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GROUND WAVE EMERGENCY NETWORK
FINAL OPERATIONAL CAPABILITY

ENVIRONMENTAL ASSESSMENT
FOR
NORTH CENTRAL WISCONSIN RELAY NODE
SITE NO. RN 8C936WI

26 February 1993

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PREFERRED GWEN SITE REPORT NORTH CENTRAL WISCONSIN

The U.S. Air Force is proposing to construct a relay node for the Ground Wave Emergency Network (GWEN) in north central Wisconsin. The Air Force has followed the siting process described in Section 5 of the Final Environmental Impact Statement (FEIS) for the Final Operational Capability (FOC) phase of the GWEN program to identify alternative Candidate GWEN Sites (CGSs). The six CGSs identified in north central Wisconsin are referred to as the Crass, Steen, Gebauer, Schubert, Kasperek, and Miller sites. Subsequent to the field investigation and site specific studies, the owners of the Gebauer, Schubert, Kasperek, and Miller sites withdrew their land from further consideration. However, the Air Force has made the decision to evaluate and publish the data already gathered on these sites as well as the other two sites.

This report summarizes the process of selecting the preferred site from the six CGSs. This PGSR, along with a site-specific Environmental Assessment (EA) and Finding of No Significant Impact (FONSI), is also being distributed for information and comment in compliance with the Air Force's process of Interagency and Intergovernmental Coordination for Environmental Planning (IICEP).

Operational, environmental, and developmental suitability; construction and real estate acquisition costs; and public comments and concerns are all factors which have been considered in arriving at the selection of the preferred sites.

Without an **operationally suitable** location, connectivity of the relay node in north central Wisconsin to the GWEN network cannot be achieved. Ground conductivity measurements are acceptable at all six CGSs. During the site-specific studies, no radio frequency interference was detected in the GWEN frequency bands which would interfere with the operation of the GWEN receiver. Also, operations at any of the sites would pose no interference with other known systems. Therefore, all six CGSs are operationally suitable.

The next major factor considered in the selection of the preferred site was **environmental suitability**. The environmental suitability of each CGS was determined from information provided by an independent field analysis and is documented in the EA. The EA for the six CGSs was completed on in February 1993. The environmental analysis found that construction of a GWEN relay node at the Gebauer site could have potential significant visual impact to historic properties. Construction on the Miller site could create potential significant impact to wetlands. However, no significant environmental impact would occur at the Crass, Steen, Schubert, and Kasperek sites as a result of installation. A FONSI for these four sites was completed on 15 March 1993. Thus, four of the six CGSs are environmentally suitable, but none of these four are environmentally favored over the others.

All six CGSs are suitable for development as a GWEN relay node. The FAA has approved construction of the GWEN relay node at any of the six CGSs. Construction cost is also a consideration in the selection of the preferred site. Construction costs for all of the sites are nearly equivalent and are, therefore, not a major factor in the selection of a preferred GWEN site. Thus of the six operationally, environmentally, and developmentally suitable sites, no site is favored for lower construction costs.

Real estate negotiations have been completed for the purchase of the Crass site or the lease of the Steen site. The owners of the Gebauer, Schubert, Kasperek, and

Miller sites announced their desire to be withdrawn from consideration before negotiations and, therefore, a negotiated amount for either lease or purchase could not be reached. Of the two sites for which negotiations have been completed, the negotiations for the purchase of the Crass site is slightly more favorable.

With operational, environmental, and developmental factors evaluated and acquisition and construction costs considered, the Air Force prefers the Crass site. The Crass site is preferred because it is operationally, environmentally, and developmentally suitable and is the least expensive site to develop.

I have therefore selected the Crass site as the Air Force's preferred site for development as the GWEN relay node in north central Wisconsin. After reviewing the information received during the ICEP process, I will direct the final land acquisition activities and construction of the GWEN relay node.


STEPHEN T. MARTIN, LT COL, USAF
Program Manager, GWEN

17 MAR 1993

(Date)

FINDING OF NO SIGNIFICANT IMPACT

NAME OF ACTION: GROUND WAVE EMERGENCY NETWORK
NORTH CENTRAL WISCONSIN RELAY NODE

DESCRIPTION OF PROPOSED ACTION ALTERNATIVES:

The U.S. Air Force plans to construct a radio communications relay node in north central Wisconsin (Taylor County) as part of the Ground Wave Emergency Network (GWEN) communications system. Six action alternatives associated with six candidate GWEN sites (CGSs) in north central Wisconsin and the no action alternative have been considered and evaluated in an environmental assessment (EA).

GWEN is a radio communications system designed to relay emergency messages between strategic military areas in the continental United States. The system is immune to the effects of high-altitude electromagnetic pulse (HEMP) energy surges caused by nuclear detonations in the ionosphere that would disrupt conventional communications equipment. A failure of such equipment would prevent timely communications among top military and civilian leaders and strategic Air Force locations and prevent U.S. assessment and retaliation during an attack. GWEN is an essential part of a defense modernization program to upgrade and improve our nation's communications system, thereby strengthening deterrence.

The GWEN system is a network of relay nodes, receive-only stations, and input/output stations. The relay node in north central Wisconsin would be part of the Final Operational Capability (FOC) phase of the GWEN system and would establish essential links with adjacent nodes in the network.

In September 1987, the U.S. Air Force Electronic Systems Division, Hanscom Air Force Base, Massachusetts published a Final Environmental Impact Statement (FEIS) for the GWEN FOC that addressed the system as a whole and identified expected environmental effects common to all sites. Section 5 of the FEIS described a siting process that is designed to minimize the potential for environmental impacts. This process has three distinct phases: network definition, regional screening, and individual site evaluation. Network definition identified the need for a relay node in north central Wisconsin. Regional screening resulted in the identification of six CGSs in north central Wisconsin that met the exclusionary and evaluative criteria described in that FEIS. Individual site evaluation examined the relative suitability of the CGSs through site-specific technical studies. The EA is a part of the third phase and is tiered from that FEIS. It addresses the potential environmental effects of the six action alternatives and the no action alternative.

The proposed relay node in north central Wisconsin will be an unmanned facility located on approximately 11 acres of land and, once constructed, will resemble an AM radio broadcast station. The facility will consist of a 299-foot-tall, low-frequency (LF) transmitter tower, three equipment shelters, an access road, and associated fences. The tower will be supported by 24 guy wires, including 12 top-loading elements. An equipment shelter at the tower base will contain an antenna tuning unit. An 8-foot-high chain link fence topped with barbed wire will surround the tower base and associated equipment shelter. A radial ground plane, composed of 100, 0.128-inch-diameter copper wires buried about 12 inches underground, will extend out about 330 feet from the tower base. A 4-foot-high fence will be installed around the perimeter of the copper radials.

A second equipment area located at the site perimeter will contain two shelters housing a back-up power group (BUPG) with two internal fuel storage tanks and radio processing equipment. The BUPG will operate during power outages and for testing purposes. An LF receive antenna, consisting of a pair of 4-foot-diameter rings mounted on a 10-foot pole, and an ultrahigh-frequency (UHF) antenna, used for communicating with airborne input/output terminals and consisting of a 9-foot-high whip-like antenna mounted on a 30-foot-high pole, will also be located in this area. An 8-foot-high chain link fence topped with barbed wire will enclose the entire equipment area. A 10-foot-wide gravel road will connect this area to the tower base. A 12-foot-wide gravel road will provide access to the site from a public road.

The station will use existing commercial three-phase electric power and telephone service. Power and telephone service will be brought to the site through either overhead or buried lines, depending on local utility practices. In its ready status, the antenna will transmit in the LF radio band at 150 to 175 kilohertz for a total of 6 to 8 seconds per hour.

Four of the six action alternatives are discussed in this Finding of No Significant Impact (FONSI). Significant impacts on surface water or wetlands could occur at the Kasperek (CGS-17) and Miller (CGS-20) sites. For these reasons, they will not be considered in this FONSI.

ANTICIPATED ENVIRONMENTAL EFFECTS

The EA evaluated potential impacts to the physical, biological, and socio-cultural environment from construction and operation of the relay node.

The project would have no significant impacts on physical resources. Erosion and increased runoff would be minimized by using proper erosion control techniques during construction and by replanting the site afterwards. Impacts on mineral resources would be minor. Paleontological resources are not likely to occur on any of the sites; therefore significant impacts to them are not anticipated. No prime farmland would be removed from production. Water quality would not be significantly affected because increases in copper concentrations due to corrosion of the ground plane would be negligible. Air quality would not be significantly affected. During construction, temporary and insignificant increases in emissions would occur, and during operation, emissions from the BUPG would not be sufficient to result in violation of air quality standards.

The project would have no significant impacts on biological resources. The sites are located on cultivated fields or heavily grazed rangeland and do not contain sensitive wildlife habitat. None of the sites contains wetlands or is within a 100-year floodplain. Informal consultation with the U.S. Fish and Wildlife Service indicated that the project would not adversely affect any threatened or endangered species. The Wisconsin Department of Natural Resources indicated that no state-listed rare, threatened, or endangered species or unique biological communities are known to occur on any of the sites. Bird-tower collisions may occur but would not be significant because the tower would be located away from primary bird habitats and migration routes.

The project would have no significant impacts on socio-cultural resources. Construction would have a small, beneficial impact on the local economy, in part by providing temporary employment for contractors and construction workers. Community support systems would not be significantly affected. Land use and noise impacts would not be significant. The relay node signal would not interfere with commercial television or radio broadcasts, amateur radio operations, garage door openers, or pacemakers. Radio-frequency emissions outside the fenced area around the tower base would not pose a health hazard to humans or animals. The Wisconsin State Historical Society was consulted and has concurred that the project would not affect significant cultural resources. Significant impacts to Native American traditional, religious or sacred sites are not anticipated. A visual analysis conducted in accordance with the criteria developed in the FOC FEIS concluded that the relay node facility would not cause significant visual impacts.

CONCLUSIONS:

No significant impacts to the surrounding environment would be caused by construction and operation of the proposed relay node on the Crass (CGS-1), Steen (CGS-12), Gebauer (CGS-14) or Schubert (CGS-15) site. Therefore, an environmental impact statement for a GWEN relay node at the cited locations in north central Wisconsin is not required.



David O. Williams, Colonel, USAF

Chairman

HQ ESC Environmental Protection Committee

15 Mar 93

Date

GROUND WAVE EMERGENCY NETWORK
FINAL OPERATIONAL CAPABILITY

ENVIRONMENTAL ASSESSMENT
FOR
NORTH CENTRAL WISCONSIN RELAY NODE
SITE NO. RN 8C936WI

26 February 1993

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SUMMARY

The Ground Wave Emergency Network (GWEN) is a radio communication system designed to relay emergency messages between strategic military areas in the continental United States. The system is immune to the effects of high-altitude electromagnetic pulse (HEMP) energy surges caused by nuclear bursts in the ionosphere that would disrupt conventional communications equipment such as telephones and shortwave radios. A failure of such equipment would prevent timely communications among top military and civilian leaders and strategic Air Force locations and prevent U.S. assessment and retaliation during an attack. GWEN is an essential part of a defense modernization program to upgrade and improve our nation's communications system, thereby strengthening deterrence.

