealth of the State, as measured by such valuation. The Region contains 159 local units of government, exclusive of school and other special-purpose districts, and encompasses all or parts of 11 major watersheds.

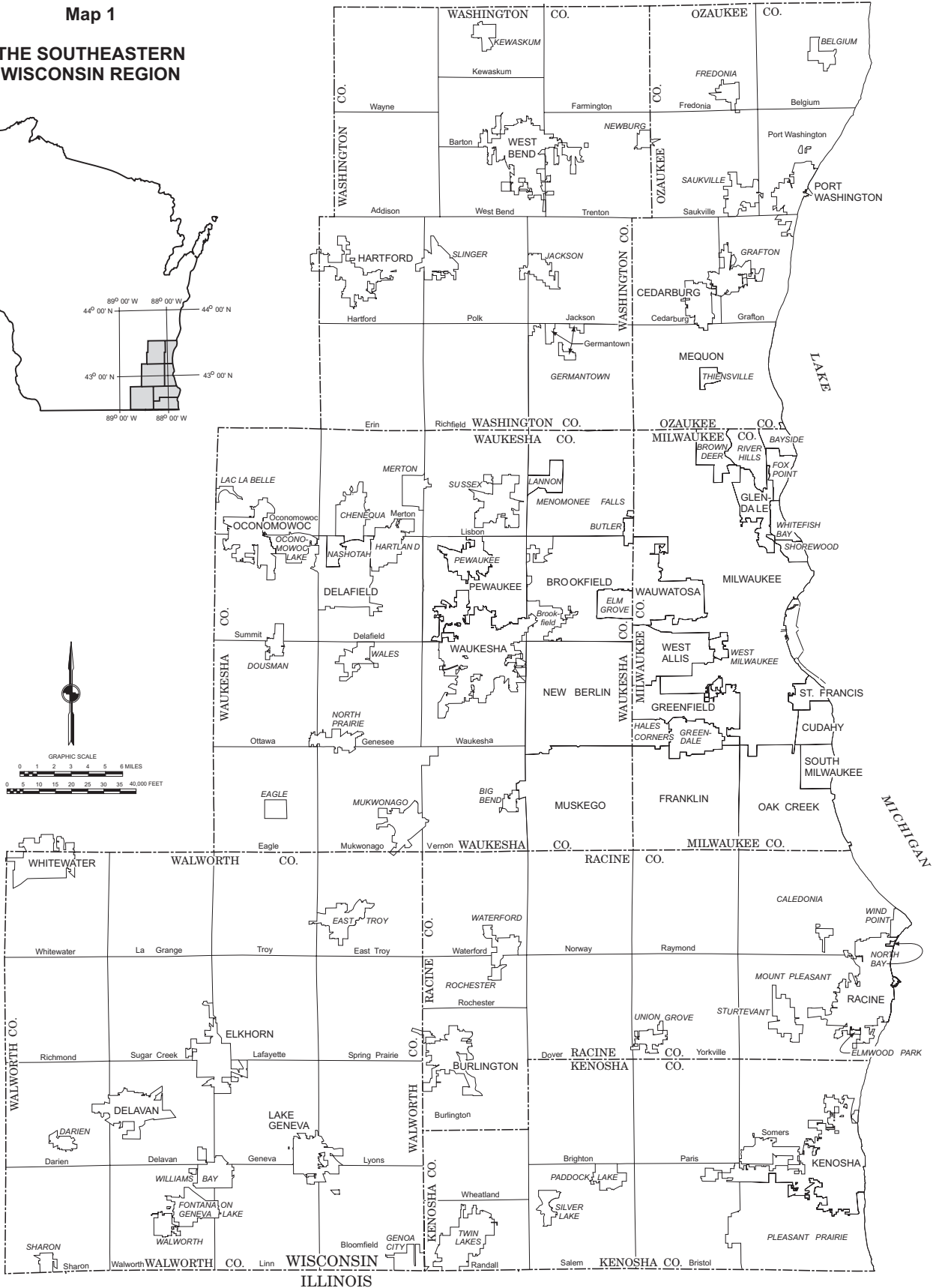
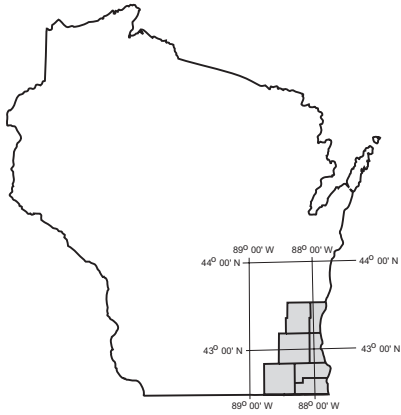
Geographically the Region is located in a relatively good position with regard to continued growth and development. It is bounded on the east by Lake Michigan, which provides an ample supply of fresh water for both domestic and industrial use, and is an integral part of a major international transportation network. It is bounded on the south by the rapidly expanding northeastern Illinois metropolitan region and on the west and north by the fertile agricultural lands and desirable recreational areas of the rest of the State of Wisconsin. Many of the most important industrial areas and heaviest population concentrations in the Midwest lie within 250 miles of the Region, and over 27.3 million people reside within this radius.

COMMISSION WORK PROGRAMS TO DATE

Since its creation in 1960, the Regional Planning Commission has diligently pursued its three basic functions of areawide inventory, plan design, and promotion of plan implementation through intergovernmental cooperation and coordination, although the relative emphasis placed upon these functions has changed somewhat over time. Initially, major emphasis in the Commission's work program was on the inventory function, with increasing attention being placed over the years on the plan design and on the intergovernmental coordination functions.

With respect to the inventory function, the Commission's planning program, as conducted since 1961, has resulted in the creation of a data bank containing in a readily usable form the basic planning and engineering information required for sound, areawide planning. The data assembled in the regional data bank include, among others, definitive data on streamflows; floodlands; surface and groundwater quality; woodlands, wetlands, and wildlife habitat; sites having scenic, scientific, cultural, and recreational value; soils; existing and proposed land uses; travel habits and patterns; transportation system capacity and utilization; existing and proposed utility service areas; and

Map 1
THE SOUTHEASTERN WISCONSIN REGION



Source: SEWRPC.

the demographic and economic base and structure of the Region. The data base also includes an extensive topographic and cadastral base mapping and horizontal and vertical survey control file. In wireless networks, the inventories include a comprehensive layout of antenna sites in the Region along with the areal coverage of these sites for the various wireless frequency bands and radio technologies.