The GWEN system consists of a network of relay nodes, receive-only stations, and input/output stations. Each relay node, such as the one proposed in north central Wisconsin, consists of a guyed radio tower facility similar to those used by commercial AM broadcast transmitters.

A Final Environmental Impact Statement (FEIS) for the GWEN Final Operational Capability (FOC) was published in September 1987 by the Electronic Systems Division, Hanscom Air Force Base, Massachusetts. That FEIS addressed the GWEN system as a whole, identifying expected environmental effects common to all sites. Section 5, beginning on page 5-1 of the FEIS, describes a siting process that is designed to minimize the potential for environmental impacts. This process has three distinct phases: network definition, regional screening, and individual site evaluation.

Phase 1, network definition, identified the geographic coordinates that met the operational needs and technical constraints of the network. Each set of coordinates became the center of a circular site search area (SSA) with a 9-mile radius (250 square miles). The SSA discussed in this Environmental Assessment (EA) was centered in Taylor County, in north central Wisconsin, at latitude 45.25° N and longitude 90.29° W. The principal town in the SSA is Medford.

Phase 2, regional screening, involved the application of exclusionary and evaluative criteria to the SSA to avoid environmentally sensitive areas. The remaining areas, called potential areawide sites (PAWS), became the focus of the siting process. The field investigation for north central Wisconsin was conducted in June 1989. Twenty-five sites were identified during automobile based surveys as potential candidate GWEN sites (PCGSs). Attempts were made to contact the owners of the sites to determine their interest in selling or leasing land to the Government. Rights-of-entry were granted to allow the field team to fully investigate thirteen PCGSs. Following evaluation against the environmental criteria set forth in the FEIS, six of the thirteen PCGSs were recommended as candidate GWEN sites (CGSs) for further review. These CGSs were described in the Preliminary Site Evaluation Report (PSER) of October 5, 1989.

Subsequent to the PSER being issued, and some site-specific studies being accomplished, four CGS landowners withdrew their sites from consideration (Gebauer, CGS-14; Schubert, CGS-15; Kasperek, CGS-17; and Miller, CGS-20). These landowners are no longer interested in leasing or selling land to the Air Force. However, since some site-specific studies had been accomplished on these sites prior to the owners' withdrawal and because these sites continue to be considered as viable alternatives, the Air Force has presented this data on the withdrawn sites in this EA.

Phase 3, individual site evaluation, involves evaluating the relative suitability of the candidate sites through site-specific technical studies. This EA is a product of those evaluations and discusses the six siting alternatives in north central Wisconsin. It addresses only those criteria that apply to the candidate sites. The seventh alternative, no action, would impair performance of the GWEN system but leave the environment unchanged.

To be suitable for construction and operation, a site should measure at least 700 by 700 feet (approximately 11 acres), be relatively level and undeveloped, be free of natural or man-made obstructions, and have soils capable of supporting relay node structures. The site should also be close to all-weather roads, commercial three-phase power, and telephone lines to minimize costs. To operate effectively, the site must be located at least a minimum distance from obstructions that could affect reception and transmission.

These include buildings and towers, high-voltage power lines, and other communications systems or sources of radio-frequency interference. Specific minimum distances depend on height and power levels of identified obstructions or interfering sources.

This EA shows that construction and operation of a GWEN relay node on the Kasperek (CGS-17) or Miller (CGS-20) site could result in significant impacts on surface water or wetlands.

The project would have no significant impacts if constructed on the Crass (CGS-1), Steen (CGS-12), Gebauer (CGS-14), or Schubert (CGS-15) site. During the 6-week construction period, the project would cause temporary and insignificant air quality and noise impacts and slight increases in traffic. It would have a small, beneficial impact on the local economy, in part because it would provide temporary employment for contractors and construction workers. If built on any of the above four sites, the project would have no significant impacts on air quality; water quality; land use; biological resources, including threatened and endangered species; mineral resources; known paleontological resources; or cultural resources that are listed, eligible, or potentially eligible for listing on the National Register of Historic Places. Visual impacts would not be significant. Radio-frequency emissions outside the fenced area around the tower base would not pose a health hazard to humans or animals.

1.0 PURPOSE AND NEED FOR ACTION

The proposed action covered by this Environmental Assessment (EA) includes construction and operation of a relay node of the Ground Wave Emergency Network (GWEN) in north central Wisconsin (see Figure 1.1 of this EA). This relay node will provide essential connections with adjacent nodes in the network. The major features of a GWEN relay node and associated environmental impacts common to all sites are addressed in the Final Environmental Impact Statement (FEIS) for the Final Operational Capability (FOC) phase of GWEN, which was published in September 1987 by the Electronic Systems Division, Hanscom Air Force Base, Massachusetts. This EA is tiered from that FEIS and addresses site-specific conditions at the candidate GWEN sites (CGSs) for this particular site search area (SSA).

The purpose of GWEN is to provide to the President and the National Command Authority a strategic communications network that is immune to the effects of high-altitude electromagnetic pulse (HEMP) and will carry critical attack warning and force execution data. As a result, GWEN will remove any possibility of potential aggressors taking advantage of the electromagnetic pulse generated by a high-altitude nuclear burst. A HEMP surge would disrupt the nation's electric power line transmission capability, cripple electronic devices, and adversely affect skywave communications networks based on conventional electronics. GWEN provides a low-frequency (LF) ground wave communication network that will not be affected by HEMP effects. It thereby strengthens deterrence by removing the option of beginning an attack against the United States by using HEMP effects.

A partial GWEN network, called the Thin Line Connectivity Capability (TLCC), has been completed. It contains 8 input/output stations, 30 receive-only stations, and 54 relay nodes. The TLCC provides a limited level of HEMP-protected communications to strategic forces and the National Command Authority.

The FOC phase of GWEN will add 29 relay nodes. The FOC will allow communication along several routes, thereby enhancing system availability and ensuring that vital communications will be maintained.

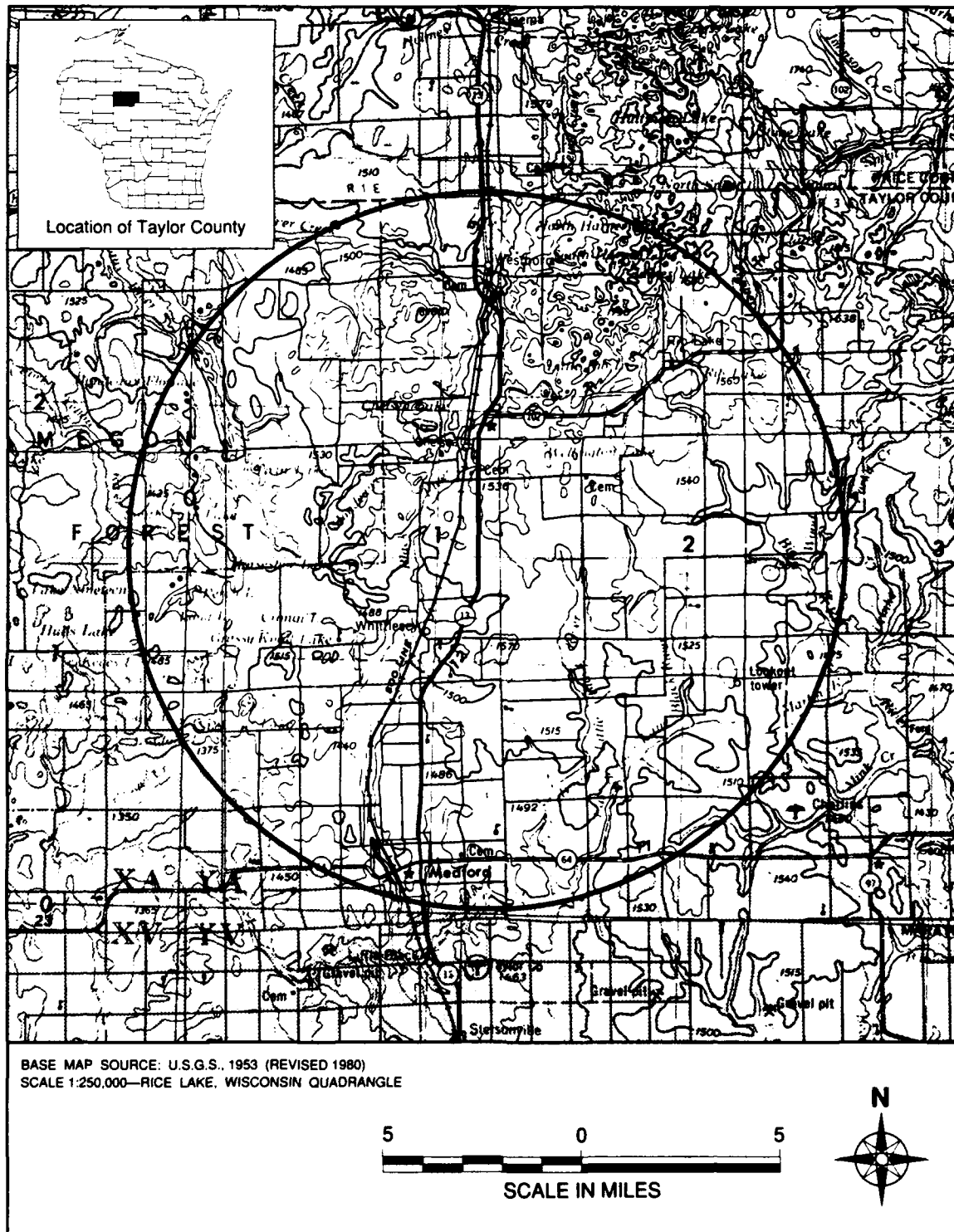


FIGURE 1.1 NORTH CENTRAL WISCONSIN SITE SEARCH AREA (SSA), TAYLOR COUNTY, WISCONSIN

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2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The six action alternatives are site-specific applications of the standard relay node design presented in the FEIS. Consequently, they share a number of features that are discussed in Section 2.1 of this EA. The site-specific features are discussed in Sections 2.2 through 2.7 of this EA. Site descriptive data was obtained during field investigations conducted in June 1989. Figure 2.1 of this EA shows the six CGSs in relation to the major features of the SSA. Figure 2.2 and Appendix B of this EA show the locations of the CGSs in relation to roads and surrounding topography, respectively.

2.1 Common Features of the Action Alternatives

2.1.1 Site Selection Process

The process used to select sites is described in Section 5, beginning on page 5-1 of the FEIS. This process has three distinct phases: network definition, regional screening, and individual site evaluation. Appendix A of this EA provides a diagram of the site selection process, and the environmental criteria used in this process are defined in Tables 5-1 and 5-2, pages 5-7 through 5-14 of the FEIS.

Phase 1, network definition, involved locating network nodes to optimize their performance while serving a predetermined number of users. A typical GWEN ground wave has an effective range of about 150 to 200 miles. Thus, relay nodes could not be located independently; changing the location of one would affect the connectivity with other nodes in the network. Once the optimal coordinates of the relay nodes were identified, a 9-mile-radius SSA was defined around each point to provide suitable opportunity for siting a relay node near that point. The 9-mile radius was chosen because it provided a reasonably sized search area consistent with the technical constraints on the relay node. If a significant portion of an SSA fell within an environmentally highly sensitive area such as a national park or wilderness area, an alternative was selected and its connectivity evaluated. This process was repeated until all relay nodes fell outside such areas.

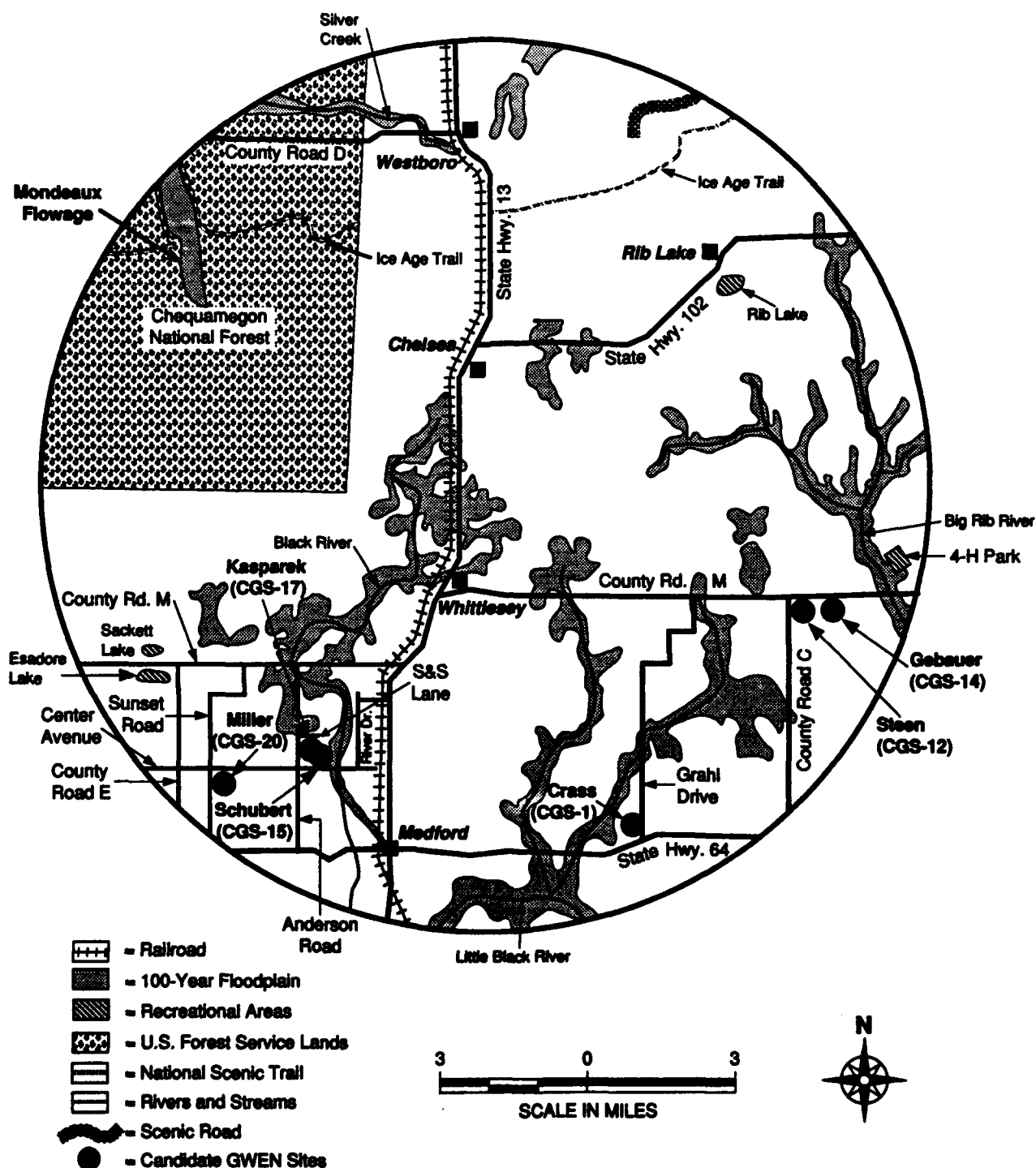
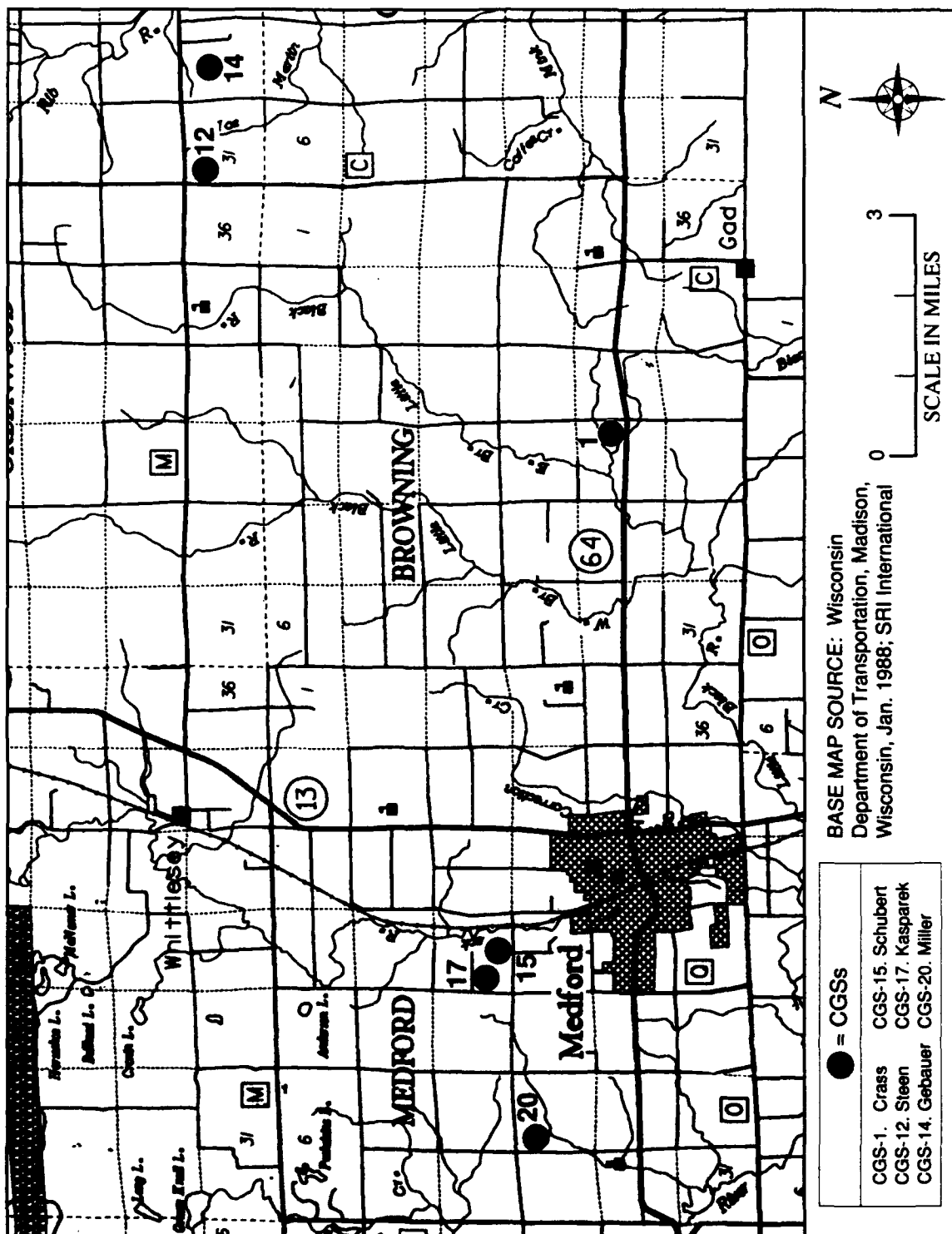


FIGURE 2.1 LOCATIONS OF CANDIDATE GWEN SITES (CGSs) RELATIVE TO SELECTED MAJOR FEATURES AND ROADS WITHIN THE NORTH CENTRAL WISCONSIN SITE SEARCH AREA



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Phase 2, regional screening, involved the application of exclusionary and evaluative criteria to the SSA to identify areas that might contain operationally acceptable sites outside environmentally sensitive areas. The resulting search areas, called potential areawide sites (PAWS), were submitted to appropriate federal, state, and local officials for review. The PAWS were then redefined, as appropriate, by incorporation of the comments of the reviewers, and a field investigation was conducted to find suitable candidate sites for a GWEN relay node within the redefined PAWS.

The field investigation for north central Wisconsin was conducted in June 1989. Twenty-five sites were identified during automobile-based surveys as potential candidate GWEN sites (PCGSs). Attempts were made to contact the owners of the sites to determine their interest in selling or leasing land to the Government. Rights-of-entry were granted to investigate thirteen PCGSs. Following evaluation against the environmental siting criteria set forth in the FEIS, six of the thirteen PCGSs were recommended as CGSs for further review.

Subsequent to the PSFR being issued, and some site-specific studies being accomplished, four CGS landowners withdrew their sites from consideration (Gebauer, CGS-14; Schubert, CGS-15; Kasperek, CGS-17; and Miller, CGS-20). These landowners are no longer interested in leasing or selling land to the Air Force. However, since some site-specific studies had been accomplished on these sites prior to the owners' withdrawal and because these sites continue to be considered as viable alternatives, the Air Force has presented this data on the withdrawn sites in this EA.

Phase 3, individual site evaluation, of which this EA is a part, is then used to determine the relative suitability of the candidate sites through site-specific technical studies. This EA presents the results of the environmental portions of those studies and covers site-specific impacts associated with construction of a relay node in north central Wisconsin. These are summarized in Sections 4.2 through 4.7 of this EA. The findings of this EA and site-specific studies of operational parameters will be used to select a preferred GWEN site (PGS).

2.1.2 Relay Node Construction and Operation

A typical relay node site is located on approximately 11 acres of land (see Figure 2.3 of this EA). It is an unmanned facility consisting of a 299-foot-tall, three-sided, 2-foot-wide LF transmitter tower, three equipment shelters, an access road, and associated fences. The tower has a base insulator and lightning protection and is supported by 24 guy wires, including 12 top-loading elements to further strengthen the signal and provide additional structural support.

These guy wires and top-loading elements are attached to the tower and 18 buried concrete anchors. The sizes of these anchors and their depth of burial varies with local soil and bedrock properties. However, the guy-wire anchors typically are rectangular blocks buried 5 feet below the surface. If bedrock occurs at or near the surface, the anchors are special rock-embedded rods. The tower base is concrete with a cross-section area resembling an inverted T. The size of this foundation is determined by soil conditions.

A radial ground plane, composed of 100 buried copper wires, extends out from the base of the tower. Each wire is 0.128 inch in diameter, about 330 feet long, and buried approximately 12 inches underground. The ground plane helps to strengthen the broadcast signal, and the number and length of the wires depend on the soil conductivity at the site. A 4-foot-high fence is installed around the perimeter of the ground plane to protect the ground plane and guy anchors and to prevent inadvertent exposure to electric shock resulting from the buildup of static electric charge.