Some of the data in the regional planning data bank have been assembled through the collation of data collected by other agencies. Data so assembled include data on highway and transit facility capacity, use, and service levels; transportation terminal facility capacity; automobile and truck availability; and population and economic activity levels. Much of the data in the regional data bank, however, have been assembled through original inventory efforts conducted by the Commission itself. Such inventory efforts have ranged from aerial photography, large-scale topographic and cadastral base mapping, and control survey programs; through extensive land use, woodland, wetland, wildlife habitat, potential park site, and public utility system inventories; to massive travel inventory, detailed operational soil survey, and streamflow gaging and water quality monitoring efforts. Wireless inventory data sources used by the Commission include federal databases such as the Federal Communications Commission and Federal Aviation Administration; permit records of local units of government; and data from wireless service providers.

The regional planning data bank is supported by an extensive data conversion, filing, and retrieval capability which permits the basic data to be readily manipulated and tabulated by various geographic areas, ranging in size from the Region as a whole down through natural watersheds, counties, and minor civil divisions to planning analysis areas, census enumeration districts and tracts, traffic analysis zones, U. S. Public Land Survey sections and quarter-sections, and, for certain data, urban blocks and block faces. Of increasing importance in the regional planning data bank is the Commission's automated geographic information systems capability. A key regional map file consists of land use data which have been digitized, allowing for automated map reproduction and related data analysis functions. The Commission's planning data bank provides valuable points of departure for all Commission work efforts and is, moreover, available for use by the constituent agencies and units of government and the private sector.

With respect to the plan design function, the Commission has placed great emphasis upon the development of a comprehensive plan for the physical development of the Region in the belief that such a plan is essential if land use development is to be properly coordinated with development of supporting transportation, telecommunications, utility, and community facility systems; if the development of each of these individual functional systems is to be coordinated with the development of each of the others; and if serious and costly developmental and environmental problems are to be avoided and a safer, more healthful and attractive, as well as more efficient regional settlement pattern is to be achieved. Under the Commission's approach, the preparation, adoption, and use of the comprehensive plan are considered to be the primary objective of the planning process; and all planning and plan implementation efforts are related to the comprehensive plan.

Telecommunication networks have become a vital resource in the physical development of metropolitan regions. Business firms, local units of government, educational facilities, and individual households all depend on communications in the conduct of their daily lives and high speed -- broadband -- communications for data and video as well as voice communications is becoming an integral part of a modern society.

The comprehensive plan not only provides an official framework for coordinating and guiding growth and development within a multijurisdictional urbanizing region, but also provides a good conceptual basis for the application of systems engineering skills to the growing problems of such a region. The comprehensive regional plan also provides the essential framework for more detailed physical development planning at the county, community, and neighborhood levels.

As previously noted, because the scope and complexity of areawide development problems prohibit the preparation of an entire comprehensive plan at one time, the Commission has determined to proceed with the preparation of individual plan elements which together comprise the required comprehensive plan. By the end of 2003, the adopted regional plan consisted of 23 individual plan elements. Four of these elements are land use related: the regional land use plan, the regional housing plan, the regional library facilities and services plan, and the regional park and open space plan. Seven of the plan elements relate to transportation. These consist of the regional transportation plan including highway and transit elements, the regional airport system plan, the transportation systems management plan, the elderly and handicapped transportation plan, and detailed transit development plans for the Kenosha and Racine urbanized areas and for the City of Waukesha. Eleven of the adopted plan elements fall within the broad functional area of environmental planning. These consist of the regional water quality management plan, the regional wastewater sludge management plan, the regional air quality attainment and maintenance plan, and comprehensive watershed development plans for the Desplaines, Fox, Milwaukee, Menomonee, Oak Creek, Kinnickinnic, Pike River, and Oak Creek watersheds. The final two plan elements consist of comprehensive community development plans for the Kenosha and Racine urbanized areas.

The telecommunications planning program is new to the Commission with the initial planning studies beginning in 2004. The program initiation was in recognition of the vital role of telecommunications in the regional economy. In form, it most closely resembles transportation planning, with both relating to infrastructure networks. It differs, however, in the rapid pace of technological change and the role of private carriers in plan implementation.

The Commission also carries on an active community assistance planning program, in which functional guidance and advice on planning problems are provided to local units of government and regional planning studies are interpreted locally so that the findings and recommendations of these studies may be incorporated into local development plans and plan implementation programs. Six local planning guides have been prepared under this program to provide information helpful in the preparation of local plans and plan implementation ordinances. The subjects of these guides are land subdivision control, official mapping, zoning, organization of local planning

agencies, floodland and shoreland development, and the use of soils data in development planning and control. Telecommunications planning services will also be extended to local units of government as part of the Commission's community assistance program. Beyond the questions related to antenna siting, some communities may require assistance in assessing telecommunications service levels and needs.

TELECOMMUNICATIONS – DEFINITION AND IMPORTANCE

Telecommunication networks provide the infrastructure for information interchange in all advanced societies. Such networks are vital for the efficient production and distribution of goods and services in a modern economy. Telecommunication exchanges also serve to help weave the social and political fabric of modern day life. Recent and continuing advances in communications technology have allowed for information transfer at rates considered infeasible even a decade ago. Although originally developed for voice communication only, telecommunication networks now transmit data, video, and multimedia forms of information.

Varying rates of deployment of new communications technologies in different areas of the United States and in the rest of the world have produced one aspect of the so-called "digital divide,"¹ placing areas with outmoded telecommunication technologies at a competitive disadvantage in national and global commerce. Such disadvantaged areas are also prevented from introducing communications-based advances in fields such as telemedicine, public safety, education, environmental monitoring, and transportation that have major impacts on the quality of life. For all of the above reasons, telecommunications planning should be an important concern of elected and appointed public officials in a metropolitan region such as Southeastern Wisconsin.

One mode of telecommunications, terrestrial wireless communications, is advancing more rapidly than other modes such as traditional wireline and satellite wireless communications. Although the first commercial cellular wireless network did not become operable until 1983, wireless telephony is rapidly becoming the predominant form of local and long distance voice communication in the United States and elsewhere. Some countries in Europe and Asia, have higher rates of wireless telephone usage than does the United States. With the advent of the third generation (3G) of wireless communication technology, wireless is expected to become important in data and video as well as voice transmission.

~~Because wireless telecommunication is based on a set of prominent antennae and connecting infrastructure, the location of the antennae and the associated supporting equipment can have important impacts on land use and on perceived property values in local communities. The coming third generation of wireless telecommunications may~~

¹The term "digital divide" is commonly used to refer to the differences between households, businesses and other organizations that, for whatever reasons, have access to personal computers and the Internet and those that do not. It can also be used to distinguish between areas that are underserved in that the areas do not have high speed data service available. Such underserved – or disadvantaged – areas may exist in urban, as well as rural areas.