In addition to the main tower, the relay node has two other antennas. One is an LF receive antenna made up of a pair of 4-foot-diameter rings mounted on a 10-foot pole. The second is an ultrahigh-frequency (UHF) antenna used for communicating with airborne input/output terminals. It is a 9-foot-high whip-like antenna mounted on a 30-foot-high pole. Both antennas are located within the equipment area at the perimeter of the site, which is enclosed by an 8-foot-high fence.

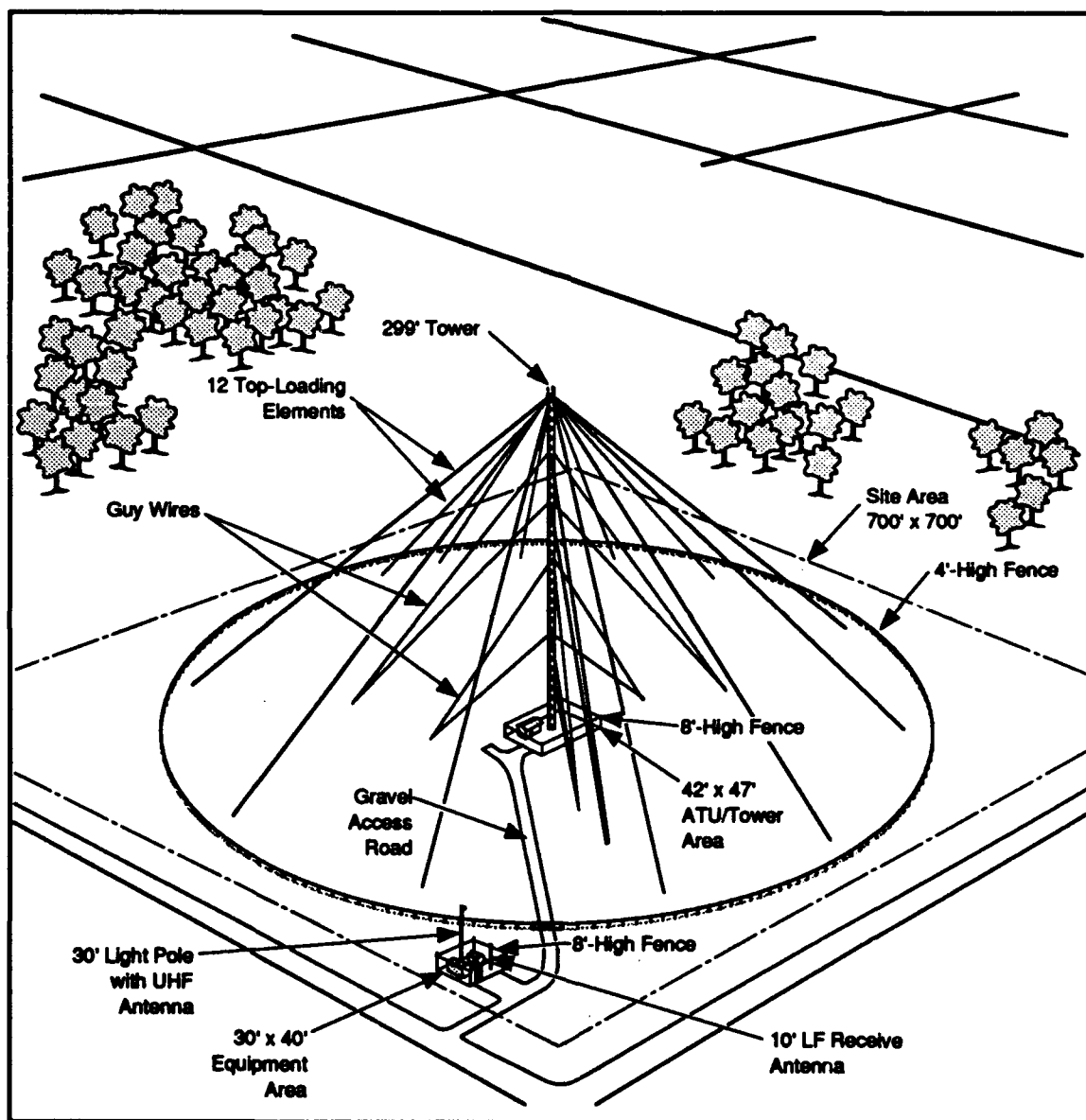


FIGURE 2.3 TYPICAL LAYOUT OF FOC RELAY NODE STATION

The siting and design of the tower are coordinated with the Federal Aviation Administration (FAA) to ensure compliance with FAA standards and regulations. The tower is equipped with a white strobe light at the top, which emits 40 flashes per minute and is rated at 20,000 candelas for daytime and twilight use and 2,000 candelas for nighttime use. To minimize glare at ground level, the light is focused upward and horizontally outward.

GWEN operates intermittently in the LF radio band at 150 to 175 kilohertz (kHz). For comparison, the low end of the AM band for commercial broadcasts is 530 kHz. The peak broadcast power for each GWEN tower is from 2,000 to 3,000 watts, depending on local soil conditions. In its ready status, GWEN typically transmits for a total of 6 to 8 seconds per hour. GWEN does not interfere with commercial television, radio broadcasts, amateur radio operations, garage door openers, or pacemakers, as noted in Section 2.1.1.1, page 2-3 of the FEIS.

All equipment shelters are anchored to concrete pads. One shelter, located at the base of the tower, houses the antenna tuning unit (ATU). Two other shelters are located side by side in the equipment area enclosed at the perimeter of the property. One houses radio processing equipment, and the other houses a 70-horsepower, back-up diesel generator and two aboveground fuel tanks. The generator operates 2 hours per week for testing purposes and during power outages. Locked, 8-foot-high chain link fences topped with barbed wire secure the equipment shelter areas at the base of the tower and at the perimeter of the site to provide safety and to inhibit unauthorized entry. A 12-foot-wide gravel road provides access to the equipment area enclosure at the perimeter of the property. A 10-foot-wide gravel road leads from the equipment enclosure to the tower.

Fuel is stored in two aboveground steel tanks inside the generator shelter. Tank capacities are 559 gallons and 461 gallons. Each tank pipes fuel separately to the back-up power group (BUPG) and is equipped with two outlet shut-off valves, one controlled manually and one controlled automatically. If a leak occurs, fuel will flow into a floor drain leading to a tightly capped pipe extending outside the BUPG. Once approximately

2 gallons of fuel accumulate in the pipe, a "liquid spill" signal is sent to the GWEN Maintenance Notification Center, which will dispatch maintenance personnel. However, if a leak were not detected, an explosion inside the shelter would be extremely unlikely due to the high flash point of diesel fuel. If a tank at the GWEN station failed, the entire contents of one tank could be released and contained inside the BUPG shelter. Refer to Section 4.12.1.1, beginning on page 4.12-1 of the FEIS for further discussion on diesel fuel spills and leaks.

The station uses existing commercial three-phase electric power and telephone service but does not require water, septic, or sewer systems. Power and telephone service are brought to the site through either overhead or buried lines, depending on local utility practices. Power and telephone service are generally brought underground from the site boundary to the equipment shelter area.

Temporary increases in air pollutant emissions will occur during construction, primarily from greater use of heavy machinery than is required in normal farming operations. Emissions resulting from operations of the facility will be limited to the operation of the BUPG, which will operate only 2 hours every week for testing purposes and for additional periods as required during power outages. Thus, the generator will operate for a total of 152 hours per year, if commercial power outages totaled 48 hours. If the generator runs at 100 percent load during the projected 152-hour operating time, total emissions in one year will be less than 350 pounds per pollutant, as documented in Section 4.3.1, beginning on page 4.3-1 of the FEIS.

Noise levels generated by construction equipment are discussed in Section 4.5.1.1, beginning on page 4.5-1 of the FEIS. Under worst-case assumptions, levels could reach 78 dBA at the site boundary from on-site activity and 92 dBA at distances of 50 feet from equipment installing the off-site access road. Noise generated during GWEN operation would come from the BUPG, which will operate only 2 hours per week and during commercial power outages. The BUPG will be located at least 50 feet within the site boundary with its exhaust side oriented toward the tower area. Noise levels due to intermittent operation of the BUPG will be less than 72 dBA at the site boundary, which is within the standards typically set for lands under agricultural use (70 to 75 dBA). At 50

feet beyond the site boundary, the noise level would drop below 65 dBA, which is within the standards typically set for residential and mixed residential/agricultural use (55 to 65 dBA). These noise levels and standards are discussed in Section 3.5.3, page 3.5-2 and Section 4.5.1, pages 4.5-1 through 4.5-6 of the FEIS.

Construction will require as many as 20 workers at any given time and take about 6 weeks. Standard earth-moving and erection equipment will be used, as detailed in Table 2-1, page 2-14 of the FEIS. Erosion control techniques that are consistent with local practices will be used during construction. Vegetation removal and grading at all of the sites will be minimal, and the site will be replanted after construction is finished.

After construction is completed, personnel requirements will be limited to periodic maintenance by a contractor who will service the equipment, cut the surface growth, remove snow from the access road, and perform other services as needed. Security services will be arranged with local authorities. The projected life of the facility is 15 to 25 years. Upon decommissioning, the tower and other structures will be removed, as discussed in Section 2.1.4, page 2-18 of the FEIS.

2.2 Alternative 1: Crass Site (CGS-1)

The Crass site is located in a parcel 725 feet north of the intersection of State Highway 64 and Grahl Drive in the eastern half of the northeastern quarter (E1/2 NE1/4) of Section 28, Township 31N, Range 2E, Browning Township. Access would be from Grahl Drive. Less than 100 feet of access road would be needed off site.

Three-phase power would be obtained from an aboveground power line 100 feet from the site. Telephone lines would be connected to an underground cable 100 feet away, along Grahl Drive.

Appendix B, Figure B.1 of this EA, provides a map showing the surrounding topography.

2.3 Alternative 2: Steen Site (CGS-12)

The Steen site is located in a parcel at the intersection of County Roads C and M in the NW1/4 of NW1/4 of Section 31, Township 32N, Range 3E, Greenwood Township. Access would be from County Road C, adjacent to the western side of the site. Less than 100 feet of access road would be required.

Three-phase power would be obtained from underground lines along County Road M, approximately 750 feet north of the site. Telephone lines would be connected to an underground cable along the south side of County Road C, less than 100 feet from the site.

Appendix B, Figure B.2 of this EA, provides a map showing the surrounding topography.

2.4 Alternative 3: Gebauer Site (CGS-14)

The Gebauer site is located in a parcel fronted by Maple Road in the W1/2 NE1/4 of Section 32, Township 32N, Range 3E, Greenwood Township. Access would be from Maple Road, which would require an off-site access road of 400 feet.

Three-phase power would be obtained from underground lines along County Road M, about 0.3 mile away. Telephone lines would be connected to an underground cable along the south side of County Road M, also about 0.3 mile away.

Appendix B, Figure B.3 of this EA, provides a map showing the surrounding topography.

2.5 Alternative 4: Schubert Site (CGS-15)

The Schubert site is located in a parcel on Center Avenue in the SE1/4 SW1/4 of Section 16, Township 31N, Range 1E, Medford Township. Access would be from Center Avenue. Less than 100 feet of off-site access road would be required.

Three-phase power would be obtained from an aboveground line located across Center Avenue, less than 100 feet away. Telephone lines would be connected to an aboveground cable, located on the south side of Center Avenue.

Appendix B, Figure B.4 of this EA, provides a map showing the surrounding topography.

2.6 Alternative 5: Kasperek Site (CGS-17)

The Kasperek site is located in a parcel on S and S Lane, a gravel road in the NW1/4 SW1/4 of Section 16, Township 31N, Range 1E, Medford Township. Access would be from S and S Lane, to avoid crossing wetlands. Less than 100 feet of off-site road length would be required.

Three-phase power would be obtained from an aboveground line along the east side of Anderson Road, about 620 feet to the west. Telephone lines would be connected to an underground cable along the south side of S and S Lane, less than 30 feet to the north. Some grading of the upland portions of the field would be required.

Appendix B, Figure B.5 of this EA, provides a map showing the surrounding topography.

2.7 Alternative 6: Miller Site (CGS-20)

The Miller site is located in a parcel on Sunset Road in the NW1/4 NE1/4 of Section 19, Township 31N, Range 1E, Medford Township. Access would be from Sunset Road. Less than 100 feet of off-site access road would be required.

Three-phase power would be obtained from an aboveground line about 850 feet north of the site along the south side of Center Avenue. Telephone lines would be connected to an underground cable parallel to the power line.

Appendix B, Figure B.6 of this EA, provides a map showing the surrounding topography.

2.8 No Action Alternative

The no action alternative is deletion of the north central Wisconsin relay node from the GWEN network. Adoption of this alternative would mean a consequent degradation in the performance of the system due to a lack of connectivity to other nodes in the system.

3.0 AFFECTED ENVIRONMENT

This section discusses the environmental setting of the proposed GWEN project in north central Wisconsin. Section 3.1 of this EA describes the general characteristics of the SSA, and Sections 3.2 through 3.7 of this EA describe the unique characteristics of each CGS within the SSA. Site descriptive data was obtained during field investigations conducted in June 1989. U.S. Geological Survey 7.5 minute topographical maps were used as data sources for distances, physiographic features, and topography (USGS, 1969a-c, 1970a-d, 1979a-c, and 1980a-b).

3.1 Site Search Area

Presented below is information on the physical, biological, and socio-cultural settings of the SSA.

3.1.1 Physical Setting

The SSA is a circular, 250-square-mile area in Taylor County, centered between the towns of Chelsea and Whittlesey, in the Canadian Shield physiographic province of the United States. The SSA consists of level to gently undulating glaciated terrain with few lakes, ponds, or large streams. The landscape as a whole has few steep slopes. Elevation differences between adjacent parcels of upland and wetland are often 10 to 20 feet with slopes between 1 and 2 percent.

Taylor County is underlain by bedrock comprised of metamorphosed volcanic and sedimentary rocks of Precambrian age that have been intensively folded, faulted, and intruded by igneous bodies (King, 1977). These are overlain by approximately 50 feet of loose glacial deposits.

Seismic activity is virtually absent from the SSA. No faults are known to have been active in the SSA within the last 66 million years. The closest epicenter of a recorded earthquake, in 1943, was 103 miles east of the SSA's center. That quake was weak and

registered only a III on the Modified Mercalli (MM) scale (Stover *et al.*, 1980; Stover *et al.*, 1986).

No known mineral deposits of economic interest, other than surficial sand and gravel deposits, are present in that portion of the SSA in which the CGSs are located. However, Precambrian rocks to the north and northwest of the CGSs have been explored for gold (Evans, 1989). The southern and eastern portions of the Chequamegon National Forest have been explored for copper, nickel, and zinc. The SSA is part of a larger area that has been characterized by the Bureau of Land Management (BLM) as having high mineral resource potential (USFS, 1986).

No known paleontological resources exist in the SSA. Both the bedrock and the surficial sediments are free of fossils that predate the last retreat of the continental glaciers, about 11,000 years ago (Dahlman, 1989; McKay, 1990a).

The soils of the SSA are diverse, with 2 to 10 soil series on each site. Soils are mostly poorly to moderately well drained and are strongly acid to neutral, with pH values between 4.5 and 7.8 at the surface. They are classified by the Soil Conservation Service (SCS) as glossoboralfs and glossaqualfs and were formerly designated as grey-brown podzolics. These soils erode easily when exposed, although they are successfully used for pasture and hay production. None of these soils is classified by the SCS as prime farmland. Water tables occur from 0.5- to 3.0-foot depths between October and May, but they are absent from these surface layers during the warmer months. Soils on portions of three of the sites (CGS-15, CGS-17 and CGS-20) are classified as hydric (Plawski, 1990; SCS, 1987; SCS, 1989; SCS, 1990). The specific soils on each CGS are discussed in Sections 3.2 to 3.7 of this EA.

Streams within the SSA are small; the largest is perhaps 20 to 30 feet wide during low flows. The principal streams flowing through the SSA are the Little Black River in the southeastern portion, the Black River in the central and southwestern portions, and the Big Rib River in the eastern portion. The Black River and Little Black River drain four of the six CGSs and run southwest into the Mississippi River. Two CGSs are drained by the Big Rib River, a tributary of the Wisconsin River. Two of the CGSs have surface water

or wetlands within 300 feet. Details of the distances from each CGS to the nearest surface water or wetlands are given in Sections 3.2 through 3.7 of this EA.

Water quality is typically good, with less than 100 parts per million (ppm) of dissolved minerals in both surface and groundwaters. Sediment loads are typically light as well (<280 ppm). Runoff averages 10 to 15 inches per year, with maximum runoffs as much as 3 to 10 times the average (USGS, 1970). Copper concentrations in the Black River as high as 10 micrograms per liter ($\mu\text{g/l}$) were observed in July 1989 but consistently have been 3 $\mu\text{g/l}$ since then (WDNR, 1990).

None of the CGSs lies in a 100-year floodplain (FIA, 1978).

Climatically, the region typically has abundant, reliable, year-round precipitation and pronounced seasonal changes in temperature. The average annual rainfall is about 33 inches. Cyclonic storms account for most of the precipitation, although convective storms are important in the summer months. The mean annual temperature range exceeds 50°F, but extreme temperatures range from -45° to 104°F. The frost-free interval extends from late May to late September. Maximum wind speeds (50-year recurrence interval) are 70 to 90 miles per hour. Tornado frequencies are moderate by midcontinental standards. Thunderstorms occur on about 30 to 40 days per year (USGS, 1970; Visher, 1954; USDA, 1941).

Air quality in Taylor County does not exceed the National Primary or Secondary Ambient Air Quality Standards, upon which the Wisconsin standards are based (Humrickhouse, 1990). Air quality standards are discussed in Section 3.3.3, pages 3.3-1 to 3.3-7 of the FEIS.

3.1.2 Biological Setting

The SSA lies within a broad transition zone between the boreal and temperate deciduous forest regions, but it has a distinctly boreal character. A continuous forest canopy once covered the northern part of Wisconsin, including the SSA. Dominant forest types included sugar maple/hemlock and sugar maple/yellow birch mixtures. Swamp

conifer types, whose dominant species included white cedar, black spruce, and tamarak, were scattered throughout the forest. After the area was settled in the late 1800s, almost the entire forest was clear-cut between 1890 and 1920, and wildfires were frequent thereafter. Consequently, current forests are predominantly second growth (USFS, 1986).

The dry, unburned, and unlogged sites in the region are covered by northern hardwood forests of sugar maple, beech, yellow birch, basswood, and hemlock. Woodlands near the candidate sites, however, are generally dominated by early successional species such as aspen and paper birch, but with occasional admixtures of black spruce.

The wetter woodland areas throughout the SSA are dominated by swamp forests and willow/alder thickets. Black spruce is the most distinctive and conspicuous constituent of the swamp forests in the SSA. The SSA is also associated with black ash, red maple, aspen, and birch. Wet sites that lack forest cover are most frequently dominated by thickets of willow and alder. Areas covered by open water or emergent vegetation are rare in the SSA, and no such areas are adjacent to candidate sites. Instead, the wetter sites covered by herbaceous vegetation are dominated by coarse grasses and sedges with some rushes and forbs. Yet even these sites are restricted in abundance in the areas surveyed and are most commonly noticed in roadside ditches and the wetter portions of hay fields and pastures.

The Federal Manual for Identifying and Delineating Jurisdictional Wetlands (GPO 1989-236-985/00336) states that an area must meet three criteria to be designated as wetland: hydric soils; hydrophytic vegetation; and wetlands hydrology, which includes a shallow water table and standing water at least 1 week of the growing season (FICWD, 1989). This manual was used as the basis for wetland determination. No National Wetlands Inventory (NWI) maps have been produced for Wisconsin. The wetland maps used in this analysis were produced by the Wisconsin Department of Natural Resources (WDNR) in cooperation with the U.S. Fish and Wildlife Service (USFWS) and are used by the USFWS in place of NWI maps (Oborny and Spry, 1992; WDNR, 1984; WDNR, 1986). Based on the WDNR maps, soils data (SCS, 1987; SCS, 1989; SCS, 1990), and consultation with the SCS (Plawski, 1990) and the U.S. Army Corps of Engineers (COE)

(Wozniak, 1990), two sites have federal jurisdictional wetlands on or within 300 feet; these are the Kasperek (CGS-17) and Miller (CGS-20) sites. These sites are discussed in Section 3.6 and 3.7 of the EA, respectively. The other four sites (CGS-1, CGS-12, CGS-14 and CGS-15) have no federal jurisdictional wetlands on or within 300 feet of their boundaries.

The most common big game animal in the SSA is the white-tailed deer. Black bear, beaver, muskrat, mink, and coyote are also common. Game birds include the ruffed grouse, wood duck, hooded merganser, mallard, and black duck. The principal game fish are walleye, muskellunge, brook trout, and largemouth bass, but bluegill, perch, crappie, and smallmouth bass are also present (USFS, 1986).

The SSA is within the Mississippi Flyway, a broad, ill-defined transcontinental migratory corridor. However, the more heavily used portions of the flyway pass to either side of the SSA, following the Mississippi River to the west and the shores of Lake Michigan to the east (USFWS, 1971).

In compliance with Section 7 of the Endangered Species Act of 1973 as amended (16 United States Code [USC] 1531 *et seq.*, at 1536), the USFWS was contacted to obtain a list of threatened and endangered species that occur within the project area (Smith, 1993; Appendix C, Stromborg, 1989, pages C-5 and C-6; Appendix C, Smith, 1992, page C-12 of this EA). The USFWS indicated that only one federally listed endangered or threatened species, the bald eagle (*Haliaeetus leucocephalus*), might pass over or through the CGSs. The nearest bald eagle nest is 10.3 miles northwest of the closest CGS as measured on a USGS map. It is given as 11.6 miles by the USFWS (Appendix C, Smith, 1990, pages C-7 and C-8 of this EA). Distances from the nest to all CGSs are given in Sections 3.2 to 3.7 of this EA. The nearest water body that might be used for foraging by the bald eagle is 2.3 miles from the closest CGS.

The WDNR indicated that another federally listed species, the grey or timber wolf, might pass through the area (Vaneck, 1989). The grey wolf is represented by a reintroduced population, released to western Lincoln County, that ranges into northeastern Taylor County. Two state-listed fish species also occur in the SSA (Nicotera, 1989). One is the

slender madtom, a species of special concern found in Esadore Lake, and the other is the redbside dace, an endangered species found in Maurer Creek and portions of the Black River drainage upstream of the river segment receiving runoff from the CGSs.