~~be expected to require a larger number of antenna sites with smaller cellular coverage. This projected increase in antenna site requirements contributes to a need for areawide planning of the future antenna site network. Without such planning, haphazard location of the future multitude of wireless antenna sites may disrupt community land use planning and create excessive and needless conflict in local communities in the Region. Also, it is necessary to look beyond the current state of communications networks and their supporting technologies to the possibilities for both wireless and wireline networks for the future in Southeastern Wisconsin. Such new plan designs must recognize the implications of new technologies including fourth generation (4G) wireless technology, new versions of the Internet, and the expected blending of all networks into one integrated but diverse multimedia system.~~

Wireless communication requires above ground antenna structures and related infrastructure. In certain instances the location of these structures and associated support equipment may have impacts on land use and on perceived property values. These impacts and perceptions may be positive or negative depending upon the site specific situations. The coming third generation of wireless telecommunications may be expected to require a larger number of antenna sites with smaller cellular coverage. This projected increase in antenna site requirements contributes to a need for areawide planning of the required future antenna site network. Site planning, if properly carried out in a cooperative manner by the public and private sector interests involved, can assist in avoiding the potential haphazard location of a multitude of future wireless antenna sites; maintain a harmonious relationship between private sector antenna site planning and county and local land use planning; and help to avoid needless conflicts over antenna structure siting and local land use development. Also in this respect, it is necessary to look beyond the current state of telecommunication networks and their supporting technologies, to the possibilities for the development of better wireless and wireline networks within Southeastern Wisconsin. Areawide plans must recognize the implications of new technologies, including fourth generation (4G) wireless technology, new versions of the Internet, and the anticipated blending of telecommunication networks into one operationally integrated but diverse multimedia system.

ADVISORY COMMITTEE

The long-established practice of the Commission has been to conduct major regional planning programs with the assistance of appropriately structured advisory committees. The membership of such committees was to be drawn, as appropriate, to include knowledgeable and concerned representatives of the constituent counties and municipalities; of concerned State and Federal agencies; of the academic community; and of concerned private businesses and industries. Accordingly, an Advisory Committee on Regional Telecommunications Planning was created by the Commission to guide the preparation of the recommended plans. The Committee consists of the following members:

Kurt W. Bauer, Chairman Executive Director Emeritus, SEWRPC
William R. Drew, Vice-Chairman SEWRPC, and Executive Director,
Milwaukee County Research Park
Kenneth Brown..... RF Engineer, Nextel Communications, Inc.
Roger Caron President, Racine Area
Manufacturers and Commerce
Bob Chernow Chairman, Regional Telecommunications Commission
David L. DeAngelis Village Manager, Village of Elm Grove
Michael Falaschi President, Wisconsin Internet
Brahim Gaddour Director of Network Operations, Time Warner Telecom of Wisconsin
Barry Gatz Network Supervisor, CenturyTel
Michael E. Klasen Director of Regulatory Affairs, SBC
J. Michael Long Attorney at Law, Murn and Martin, SC
Jeff Mantes Commissioner of Public Works, City of Milwaukee
Jody McCann Network Domain Manager, Wisconsin Department of Administration, BadgerNet
George E. Melcher Director, Office of Planning and Development, Kenosha County
Paul E. Mueller Administrator, Washington County Land Use and Park Department
Steven L. Ritt Attorney at Law, Michael Best & Friedrich
James W. Romlein Managing Director, MVLabs, LLC
Bennett Schliesman Director, Kenosha County Emergency Management/Homeland Security
Paul R. Schumacher Program Manager, TriCounty Business Partnerships
Dale R. Shaver Director, Waukesha County Department of Parks and Land Use
Michael Ulicki Vice President and Chief Technology Officer, Norlight Telecommunications
Darryl Winston Director of Data Services, City of Milwaukee Police Department
Gustav W. Wirth, Jr. SEWRPC Commissioner

PROSPECTUS

On December 4, 2002 the Commission authorized the preparation of a Prospectus for a Regional Telecommunications Planning Program. During the following year the Commission staff, under the guidance of a predecessor Advisory Committee, prepared a prospectus for a regional telecommunications planning program. This prospectus described in some detail the need for, and the major work elements of such a planning program. In December 2003, the Commission approved the initiation of a Regional telecommunications planning program based on this prospectus. The prospectus envisions the regional telecommunication plan to be comprised of two elements: a wireless antenna siting and related infrastructure plan; and an overall telecommunications network plan. In addition, a technical report presenting the findings of an inventory of the existing regional telecommunications system and system performance; and a memorandum report on public enterprise networks.

NEED FOR REGIONAL TELECOMMUNICATIONS PLANNING

Based upon a careful examination of the historical background and of the current state of telecommunications facilities and services within the Region, the Advisory Committee that guided the preparation of the afore-referenced Prospectus concluded that seven factors contribute to the need for the conduct of a regional telecommunications planning program and the preparation of a regional telecommunications plan for

Southeastern Wisconsin. These factors are:

1. The lack of comprehensive information on the state of telecommunications facilities and services within the Region readily available to county and municipal officials, business men and industrialists, and concerned citizens.

In past years, comprehensive information on the Regional telecommunications infrastructure was available from the Public Service Commission of Wisconsin (PSC). The PSC no longer has any jurisdiction over the growth areas of the telecom infrastructure, i.e. the packet-switched wireline network and all wireless networks. Without such information, public planning of any kind is not possible.

Quality of service information on telecommunication services within the Region is also lacking. Many users of data services are often unaware of the degraded nature of transmission rates provided in some parts of the Region. Remedies for the correction of service deficiencies often take extended time periods with increasing subscriber frustration. At the same time, information on levels of service is rarely publicized. A regional network monitoring system could assist significantly in identifying network deficiencies as well as publicizing service quality levels throughout the Region.

2. The increasing need for advanced telecommunication facilities and services to support the economic development of the Region.

Currently, primary economic competitors of the Region include countries of East Asia—South Korea, Japan and increasingly China. Manufacturing jobs especially are moving from Southeastern Wisconsin to East Asia. East Asia is reported to be ahead of the United States and the Region in broadband telecommunications services—both in terms of transmission speeds and in lower costs of these services. A regional telecommunications plan would assist Southeastern Wisconsin in recovering and maintaining its competitive position in the global economy by identifying the telecommunications infrastructure required to prosper in the current economic environment.

3. The need to address the universal provision of adequate broadband telecommunication services within the Region.

A long term public approach to planning for the universal provision of broadband services within the Region is needed. Such an approach requires the evaluation of alternative network configurations and technologies to ascertain what is in the best socioeconomic interests of the people of Southeastern Wisconsin.

4. The need to address differences in the provision of adequate telecommunication services in rural and other underserved areas of the Region.

The governor in 2003 called for the provision of universal broadband communication services to all areas of Wisconsin as part of a needed economic development program. Creative network design innovations are required to make such universal coverage cost-effective in rural and disadvantaged areas in a more effective manner. Such innovations can be evaluated as part of a regional telecommunications planning process.

5. The need to develop special purpose public telecommunication networks within the Region for applications such as telemedicine, public safety, transportation, environmental monitoring, and education.

Some of the greatest benefits of advanced telecommunications technology can result from the development of special public networks in areas such as emergency telemedicine, home health care telemedicine, air and water pollution monitoring, transportation system management, and education.

Many of these public network applications are regional in scope and planning for such would be enhanced by a regional telecommunication planning program.

6. The need to assist local units of government in telecommunication network development.

Wisconsin municipalities have authority to provide telecommunications services, and court decisions have upheld this authority. Over 25 municipalities have been certified by the Wisconsin Public Service Commission to provide competitive telecommunications services. The Village of Jackson, within the Southeastern Wisconsin Region, is creating a broad-band telecommunication utility to provide telecommunication facilities and services within the Village. Municipalities choosing this route could significantly benefit from planning assistance at the regional level. All municipalities within the Region will, however, require planning assistance with respect to telecommunication issues, particularly as related to future wireless and broadband communications services. In this respect, it should be noted that Section 66.0295(2)(d) of the *Wisconsin Statutes* requires that local comprehensive plans specifically address telecommunications facilities as an integral part of the utilities and community facilities element of such plans.

7. The need to develop a well-conceived antenna siting and related infrastructure plan for wireless communications in the Region.

The emerging major role of all forms of mobile and fixed wireless communications in future broadband services highlights the importance of a regional antenna siting and related infrastructure planning effort. Particularly important will be consideration of new radio and free space optical bands beyond VHF and UHF (3GHz) in the SHF (Super High Frequency), EHF (Extremely High Frequency) and near infrared—free space optical—regions. These higher frequency bands are synonymous with broadband capability and offer a potentially powerful and low cost alternative for the local loop—a potential key to resolution of the “last mile” connection problem. The antenna siting plan would also provide the structure for orderly expansion of wireless communications services in the Region.

While long-term trends emphasize the move to higher frequencies for broadband capability, short-term considerations for interoperable communications in public safety agencies (police, fire, and emergency medical services) restrict local governments to lower band spectrum for voice communications. For example, both 150 MHz and 800 MHz are popular public safety bands in Wisconsin. Until at least 3G based voice over internet protocol services are widely available, there is little choice but to remain at lower frequencies for interoperable public safety voice communications. Realistically, only the advent of public sector 4G networks will allow for a universal public safety transformation to broadband frequencies.

SEWRPC TECHNICAL STUDY DESIGN MEMORANDUM NO. 3

WIRELESS ANTENNA SITE AND RELATED INFRASTRUCTURE DESIGN

In 2004, a series of six technical study design memoranda were prepared to further define the content of the Regional Telecommunications Planning Program. One of these design memoranda, No. 3, described the system design sequence to be followed in the creation of the wireless infrastructure plan element. ~~Particular attention in the memorandum was focused on the optimization of antenna site locations within the Region with the objective of minimizing the number of antenna sites while providing full coverage and quality service throughout the Region.~~

Particular attention in the memorandum was focused on the optimization of antenna site location with the Region with the objective of encouraging co-location of antenna on supporting structures, and minimizing the number of single user antenna sites while providing full coverage of high quality service throughout the Region.

The memorandum described a mathematical programming model to be developed to assist in this process of antenna site location optimization.

PLAN DESIGN YEAR

The wireless antenna siting and related infrastructure plan for the Southeastern Wisconsin Region is to have a plan design year 2015. This design year was selected to correspond with a set of the new land use and transportation system plans being prepared for the Region, which plans are to have a design year 2035 with appropriate ten year stagings. The plan design year of 2015 was also selected to provide a long-range, as opposed to a short-range, basis for the planning effort. Because of the rapidly changing economic, technological, regulatory, and market conditions concerned, private sector telecommunications planning efforts tend to be relatively short range, a five year time horizon often being used. A longer time horizon – 10 years – was selected for the antenna siting and related infrastructure planning effort in order to permit the planning to reflect probable new technologies, including fourth generation (4G) wireless technology, and new versions of the Internet. The wireless antenna siting and related infrastructure plan is also staged to reflect the introduction of 3G technology, an anticipated evolutionary stage to the 4G end state technology of the plan.

SCHEME OF PRESENTATION

The findings and recommendations of the wireless antenna site and related infrastructure planning program are documented in this report. Following this introduction, Chapter II sets forth the principles and concepts underlying the wireless infrastructure plan and outlines the major steps in the planning process. Chapter III presents the objectives of the wireless planning program and the standards by which alternative plans will be judged. Chapter IV documents the ~~various infrastructure and demographic, economic~~ land use ~~and transportation system inventory findings – the background conditions for the antenna siting plan.~~ Chapter V documents the findings of the wireless telecommunication infrastructure inventory ~~inventories~~ required ~~in the wireless telecommunications~~ for the planning ~~process~~ effort. This chapter will also describe the network monitoring system being established to collect performance data on the regional wireless networks over time. In Chapter ~~V~~ VI, aggregate and spatial forecasts of demand for wireless telecommunications services will be presented with spatial demands based on future land use forecasts and plans. The end products of these forecasts use areal call generation data by land use and unit density. A modal split between wireless and wireline traffic will also be estimated and applied to telecom demand. Two forms of plan design will be presented in Chapter ~~VI~~ VII – one for second/third (2G, 3G) generation wireless and one for fourth generation (4G) wireless. The 2G/3G plan will be a forecast/plan with projection of existing trends linked with a rational antenna siting plan. The 4G plan will be a true futures plan moving beyond current infrastructures and trends to a vision of wireless communications in years 2010 and beyond. The Chapter VIII concludes with a summary of the ~~wireless communications planning report~~ findings and recommendations of the antennae siting and related infrastructure planning effort.

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Appendix 2

SEWRPC PLANNING REPORT NO. 51

**CHAPTER II,
BASIC PRINCIPLES AND CONCEPTS**

PRELIMINARY DRAFT

**SEWRPC Planning Report No. 51,
A WIRELESS ANTENNA SITING AND RELATED INFRASTRUCTURE PLAN
FOR SOUTHEASTERN WISCONSIN**

Chapter II

BASIC PRINCIPLES AND CONCEPTS

INTRODUCTION

In the preparation of a regional wireless antenna siting and infrastructure plan, the Regional Planning Commission followed a systematic planning approach that combined traditional regional planning procedures with well established radio frequency system engineering procedures. This chapter describes the approach followed by the Commission in preparing the wireless antenna siting and infrastructure plan. More specifically, the chapter details the major elements of the wireless network planning process and how radio frequency system engineering was integrated into the regional planning process. Definitions are provided for the various wireless technologies, both fixed and mobile, together with the descriptive parameters that characterize the applications of these technologies.