No plant species were designated as being of special concern, but three non-designated natural areas of special concern were identified by the WDNR as occurring near the SSA (WDNR, 1984). None is on or adjacent to any of the CGSs. The Medford Woods Natural Area is at least 1 mile south of the nearest CGS (Kasperek, CGS-17); the Little Rib Natural Area is at least 6 miles north of the closest CGS (Steen, CGS-12); the Berger Swamp natural area is at least 9 miles north of the closest CGS (Steen, CGS-12).

3.1.3 Socio-Cultural Setting

The SSA is near the junction of the territories of the Ojibwa, Sauk, and Fox tribes and may have been visited at various times by any of these. Euro-Americans began to explore the region in the seventeenth and eighteenth centuries and settled the area in the nineteenth century. Taylor County was legally created from several adjacent counties in 1875.

Archaeological surveys in the SSA have been restricted primarily to U.S. Forest Service (USFS) lands, highway rights-of-way, and construction projects near Medford. The Wisconsin State Historical Society's records accordingly show archaeological sites outside the Chequamegon National Forest in two corridors. One of these is remote from the candidate sites, and the other is a narrow band that extends along the Black River in the central and southern portions of the SSA. Extrapolation from the latter suggests that archaeological sites might occur within 0.5 mile of the Schubert site (CGS-15), and the proximity of a small wetland north of the Crass site (CGS-1) suggests that a prehistoric seasonal camp may have been located there.

In accordance with the National Historic Preservation Act (16 USC 470, *et seq.*), the Wisconsin State Historic Preservation Officer (SHPO) was consulted to determine the probability of unidentified historic properties that could be affected by the project. The Wisconsin SHPO recommended that an archaeological survey be conducted but did not

recommend an historic structures survey (Appendix C, Dexter, 1989, pages C-9 and C-10 of this EA). Three CGSs, the Crass (CGS-1), Steen (CGS-12), and Miller (CGS-20) sites, were systematically searched during a walk-over (Phase I) archaeological survey in the fall of 1989 and spring of 1990 by a professional archaeologist qualified in the State of Wisconsin (McKay, 1990a). Transect intervals during these searches ranged from 5 to 15 meters. No evidence of a prehistoric archaeological site or the presence of significant historic materials was found. Vegetative cover and snow cover prevented a complete survey of the Gebauer (CGS-14), Schubert (CGS-15), and Kasperek (CGS-17) sites prior to withdrawal of rights-of-entry. However, portions of these CGSs were surveyed. No significant historic material was found and the probability of an archaeological site on these CGSs is not high (McKay, 1989). The Wisconsin SHPO has concurred that there are no archaeological resources eligible for inclusion on the National Register of Historic Places (NRHP) within the areas surveyed (Appendix C, Kolb, 1990, page C-11 of this EA).

For reasons discussed in Section 4.8.1.3, beginning on page 4.8-2 of the FEIS and Section 4.1.3 of this EA, historic properties that occur within 1.5 miles of a CGS are potentially subject to adverse visual impacts from the relay node facility. Three historic sites listed on the NRHP are located in the vicinity of the project area. The J. W. Benn Building and the Taylor County Courthouse are both in Medford, over 1.5 miles from the nearest CGS. The Mondeaux Dam Recreation Area is about 11 miles north of the nearest CGS. No other sites listed or eligible for listing on the NRHP occur in the area. Structures that may possibly be historic have been systematically inventoried by the Wisconsin State Historical Society and are found to be widely dispersed throughout the SSA. Three of these structures are located within 1.5 miles of the Schubert (CGS-15), Kasperek (CGS-17), and Miller (CGS-20) sites; however, none of these structures is of concern to the Wisconsin SHPO with respect to the GWEN program (McKay, 1990b).

In compliance with the American Indian Religious Freedom Act of 1978 (42 USC 1996), the Bureau of Indian Affairs (BIA) was consulted in order to locate tribes associated with the project area. The BIA indicated that 11 Native American tribes recognized in Wisconsin could be associated with the project area (Heide, 1992). Based on BIA recommendations, the following tribes were contacted: The Bad River Tribal Council,

Forest County Potawatomi General Council, Lac Courte Oreilles Tribal Council, Lac du Flambeau Tribal Council, Menominee Indian Tribe of Wisconsin, Oneida Executive Committee, Red Cliff Tribal Council, Sokaogon Chippewa Tribal Council, St. Croix Council, Stockbridge-Munsee Tribal Council, and Wisconsin Winnebago. These tribes were notified of the GWEN project and information was requested regarding traditional, religious, or sacred sites within the SSA. The Menominee Indian Tribe of Wisconsin responded that they wish to be contacted if any archaeological site is found during construction (Appendix C, Miller, 1992, page C-13 of this EA). No response has been received from any of the other tribes.

The principal land uses of the SSA are agricultural and recreational. Dairy and hay production are the dominant agricultural activities, but mink farming was once common in Taylor County. The long low sheds associated with mink farming are scattered throughout the southwestern portion of the site.

All of the CGSs are located within areas that are not zoned (Peterson, 1989).

Sources of ambient noise are limited primarily to the operation of farm equipment and traffic in the summer and snowmobiles and road traffic in the winter. As described in Section 3.5.3, beginning on page 3.5-1 of the FEIS, local ordinances typically set maximum noise level limits at 70 to 75 dBA for land under agricultural use. Taylor County has no local noise ordinances (Peterson, 1990).

Economically, the county depends on agriculture, light industry, and in-state recreation/tourism. The population of Taylor County was 7,273 people in 1980, and over half of those lived in Medford. Mean household income in 1979 was \$17,266 (Census Bureau, 1983).

Outside the towns in the SSA, the density of residences is low, about two to three houses per square mile. The local transportation network is a grid of paved and gravel roads that divides the area into 1-mile-square sections. The main north-south road through the SSA is State Highway 13, a two-lane paved road. The main east-west road is State Highway 64, also a two-lane paved road. The SSA is also serviced by county roads.

The nearest interstate highway is U.S. Highway 94, 4 miles to the west of the SSA. An airfield for light aircraft is located 2.6 miles southeast of Medford.

Recreational resources in the SSA are concentrated in the Chequamegon National Forest, the Rib Lake area, and the town of Medford. The major recreational resources are swimming, fishing, and boating in the larger lakes and the Black River west of Medford. Other recreational uses are hunting, snowmobiling, and hiking. Marked snowmobile trails, on both public and private land and insured by the county and maintained by private clubs, radiate from Medford and Whittlesey, but do not cross any of the candidate sites (Peterson, 1991). Hiking and non-motorized biking are permitted along the Ice Age Trail, a National Scenic Trail, across the northern quarter of the SSA, more than 10 miles north of the nearest CGS. Hunting occurs throughout the rural portions of the SSA. Game species include ducks, geese, white-tailed deer, and ruffed grouse. Locally important recreational fisheries include muskie, pike, walleye, bass, and panfish (Taylor County Tourism Council, undated; Anonymous, 1989).

No exceptional natural features, such as mountains or waterfalls, occur in the SSA. The landscape contains a mosaic of pastures, coniferous and deciduous forests, lakes, and extensive areas of marshes and broad, slowly flowing waters locally known as flowages. Except for views that include towns, the complexity of the skyline is generally low to moderate as defined in Section 4.8.1.3, page 4.8-10 of the FEIS, although farmsteads and gently undulating topography provide variation on a local level. Tall structures such as silos are also common and are generally concentrated near farmhouses.

3.2 Alternative 1: Crass Site (CGS-1)

The Crass site slopes gently toward the north. The soils are in the Withee and Alameda series both of which are somewhat poorly drained (SCS, 1989). They are periodically wet but neither is classified as hydric (SCS, 1987). These soils range from very strongly acid to neutral (pH 4.5 to 7.3) in the upper 8 inches and very strongly acid to strongly acid (pH 4.5 to 5.5) in the next 17 inches. Perched water tables occur at 0.5- to 2.5-foot depths during the winter months (SCS, 1989).

The nearest perennial stream is 424 feet northwest of the site; an intermittent stream lies 0.25 mile to the south. Both drain into the east branch of the Little Black River, which lies 0.5 mile to the west. The nearest large water bodies that might be used for foraging by the bald eagle are Rib Lake, 11 miles to the north, and several smaller lakes 9 miles to the west. According to wetlands maps, no federal jurisdictional wetlands occur less than 300 feet from the site. The nearest mapped wetlands are willow/alder thickets and wet meadows 300 feet northwest of the copper ground plane. These wetlands are drained by the perennial stream mentioned above (FICWD, 1989; WDNR, 1984).

The site is now used for hay production and is remote from any substantial area of woodland or open water.

The nearest known evidence of an endangered species, a bald eagle's nest, is found 15 miles to the northwest (Appendix C, Stromborg, 1989, pages C-5 and C-6 of this EA).

A snowmobile trail lies about 400 feet north of, and parallel to, the site's northern edge. The closest residential area is the town of Medford, 4.8 miles to the west.

3.3 Alternative 2: Steen Site (CGS-12)

The Steen site is a flat, nearly level parcel that drains to the west and north, where substantial ditches parallel the roads. The soils are in the Magnor series, which are coarse-loamy soils formed from silty deposits and glacial till (SCS, 1990). They are not classified as hydric (SCS, 1987). The Magnor soils range from very strongly acid to slightly acid (pH of 4.5 to 6.5). Perched water tables occur at 0.5- to 3.0-foot depths during the winter months (SCS, 1990).

The nearest stream is over 1,000 feet from the site. The nearest large body of open water that might be used for foraging by the bald eagle is Rib Lake, 6 miles to the northwest. No wetlands as defined by federal criteria (FICWD, 1989) occur on the site. According to wetlands maps, no federal jurisdictional wetlands occur on or within 300 feet of the site. The nearest mapped wetlands are forested lands 420 feet northwest of

the copper ground plane, across County Road C, and 900 feet northeast of the copper ground plane, across County Road M (FICWD, 1989; WDNR, 1984). The areas of these wetlands closest to the site are dominated by aspen and bracken fern, which indicate a deep water table.

The site is a cornfield. Fencerows of shrubs and trees border the field to the south and east. The fields beyond are covered by crops used for hay.

The nearest known evidence of an endangered species, a bald eagle's nest, is found 14.5 miles to the northwest (Appendix C, Stromborg, 1989, pages C-5 and C-6 of this EA).

The Green Grove 4-H Park on the Big Rib River is 2.1 miles away, and a snowmobile trail is about 0.5 mile to the north, roughly parallel to County Road M. The Big Rib River fire lookout tower is 0.8 mile south of the site. The closest residential area is the town of Whittlesey, 7.6 miles to the west.

3.4 Alternative 3: Gebauer Site (CGS-14)

The Gebauer site is located on a small rise that slopes gently to the east and west and a little more sharply to the north. About half of the site has soils of the Magnor series, and half has soils of the Santiago series (SCS, 1990), none of which is hydric (SCS, 1987). These soils range from very strongly acid to neutral (pH of 4.5 to 7.3). Perched water tables occur on the Magnor soils at 0.5- to 3-foot depths during the winter months, but the water tables on the Santiago soil are more than 6 feet (SCS, 1990).