BASIC PRINCIPLES UNDERLYING THE REGIONAL PLANNING PROCESS

The planning process applied in the regional telecommunications planning effort is based on four basic principles. These are:

1. Telecommunications planning must be regional in scope. The need for and demand in telecommunication services develops over the entire urban region without regard to corporate limit lines. Thus, telecommunications planning cannot be accomplished successfully within the confines of a single municipality or a single county if that municipality or county is a part of a larger urban complex. The regional telecommunications system, which is comprised of wireless and wireline facilities and attendant services, must form ~~a single integrated~~ *an interoperable* system over the entire region, a system which can adequately serve the developing telecommunication needs of the developing region.
2. Telecommunications planning must be conducted concurrently with and cannot be separated from land use planning. The land use pattern determines the amount and spatial distribution of the need

and demand for telecommunication services; and for wireless communications, local use development has a major impact on radio propagation patterns.

3. Telecommunications planning must be comprehensive, considering in an integrated manner access, distribution and core networks using various wireless and wireline technologies for multiple service applications and media.
4. ~~Telecommunication networks should be hierarchical in structure, grouping users into cellular units that permit local traffic to remain local.~~ *Private sector companies are significant providers of telecommunications services within the Region. These private sector companies independently prepare plans for the development of their networks; independently develop their own levels of service; and independently provide competitive services. Meaningful public telecommunication planning effort must recognize the existence of these private sector planning efforts; and pursue the public planning effort in close cooperation with the private providers, actively involving these providers in the public planning process.*

PLANNING PROCESS

The planning process used consisted of the following sequential work elements:

1. Formulation of Objectives and Standards

A set of wireless telecommunications facility and service objectives and standards were formulated. These objectives and standards emphasize the provision of areawide, low-cost, fixed and mobile broadband telecommunications facilities and services. The objectives are supported by a set of standards that provide quantifiable measures of availability, response time, throughput, and accuracy, the parameters that define the performance of a communications system that will meet the agreed upon objectives.
2. Conduct of Facilities and Services Inventory

A sound planning process must be based upon factual data about the existing state of the system being planned. Such data are provided by an inventory function that for the wireless antenna siting and infrastructure planning process includes the collation and collection of definitive information on the location of existing antenna sites and related infrastructure and on the technical specifications of the attendant antennas and supporting structures. The inventory data are then used as inputs to radio propagation models that determine the capacity and coverage of the existing sites located throughout

the Region. A second dimension to the inventory relates to network performance. A network monitoring system has been established at the Commission offices that provides a means for measuring the quality of the existing wireless network services. A central server computer located at the Commission offices scans remote site transceivers -- cell phones -- located at various changing locations throughout the Region. The data collected from these scans is used to compile [definitive](#) data on the quality of service within the Region.

In order to be comprehensive, the inventory, in addition to modeling antenna sites providing commercial service, also includes antenna sites that provide public support services. This class of sites, which includes paging and microwave point-to-point link antenna sites, also may have resource value as future co-location sites for advanced wireless communications systems.

3. Analyses and Forecasts

Spatial forecasts of potential subscribers and the attendant call generation characteristics are based upon the year 2000 existing land use inventory and future land use plans prepared and maintained by the Commission. The basic areal unit of analysis is the U.S. Public Land Survey section, and approximately one square mile area.

4. Plan Design

Plan designs are generated based on selected technologies and available antenna sites. The technologies determine the range and performance characteristics of communications from each antenna site. The aggregate collection of antenna sites and their composite coverage, capacity and quality of service determine the overall performance of the system. Two types of plan design are contemplated in the current program. The first will be a rationalization and optimization of current trends in wireless second (2G) and third (3G) generation communications technologies and services. The second, will represent a completely new -- beyond 3G -- wireless network configuration that will reach beyond currently deployed capabilities and trends based on those capabilities to provide a system with the enhanced performance necessary to support the economic development and quality of life challenges of the coming decade as defined by the objectives and standards.

5. Plan Test and Evaluation

A number of means exist for plan test and evaluation. The most commonly used is system simulation in which a dynamic model of the network is used to simulate the performance of the existing system - - or of alternative planned systems -- on a computer. Such simulation can take place at varying levels of detail from high level evaluations of system capacity based on statistical estimates of subscriber

usage, to detailed investigations of network packet transmissions. Interest at the regional system planning level emphasizes models that view a network as a service provider. The objective of a modeling effort is to determine the system coverage and capacity and the level of service possible at various traffic loadings.

Small-scale experimental verifications of wireless network plans are also possible. Such experiment may be necessary to validate some assumptions made in simulation modeling.

6. Plan Selection And Implementation

Following public informational meetings and hearings on alternative wireless network plans, one of the alternative plans, or some composite version of these plans, will be adopted to help guide the short and long-range development of the regional telecommunications infrastructure within Southeastern Wisconsin. In presenting the alternative plans for public informational meetings and hearings, strong emphasis will be placed on the performance standards characterizing each alternative plan and how these standards relate to the capital investment and operating costs implicit in implementing each plan. Since one of the alternative plans will always represent a no-plan projection of current trends, these performance standards data will play a critical role in plan selection and adoption.

INVOLVED TECHNOLOGIES

Although the above description of the planning process delineates the basic work elements of regional telecommunications planning, it does not define the various technologies and provider networks that will establish the scope of the planning program. This section describes these technologies and networks as well as the frequency bands involved in wireless planning in Southeastern Wisconsin.

Mobile Wireless Networks

The major antenna site users -- owners or renters -- in Southeastern Wisconsin are the mobile cellular/Personal Communication System (PCS) service providers such as Cingular, Nextel, Sprint and Verizon. Based on the Federal Communications Commission (FCC) database, there are 376 antenna sites serving 393 cellular/PCS antennas in the Region. These sites are a resource not only for their present applications in second generation (2G, 2.5G) networks, but also as a resource for co-location of 3G and 4G networks.

The emphasis for wireless 2G, 2.5G and 3G infrastructure planning will be on a rational set of antenna sites that will provide adequate coverage, capacity, and quality of service for the Region *as such coverage, capacity and quality of service are defined by objectives and standards set forth in this report*. Second generation networks are

already in place. Planning issues will relate mostly to coverage and quality of service. Third generation networks are just coming on the scene in Southeastern Wisconsin. Primary planning decisions here relate to planned coverage of the various service providers and their selection of antenna sites.

Fourth generation (4G) wireless infrastructure planning will proceed with significantly different objectives and procedures. The primary objective of the 4G plan is to present an imaginative, big broadband (20-100 megabits/second) fixed and mobile wireless plan for the Region that provides universal, region-wide coverage at affordable costs to all citizens of the Region. Current mobile cellular networks operate in the 800-900 MHz frequency bands. PCS networks utilize the 1900 MHz band. Although 3G networks will continue to operate in these same bands, 4G systems will move to higher frequencies such as the 5.2-5.9 GHz range.

Fixed Wireless Networks

Fixed wireless networks in the Region are currently small in size as compared to their mobile cellular/PCS counterparts. They are, however, expected to expand rapidly in the next few years, particularly with the advent of WiMAX technology. Most fixed wireless systems are now managed by Internet Service Providers (ISPs). Because they operate in higher frequency ranges (2.4 GHz or 5.7 GHz), their radius of coverage is limited to about 3 miles from each base station. Since they serve subscribers at fixed locations, there is no need to provide wide coverage, but instead they locate in areas with higher population densities to enhance their revenue potential. Most fixed wireless operators deploy proprietary systems such as the Motorola Canopy System. They tend to serve local areas mostly within a single county. In the future, however, it is expected that larger scale fixed wireless networks will be deployed by larger service providers offering a region-wide broadband service alternative. The advent of WiMAX (IEEE 802.16) technology is expected to lead to a merger of fixed and mobile communications networks all based on Internet operation. Although wireless communications networks, fixed and mobile, are now generally confined to frequencies below 6 GHz, future systems, particularly mesh network systems, are expected to employ higher frequencies up to and including the 60 GHz band because of the faster transmission rates possible at these frequencies. Although shorter in range coverage and subject to strong atmospheric alternation, these frequency bands will play a role in multihop mesh network configurations. In some deployments, even free space near infrared optical links can expand performance capabilities.

SUMMARY

Regional planning for wireless antenna siting and related infrastructure development combines traditional planning procedures with the methodology of radio frequency systems engineering. A six-step process is followed: beginning with the formulation of objectives and standards, and a determination of the current state of the system in terms of both infrastructure and performance. These two initial steps are followed by the preparation of forecasts of probable future demand for services which establishes the requirements for network coverage and capacity. Alternative plans meeting these requirements are then prepared, tested, and evaluated. The plan test involves computer simulation modeling that permits the evaluation of each alternative plan in terms of ability to meet the objectives and standards. The best plan is then selected for adoption and implementation. Implementation takes place in the form of guidance to private wireless service providers and regulatory agencies concerned; or directly through public sector applications. The regional wireless antenna siting planning process encompasses both fixed and mobile wireless in both their present second (2G) and (3G) generations and fourth generation (4G) technology that merges fixed and wireless telecommunication into one Internet based infrastructure.

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PRELIMINARY DRAFT

**SEWRPC Planning Report No. 51,
A WIRELESS ANTENNA SITING AND RELATED INFRASTRUCTURE PLAN
FOR SOUTHEASTERN WISCONSIN**

Chapter III

OBJECTIVES AND STANDARDS

INTRODUCTION

Planning is a rational process for formulating and meeting objectives. Therefore, the formulation of objectives is an essential task which must be undertaken before a comprehensive plan can be prepared and evaluated. Objectives guide the preparation of plans and, when converted to specific measures of plan effectiveness, termed standards, provide the structure for evaluating how well the plan meets planning objectives. Because planning objectives provide this basis for plan preparation and evaluation, the formulation of objectives is a particularly important step in the planning process.

Accordingly, a set of recommended objectives with supporting principles and standards was formulated as a part of the wireless antenna study and related infrastructure planning effort. The associated standards perform an important function in plan design since they provide the basis for relating the objectives to alternative plan configurations.

It is important to note that the objectives, principles, and standards presented herein are intended to serve as a basis for determining desired alternative and recommended wireless antenna and related infrastructure. The standards, particularly, must be applied with judgment in the more detailed public and private planning and engineering studies which will be needed during plan implementation. The objectives, principles, and standards formulated herein relate only to the wireless portion of the comprehensive regional telecommunications plan to be prepared by the Regional Planning Commission. The comprehensive plan will include both wireless and wireline elements relating to core as well as access networks. Despite these differences in focus, the objectives, principles and standards presented herein will also apply to the comprehensive plan. Additional objectives, principles, and standards may be expected, however, to apply to the wireline and core networks of the comprehensive plan.

It is also important to note that the objectives, principles, and standards presented herein were formulated within the context of other objectives, principles, and standards previously adopted by the Regional Planning Commission. These other objectives, principles, and standards relate to socio-economic, land use, transportation, and sewerage system development within the Region and to environmental protection and enhancement. As such, the telecommunications system development objectives, principles, and standards are intended to support these other regional development objectives, principles, and standards.

DEFINITIONS

The terms “objective,” “principle,” “standard,” “plan,” “policy,” and “program” are subject to a range of interpretations. To clarify their meanings, the Regional Planning Commission has defined these terms as they are used within the context of this planning process as follows:

1. Objective: A goal or end toward the attainment of which plans and policies are directed.
2. Principle: A fundamental, generally accepted tenet used to support objectives and prepare standards and plans.
3. Standard: A criterion used as a basis of comparison to determine the adequacy of plan proposals to attain objectives.
4. Plan: A design which seeks to achieve agreed-upon objectives.
5. Policy: A rule or course of action used to ensure plan implementation.
6. Program: A coordinated series of policies and actions to carry out a plan.

Although this chapter deals with only the first four of these terms, an understanding of their interrelationship and the concepts they represent is essential to the following discussion of objectives, principles, and standards.

To be useful in planning, objectives must be logical and clearly stated. The consideration of objectives for plan design and evaluation is facilitated by complementing each objective with one or more quantifiable standards. These standards are, in turn, directly related to a planning principle which supports the objective. The objectives relate primarily to the provision of universal wireless broadband telecommunications services within the Region, and to the desired performance of the system, its availability, and the overall quality of service. Each objective, together with its supporting principle and standards, is given in the following section. *The following objectives, principles, and standards are intended to be used in the formulation and evaluation of alternate design year 2015 regional wireless antenna siting and related infrastructure plans and in the preparation of a recommended plan.*

Given the important role of the private sector in providing telecommunications facilities and services within the Region, and given the concern of these providers about the continued freedom to operate independently in a

competitive market, it is important to note that the following objectives, principles, and standards are not intended to have any regulatory implications, but are intended for use solely in plan preparation and evaluation.

OBJECTIVES, PRINCIPLES AND STANDARDS

OBJECTIVE NO. 1 – BROADBAND WIRELESS COMMUNICATIONS PERFORMANCE

A level of broadband wireless communications performance that is competitive in a global economy and supports cost effective enhancements of public sector services.