The nearest stream is 0.3 mile to the northwest, but the area's general drainage is northeast to the Big Rib River, about 0.7 mile away. The nearest large body of open water that might be used for foraging by the bald eagle is Rib Lake, 7 miles to the northwest. According to wetlands maps, no federal jurisdictional wetlands occur on or within 300 feet of the site. The nearest mapped wetlands include a combination broad-leaved deciduous scrub/shrub and narrow-leaved persistent emergent/wet meadow

wetland 1,200 feet to the northwest and a broad-leaved deciduous forested/scrub-shrub wetland 2,000 feet to the east (FICWD, 1989; WDNR, 1984).

The site is currently used for hay production, but the access road would cross a cultivated field that is currently planted in oats. Extensive tracts of woodlands are present in the vicinity, and the edge of one of these large wooded tracts lies at the site's northern boundary.

The nearest known evidence of an endangered species, a bald eagle's nest, is found 16 miles to the northwest (Appendix C, Stromborg, 1989, pages C-5 and C-6 of this EA).

Gravel pits are the principal commercial use of nearby areas. Four pits are located between 0.6 and 0.9 mile east of the proposed tower site.

The Green Grove 4-H Park is 0.8 mile from the site to the northeast, and a snowmobile trail is about 0.8 mile to the north, roughly parallel to County Road M. The nearest residential area is the town of Whittlesey, 8.7 miles to the west.

3.5 Alternative 4: Schubert Site (CGS-15)

The Schubert site is a gently sloping parcel that drains to the south, with subsequent drainage east to the Black River. The soils are mostly in the Magnor series, which are somewhat poorly drained soils but are not hydric (SCS, 1987; SCS, 1989). Portions of the site belong to the Auburndale soil series, which is classified as hydric (Plawski, 1990; SCS, 1987). These soils range from very strongly acid to slightly acid (pH of 4.5 to 6.5). Perched water tables occur at 0.5- to 3-foot depths on the Magnor soils in the winter months, and standing water occurs at the surface of the Auburndale soils (SCS, 1989).

The nearest surface water is a pond, 1,500 feet to the east. The nearest water bodies that might be used for foraging by the bald eagle are small lakes to the north and west, the nearest of which is 2.3 miles to the north. According to wetlands maps, a small federal jurisdictional wetland of less than 5 acres lies about 360 feet northwest of the ground plane (FICWD, 1989; WDNR, 1986). The southern border of the CGS was

formerly a federal jurisdictional wetland but is no longer a wetland due to construction of Center Avenue and its associated ditches prior to the passage of the Clean Water Act of 1977 (USGS, 1970a). Construction of the road removed hydric vegetation and altered the hydrology of the site (Wozniak, 1990).

The site is currently used for hay production. A stone wall and an associated fencerow of aspen, elm, oak, maple, and plum trees border the site's western edge. To the east, the CGS is bordered by a predominantly mesic forest. In the area nearest the site, the forest consists of ash, red oak, aspen, white birch, and willow, with seedlings of sugar maple and basswood.

The nearest known evidence of an endangered species, a bald eagle's nest, is found 10.7 miles to the northwest (Appendix C, Stromborg, 1989, pages C-5 and C-6 of this EA).

A snowmobile trail roughly parallels Woodland Road then turns east to parallel Center Avenue 350 feet east of the site. The nearest residential street of Medford is 1.3 miles away. An electric substation is 0.25 mile to the west at the intersection of Center Avenue and Anderson Road and a gravel pit is 0.2 mile to the south.

3.6 Alternative 5: Kasperek Site (CGS-17)

The Kasperek site is located on a slight rise bordered by a broad, shallow drainage. The soils belong to several soil series, but 90 percent of the site is in the Freeon and Magnor series; less than 10 percent is Auburndale (SCS, 1989). Only the Auburndale soil is classified as hydric (SCS, 1987). The Freeon and Auburndale soils range from very strongly acid to slightly acid (pH of 4.5 to 6.5). The Magnor soils range from very strongly acid to neutral (pH of 4.5 to 7.3). Drainage ranges from somewhat poor to moderately well drained (slowly permeable). Perched water tables occur at 0.5- to 3.0-foot depths on the Freeon and Magnor soils and water may accumulate on the Auburndale soils during the winter months (SCS, 1989).

The nearest stream is 1,500 feet north of the site. The Black River is 0.5 mile east. The nearest water bodies that might be used for foraging by the bald eagle are small lakes to the north and west, the nearest of which is 2.3 miles to the north. According to wetlands maps, federal jurisdictional wetlands occur on the site. An 8-acre shrub- and forest-covered area adjacent to and extending into the southwest corner of the site is a federal jurisdictional wetland. This wetland occupies a depression with no surface drainage to an intermittent or perennial stream. Two other wetlands occur about 700 to 900 feet northwest of the site, one of less than 5 acres and another of several square miles (FICWD, 1989; WDNR, 1986).

The site is currently used for hay production and is set within an unforested area.

The nearest known evidence of an endangered species, a bald eagle's nest, is found 10.3 miles to the northwest (Appendix C, Stromborg, 1989, pages C-5 and C-6 of this EA).

A gravel pit is located 0.5 mile to the southeast and an electric substation is located 0.25 mile to the southwest. The closest residential area is Medford, whose boundaries are 1.6 miles southeast of the site.

3.7 Alternative 6: Miller Site (CGS-20)

The Miller site is a flat parcel that slopes to the east. Soils over much of the site belong to the Magnor series, which is somewhat poorly drained but not hydric. Portions of the site belong to the Auburndale series (SCS, 1989), which is a hydric soil (SCS, 1987). These soils range from very strongly acid to slightly acid (pH of 4.5 to 6.5). Perched water tables on the Magnor soils occur at 0.5- to 3-foot depths during the winter months; the Auburndale soils may have standing water on them during the winter (SCS, 1989).

The nearest stream is 930 feet southeast of the site. The nearest water bodies that might be used for foraging by the bald eagle are small lakes to the north and west, the nearest of which is 2.3 miles to the north. According to wetlands maps, federal jurisdictional wetlands occur within 300 feet of the site, beyond the eastern site boundary (FICWD,

1989; WDNR, 1986). Field investigations conducted during the initial site survey indicated that the wetlands may extend onto the site. Although the site does not contain hydrophytic vegetation because it was converted to agricultural use before passage of the Clean Water Act of 1977, the hydrology was not altered at that time, so the area would still be considered a federal jurisdictional wetland (Wozniak, 1990).

The site is currently devoted to the growing of corn and other crops for hay. Adjacent lands are also agricultural.

The nearest known evidence of an endangered species, a bald eagle's nest, is found 10.6 miles to the northwest (Appendix C, Stromborg, 1989, pages C-5 and C-6 of this EA).

The Esadore and Sackett lakes recreational areas are 2.4 miles northwest of the site. County Road E, 1 mile west of the site, provides access to these recreation areas but primarily serves other destinations. A snowmobile trail passes the site 0.25 mile to the southwest. Medford is 2.5 miles to the southeast.

4.0 ENVIRONMENTAL CONSEQUENCES OF ACTION ALTERNATIVES

This section discusses the potential impacts of the GWEN project on the environmental setting of the six CGSs in north central Wisconsin. Several impacts common to some or all of the action alternatives are discussed in Section 4.1 of this EA. Impacts that are unique to each action alternative are discussed in Sections 4.2 through 4.7 of this EA. As indicated in Sections 4.6 and 4.7 of this EA, the project could have significant impacts on surface water or wetlands if built on the Kasparek (CGS-17) or Miller (CGS-20) site. There would be no significant impacts at the other four sites, as indicated in Sections 4.2 through 4.5 of this EA.

4.1 Common Features

Presented below is information on the physical, biological, and socio-cultural impacts common to some or all of the action alternatives.

4.1.1 Physical

Impacts from **construction** activities would not be significant. Construction would require localized earth-moving, including excavation and backfilling for placement of foundations and guy-wire anchors. Less than 3,800 square feet would be covered with concrete and gravel for the tower base and the equipment area enclosures. Similar coverage would be required for on-site access roads and parking; incidental activities during construction would disturb a similar amount. In total, about 0.25 acre would be occupied by foundations and the on-site access roads. Construction of an off-site access road and installation of utility lines would have no significant impacts because they would cover less than 0.10 acre of land.

The ground plane would be installed using machines that bury wire approximately 1 foot below the surface with minimal disturbance of the soil surface. This process would require moving a small tractor or similar equipment over much of the 11-acre site, but this would not significantly disturb the existing vegetation or create a significant erosion hazard.

Impacts on **mineral resources** would be minor, as indicated in Section 4.1.1.4, page 4.1-2 of the FEIS. Taylor County has been explored for sulfide and precious metal deposits; however other than aggregate quarries, there are no active mines in the county (Bureau of Mines, 1992). If any mineral resources are present under a site, development of the site would only deny access to a small portion of those resources for the lifetime of the project and would not result in any significant impacts.

Impacts on **paleontological resources** are not anticipated because fossils are unlikely to occur on any CGS, as discussed in Section 3.1.1 of this EA. However, if any fossils are found during construction, work that might affect them will be suspended while the Wisconsin Geological Survey Bureau is notified and the significance of the find is evaluated.

Erosion and increase in storm water runoff would not be significant. All sites have slopes of 6 percent or less, so any required grading to level the site would be minimal. In addition, standard measures for erosion control would be used during and after site construction, including replanting the site.

None of the sites is located in a **100-year floodplain** (FIA, 1978).

No **prime farmland** would be removed from production for the project because none of the sites contains designated prime farmland (SCS, 1989; SCS, 1990).

Impacts on **drinking water** are not expected. As stated in Sections 3.2.4.1 and 4.2.1.1, pages 3.2-2 and 4.2-3 of the FEIS, corrosion of the copper ground plane is not expected to raise copper concentrations in any aquifer or surface water body by more than 20 µg/l. This is equivalent to 2 percent of the allowable copper concentration under Wisconsin regulations for raw water sources for potable water (Wisconsin Administrative Code NR 102.14). Because existing copper concentrations in the SSA are 1 percent or less of the potable water standard (WDNR, 1990), copper concentrations in waters affected by corrosion of the ground plane would be 3 percent or less of the allowable concentrations for potable waters.

Impacts on **surface water or wetlands** that support aquatic plants and animals could be significant at two of the six sites (CGS-17 and CGS-20), as discussed in Sections 4.6 and 4.7. of this EA. This is because the sites are within 300 feet of surface water or wetlands, the soils are acidic, and the depth to the seasonally high water table is less than 4 feet. As discussed in Section 4.2.1.1, page 4.2-3 of the FEIS, under these conditions the increase in copper concentrations could exceed 1 to 2 $\mu\text{g/l}$, which might then exceed the state standards of 5.99 $\mu\text{g/l}$ for the most sensitive waters (Wisconsin Administrative Code NR 105.06). Impacts are not expected at the other four sites because the copper ground plane at those sites is at least 300 feet from surface waters and wetlands and at that distance the impact from copper leachate would be negligible.