PRINCIPLE

High quality telecommunication services are vital to the expeditious conduct of national and international business and industrial transactions, and to prompt responses to emergencies. To be competitive in a global economy, the Region requires advanced, low cost broadband telecommunications services, some of which can be provided by wireless telecommunications technology. The services should have a level of availability and continuity which facilitate business and industrial transactions, but which also ensure prompt responses to emergencies.

STANDARDS

- Broadband wireless services should provide a transmission rate in the range of 20 to 200 megabits per second.¹
- Broadband wireless communication networks should be available 99.9 percent of the time.²
- Wireless voice service should be provided at a minimum MOS Standard Value of 4.0.³
- Wireless data and video service should be provided at a maximum Uncorrected Bit Error Rate of 15 bits per million bits transmitted.⁴
- Wireless data and video service shall be provided at a maximum packet loss of 10 percent.⁵

¹ The generally accepted range for both IEEE 802.16a,d and 4G wireless networks is 20 to 100 megabits per second. The high end target value was raised to meet the needs of high definition television on demand.

² While wireline telephone service has a general availability standard of 99.999 percent (equivalent to a total of 3 minutes down time per year), wireless service availability has not yet reached this level. The standard of 99.9 percent (equivalent to a total of 8.6 hours of down time per year) is believed to represent an achievable goal by the plan target year 2015.

³ Mean Opinion Score, (MOS) was originally defined based upon a subjective evaluation of voice quality by a group of listeners. It is now objectively defined as an ITU-T P.800 specification, and is determined from a standard formula based upon signal to noise ratio (SNR), line delays, and other factors. The value ranges from 1.0 to 5.0, corresponding to lowest and highest levels of voice quality satisfaction.

⁴ This error rate was based on the low end of current wireless communications experience.

⁵ This packet loss percentage was based on the low end of current wireless communications experience.

OBJECTIVE NO. 2 – UNIVERSAL WIRELESS BROADBAND TELECOMMUNICATIONS SERVICES

The provision of broadband wireless telecommunication services to all geographic areas ~~and all of the residences, businesses, industries, and organizations~~ of the Region.

PRINCIPLE

Residents and organizations of the Region, regardless of geographic location, ~~or economic status~~, should be offered an equal ~~opportunity through telecommunications to advance economically and achieve as high a standard of living as possible.~~ *access to broadband telecommunications services in order to promote the social and economic welfare of the Region.*

STANDARD

- Broadband wireless network coverage should be provided in all geographic areas of the Region and should be available to all ~~households at a maximum cost of \$60 per month.~~⁶ *residences, businesses, industries, and organizations of the Region.*

OBJECTIVE NO. 3 – REDUNDANCY

The provision of alternative transmission paths through the *individual providers* telecommunication networks so as to minimize network congestion, reduce susceptibility to radio interference, and provide high immunity to catastrophic failure.

PRINCIPLE

Robust and reliable networks are required in a communications dependent economy and society and in emergency situations.

STANDARD

- Redundancy is measured based on the average number of alternative transmission paths between users in a network. Desirably, the ratio of the average number of alternative transmission paths to the total number of links in the network should be at least 20 percent.⁷

OBJECTIVE NO. 4 – ANTENNA SITE NUMBER ~~MINIMIZATION~~ OPTIMIZATION

The number of wireless antenna site locations within the Region should be ~~minimized~~ *optimized*.

⁶ ~~The \$60 per month maximum charge for comprehensive voice, data, and video services is based on an assumed minimum possible monthly charge. This charge amount will have to be adjusted periodically to reflect general price inflationary or deflationary trends. This charge would represent about four percent of the gross monthly income of a household of four earning \$18,850 per year, the poverty threshold as defined by the U.S. Bureau of Census.~~

⁷ This standard value was based on partial mesh paths in a full mesh topology where the number of links $L=N(N-1)/2$; and N=number of nodes in network

PRINCIPLE

~~Minimization of the number of antenna sites within a planning area is consistent with both minimization of infrastructure investment cost and with promotion of environmental and aesthetic quality.~~ *Optimization of the number of antenna sites within a planning area is consistent with minimization of infrastructure investment costs, with the provision of redundancy in the service of each individual provider, and with promotion of environmental protection and the pursuit of a high aesthetic quality in the land and cityscape.*

STANDARD

- The number of antenna sites should be the smallest number that provide universal coverage and quality of service within the Region.

OBJECTIVE NO. 5 – SERVE MOST DEMANDING APPLICATION

Telecommunications systems should be designed to serve the most demanding expected system application, thereby permitting all applications to be accommodated.

PRINCIPLE

The planned telecommunication system should not preclude needed applications of the system.

STANDARD

- The planned network bandwidth should be the broadest possible with projected technologies within the planning period; approximately 200 megabits per second.

OBJECTIVE NO. 6 – NETWORK INFRASTRUCTURE COST MINIMIZATION

~~A telecommunication system which is~~ *Achieve the provision of wireless telecommunication networks which are both economical and efficient, meeting all other objectives at the lowest cost possible.*

PRINCIPLE

Minimization of capital and operating costs conserves limited public and private capital resources. Any undue investment in telecommunication facilities and services must occur at the expense of other public and private investment; therefore, total telecommunication costs should be minimized for the desired level of service.

STANDARD

- The sum total of telecommunication system capital investment and operating costs should be minimized.

- Full use should be made of existing facilities and such facilities should be supplemented only with additional major facilities as necessary to serve the anticipated demand for the desired level of services.

OBJECTIVE NO. 7 – ANTENNA SITE AESTHETICS AND SAFETY

A high aesthetic quality and safe design in the telecommunication antennae and supporting structures and equipment with proper visual relation to land and cityscape.

PRINCIPLE

Beauty and safety in the physical environment are conducive to the physical health and well-being of people; and as major features of the land and cityscape, telecommunication facilities have an important impact on the aesthetic quality of the total environment. *In order to ensure public safety, careful attention must always be given to structural design principles and practices, including careful conformance to existing regulatory codes.*

STANDARDS

- Telecommunication facilities should be located to avoid the destruction of visually pleasing buildings, structures, and natural features, and to avoid interference with visitors to such features.
- Co-location on existing antenna sites is preferred over new antenna *support structure* deployment.
- Antenna locations on existing buildings, ~~elevated water storage tanks or other structures is~~ *or other existing structures are* preferred over new antenna tower construction.
- ~~Antenna tower construction should emphasize solid forms over lattice structures and avoid the use of supporting guy wires.~~
- ~~Antenna heights should be minimized consistent with network coverage requirements.~~
- Antenna structures should be designed, constructed and maintained to insure a safe environment.
- *Antenna heights should be minimized consistent, however, with maximizing the potential for antenna co-location, and with providing a potential for height extension and capacity expansion.*

OBJECTIVE NO. 8 - PREFERENCE FOR USE IN PUBLIC SAFETY EMERGENCIES

A broadband wireless communication network that assures capacity for, and provides preference to police, fire, emergency medical, and homeland security agencies for use in times of public emergencies.

PRINCIPLE:

The potential for interagency communication by police, fire, emergency medical, and homeland security agencies in times of public emergencies -- such as national disasters including flooding and wind, snow and sleet storms, and freezing rain, and in times of culturally related disasters such as fire, explosions, nuclear electric power generation plant failures, and terrorist attack, must be protected and preserved.

STANDARD:

Public safety related multi-media traffic should be assigned the highest priority based on network port designation and assignment.

UNIVERSAL BROADBAND SERVICE AND AFFORDABILITY

The Commission Advisory Committee recognizes the need to define universal broadband telecommunications service in terms of affordability as well as geographic coverage. The Committee could not, however, agree on the proportion of gross monthly household income which should as a maximum be allocated to broadband telecommunication service; noting that a range from \$60 to \$125 a month would constitute from four to eight percent of the gross monthly income of a household of four earning \$18,850 per year, the poverty threshold as currently defined by the U.S. Bureau of Census. Given the number of private providers offering service within the Region; and the range of applications deemed essential for upward economic mobility, the attainment of a desired percentage of income allocated to telecommunication services might require public subsidy. The Committee concluded that the issue of affordability needs to be addressed by the Congress and the President at the national level and that adoption of an affordability standard by the Commission should await national action.

APPLICATION – SPECIFIC REQUIREMENTS

The wireless communications performance standard of 20 to 200 megabits per second specified above is ultimately justified based on network applications. The term broadband is often confusing to many as a measure of data transmission rate since it is measured in Hertz (cycles per second). Data transfer rate, however, is measured in bits per second or more typically in megabits (millions of bits) per second. The term broadband derives from the radio frequency spectral bandwidth licensed to a particular service provider or unlicensed to the general public. This bandwidth is measured in Hertz or in the broadband range megahertz (millions of cycles per second) or gigahertz (billions of cycles per second). High data transfer rates require wide or broad band widths. The ratio of data transfer rate to bandwidth expressed in percentage is spectral efficiency. With 100 percent spectral efficiency, 100 megahertz of bandwidth allows for a data transfer rate of 100 megabits per second.

Wide bandwidths and fast data transfer rates are important only as they relate to applications. DSL and cable broadband are often sold to consumers based on faster downloads of Web pages many of which contain images and video. The objectives and standards for this wireless infrastructure plan must also consider other potential public sector and private sector applications that create the need for broadband telecommunication networks.

The dominant underlying media in all advanced broadband applications is video. A quick summary of the bandwidth requirements of the three predominant media reveals the sharp differences in media bandwidth requirements:

1. Voice – 64 kilobits per second
2. Data – 1 megabit per second
3. Video – 5 to 200 megabits per second

Even though many applications require a mix of media to be effective, video bandwidth needs are so much larger that they predominate in multimedia bandwidth specifications. Video bandwidth requirements are a function of: format resolution, frame rate, modulation methods, and compression technology.

For one form of video communications, video conferencing, a range of bandwidth requirements based on international standard H.393 are:

1. VCR Quality Resolution: 352 x 288 pixels – 3.8 megabits per second
2. TV Quality Resolution: 740 x 480 pixels – 13.4 megabits per second

Video teleconferencing plays a key role in many public and private applications of broadband including areas such as telecommuting, home healthcare, and distance learning. It, therefore, represents a key capability in terms of broadband performance. It may, in fact, be the primary application for public sector, business and professional uses of the system.

In the consumer domain, television in both its standard and high definition formats is the equivalent driving force for major broadband capabilities. To accommodate 10 channels of high definition digital television on demand a network with a bandwidth of about 193 megabits per second will be required. Such an Internet based capacity would allow potential users to purchase televised entertainment services from any content provider serving the Internet.

These two primary examples are given to illustrate the need for a “big broadband” communications capability. It is not possible, or appropriate, to review all potential broadband applications. To indicate the future scope of broadband communications, however, a display of a number of applications and the attendant bandwidth needs are shown in Figure 2.

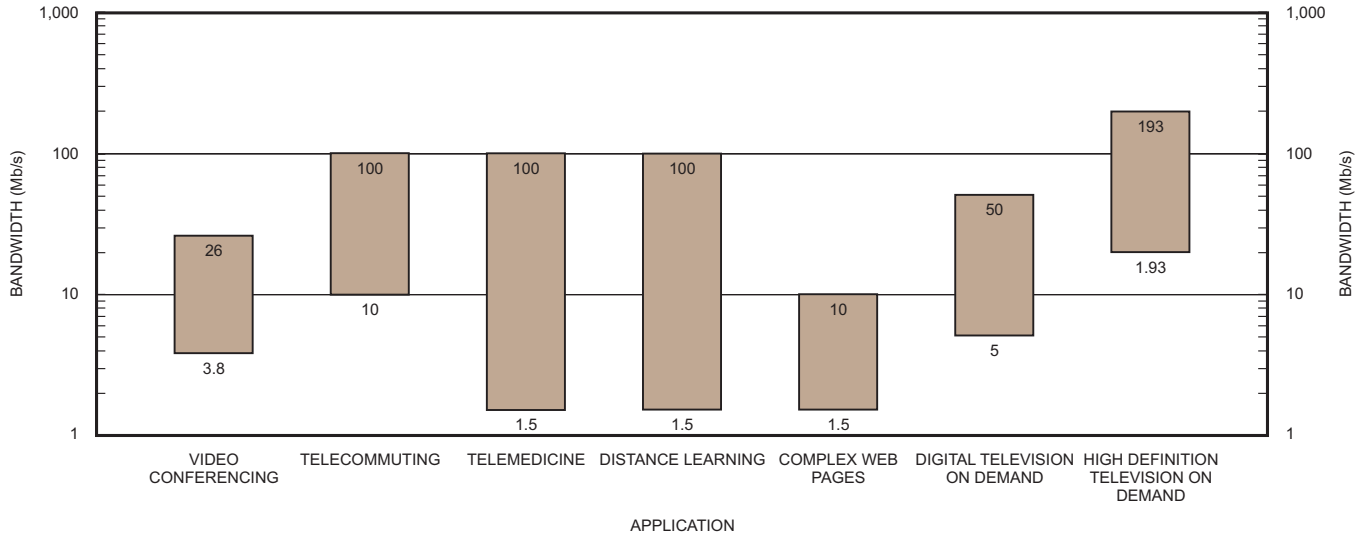
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Figure 2

APPLICATIONS SPEED MATRIX



Source: SEWRPC.