Impacts on **air quality** would not be significant. Temporary but insignificant increases in air pollutant emissions would occur during construction, primarily from greater use of heavy machinery than would be required in normal farming operations. Emissions occurring during both construction and operation would be well below the levels requiring permitting under Wisconsin Administrative Code NR 406.04. Estimates of these emissions are given in Section 4.3.1, page 4.3-1 of the FEIS. During operation of the BUPG at 100 percent load, total yearly emissions from the BUPG would be less than 350 pounds per pollutant, as described in Section 2.1.2 of this EA. These are also well below the standards set by the Clean Air Act (42 USC 7401, *et seq.*), which requires permits for facilities emitting any single regulated substance at the rate of 50 tons per year. Hence, the project would not result in violation of National Primary and Secondary Ambient Air Quality Standards, which have been adopted by the State of Wisconsin (Humrickhouse, 1990).

4.1.2 Biological

Impacts on **wetlands and other wildlife habitats** would not be significant. All the sites are located on cultivated fields or heavily grazed rangeland and each is far from extensive areas of woodland, ponds, lakes, or perennial streams. Although two sites have federal jurisdictional wetlands on or within 300 feet, these wetland habitats are not expected to be adversely affected. The Miller site (CGS-20) has a federal jurisdictional

wetland just east of the site and it may extend onto the site; however, the site is cultivated for hay and corn and contains no critical wildlife habitat. The Kasparek site (CGS-17) has a shrub- and forest-covered wetland just outside and extending into the southwest corner of the site. Any construction on these wetlands would require a permit from the COE under Section 404 of the Clean Water Act.

No federally listed **threatened or endangered species** would be adversely affected. This determination was made after informal consultation with the USFWS in compliance with Section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531, *et seq.*, at 1536) (Appendix C, Smith, 1990, pages C-7 and C-8 of this EA). The only endangered species cited by the USFWS was the bald eagle. Each of the sites is far enough from the nearest known bald eagle's nest—10.3 to 11.6 miles—to pose no threat to that nest. The nearest water body that might be used for foraging by the bald eagle is 2 miles from the closest CGS. Wolves introduced into Lincoln County are not expected to occur near any of the CGSs, and no impact is expected even if they should do so. None of the proposed sites would remove any wolf habitat; the outer fence would not restrict the wolves' movements. Consequently, no critical or exceptionally valuable wildlife habitats would be at risk. No rare, threatened, or endangered plant or animal species are known to occur on or adjacent to any of the sites, nor are any unique biological communities present on these sites.

Bird collisions with the tower may occur but are not expected to be significant. Section 4.4.1.5, page 4.4-5 of the FEIS states that most bird collisions occur in adverse weather conditions when the visibility of man-made structures is obscured and birds may be forced to lower their flight level. Generally, songbirds (passerines) are more likely to collide with a tower or the guy wires than are raptors or waterfowl (Avery *et al.*, 1980). Annual losses due to collisions with towers represent approximately 0.013 to 0.016 percent of the total estimated annual avian mortality (Avery, 1982). The siting process aims to minimize the probability of collisions by avoiding areas with high concentrations of bird flight activity, such as feeding and nesting habitats, prominent topographical features that could serve as navigational aids, and raptor roosting areas. The SSA is within the Mississippi Flyway, a broad, ill-defined transcontinental migratory corridor. However, the more heavily used portions of the flyway pass to either side of the SSA,

following the Mississippi River to the west and the shores of Lake Michigan to the east (USFWS, 1971).

4.1.3 Socio-Cultural

Local employment would be increased slightly, primarily through use of local subcontractors for earth-moving and possibly for some of the facility's maintenance.

Impacts on community support systems would not be significant because the relay node will be unmanned and will use modest amounts of power (comparable to that used by an average single-family house). Security needs will be met through agreements with local police officials to monitor the integrity of the site during routine patrols, as detailed in Section 4.6.1.1, page 4.6-1 of the FEIS.

Impacts on land use would not be significant. The Chequamegon National Forest is 5.4 miles away from the closest CGS. Care was taken in the site selection process to maintain setbacks from institutional uses such as churches, schools, recreation areas, and areas zoned residential. Section 4.7.1.3, page 4.7-8 of the FEIS concluded that the tower would not significantly affect property values because non-noxious, nonresidential land uses have no systematic effect on housing values.

Construction noise impacts would be temporary and insignificant. Operational noise from the backup generator would be less than 72 dBA at the site boundary. At 50 feet beyond the site boundary the noise level would drop below 65 dBA, as discussed in Section 2.1.2 of this EA. Although Taylor County has no local noise ordinance (Peterson, 1990), this noise level is within the standards typically set for residential and mixed residential/agricultural use (55 to 65 dBA), as stated in Section 3.5-3, page 3.5-2 of the FEIS. The BUPG would only operate at this noise level for 2 hours per week during testing and during commercial power outages. In addition, no residence is within 50 feet of any site boundary, so noise impacts would not be significant.

Impacts on public health and safety would not be significant, as discussed in Sections 4.11 and 4.12, beginning on pages 4.11-1 and 4.12-1 respectively, of the FEIS.

Shock and burn risks would be associated with the buildup of electrical charges on ungrounded metallic objects inside the inner exclusionary (8-foot) fence located approximately 20 feet from the tower base. However, a grounded person within the outer exclusionary (4-foot) fence located approximately 330 feet from the tower base who touches an ungrounded object while the tower was transmitting would experience only a mild shock, sufficient to cause the individual to break contact but not cause harm. Furthermore, because the transmission periods would total between 6 and 8 seconds per hour during normal operations, the risk of even these mild shocks would be insignificant. Only a determined effort to enter the inner exclusionary zones, within the 8-foot fence, would put a person at increased risk of higher shock and a higher specific absorption rate, dependent on the period of prolonged grasping contact with an ungrounded metallic object. Fire hazards at the relay node facility would be low, as described in Section 4.12.1.1, page 4.12-1 of the FEIS. Radio-frequency emissions would not cause adverse health effects, as described in Section 4.4.1-6, pages 4.4-6 and 4.4-7 of the FEIS. Subsequent to the publication of the FEIS, further study confirmed the conclusion of the FEIS that there is no evidence of adverse effects of GWEN radio-frequency emissions on public health (NRC, 1992).

The relay node would operate in the LF band and therefore would not interfere with pacemakers, emergency communications, commercial and amateur radios, televisions, or garage door openers, as noted in Section 2.1.1.1, page 2-3 of the FEIS.

Impacts on **archaeological resources** would not be significant. The on-site archaeological survey of three of the sites (CGSs-1, -12, and -20) revealed no significant archaeological resources on the sites (McKay, 1990a). The Wisconsin SHPO concurs with the findings of the archaeological survey (Appendix C, Kolb, 1990, page C-11 of this EA). Vegetative cover and snow cover prevented survey of the other three CGSs, but the probability of an archaeological site is not high at any of these CGSs (McKay, 1989). If any archaeological resources are discovered during construction, work that might affect them would be suspended while the Wisconsin SHPO is notified in accordance with the provisions of 16 USC 470, *et seq.*, at 470f.

Impacts on **historic properties** would not be significant. The CGSs are more than 1.5 miles from any property listed, eligible, or potentially eligible for listing on the NRHP (McKay, 1990b; NRHP, 1989; Appendix C, Dexter, 1989, pages C-9 and C-10 of this EA).

Significant impacts on **Native American traditional, religious, or sacred sites** are not anticipated. The BIA indicated that 11 Native American tribes recognized in Wisconsin could be associated with the project area (Heide, 1992). Based on BIA recommendations, the following tribes were contacted: The Bad River Tribal Council, Forest County Potawatomi General Council, Lac Courte Oreilles Tribal Council, Lac du Flambeau Tribal Council, Menominee Indian Tribe of Wisconsin, Oneida Executive Committee, Red Cliff Tribal Council, Sokaogon Chippewa Tribal Council, St. Croix Council, Stockbridge-Munsee Tribal Council, and Wisconsin Winnebago. The Menominee Indian Tribe of Wisconsin responded that they wish to be contacted if any archaeological site is found during construction (Appendix C, Miller, 1992, page C-13 of this EA). No response has been received from any of the other tribes.

Visual impacts associated with a GWEN tower are discussed in Sections 3.8 and 4.8, pages 3.8-1 and 4.8-1 of the FEIS. The significance of a visual impact would depend on the visual dominance of the GWEN facility and the sensitivity of the affected views. Visual dominance is the degree to which a GWEN facility would compete with other features of the existing landscape for the attention of the viewer. Section 3.8.4, beginning on page 3.8-3 of the FEIS defines four levels of dominance, called Visual Modification Classes (VMC):

- VMC 1, not noticeable: the tower would be overlooked by all but the most interested viewers
- VMC 2, noticeable, visually subordinate: the tower would be noticeable to most viewers without being pointed out but would not compete with other features for their attention
- VMC 3, distracting, visually codominant: the tower would compete with other features in the landscape for the viewer's attention

- VMC 4, visually dominant, demands attention: the tower would be the focus of attention and tend to dominate the view.

Visual sensitivity is a measure of the public's reaction to a proposed change of the affected view and is a function of the viewer's activity, awareness, goals, and values. Consequently, the more sensitive the view, the stronger will be the public reaction to any alteration of it. Areas defined in the FEIS as having high visual sensitivity include national and state parks; designated scenic routes; designated national, state, or local historic sites where setting is important to their historic significance; and travel routes providing primary access to these sites. Examples of areas having medium visual sensitivity would be locally popular, but undesignated, beaches or public use areas and the travel routes that provide primary access to them. Travel routes that pass near or provide access to high sensitivity views, such as historic properties, but primarily serve other destinations are considered medium sensitivity. Travel routes are considered sensitive on segments within 0.5 mile of the property and 1.5 miles of the tower, based on FEIS criteria and review by visual analysis specialists (Duffey, 1991). Low visual sensitivity includes those views from sites, areas, travel routes, and sections of travel routes not identified as medium and high in sensitivity. Snowmobile trails, which are a type of recreational facility (normally considered high sensitivity), are considered low sensitivity because they are used for high-speed, motorized activities in which attention of the participants is more focused on the route itself rather than on the surrounding environment. The snowmobile trails are not in officially designated recreational areas, but are maintained by private clubs. In contrast, cross-country ski trails and hiking trails are considered high sensitivity.

Significant visual impacts would occur if the relay node facility were to dominate or codominate (VMC 4 or 3) a high-sensitivity view or dominate (VMC 4) a medium-sensitivity view. If the relay node facility cannot be seen from medium-to-high sensitivity routes or areas, then visual impacts are not considered significant. Distance is the primary factor in determining visual dominance and therefore visual impacts. At distances greater than 3 miles, a GWEN tower would not be visible to the unaided eye. At 1.5 to 3 miles, the tower would be visually subordinate if noticeable (VMC 2) but more

usually would not be noticed (VMC 1) because of its grey color and lack of mass. If a viewer at this distance actively sought the tower, it would appear as a thin vertical line on the horizon. Within 1.5 miles, the tower becomes a more important component of the view. In addition, other aspects of the tower's setting, such as focal point sensitivity, skyline complexity, competing feature interest, and topographic and vegetative screening, become important considerations in determining the level of visual impact.

USGS topographic maps and a windshield survey were used to determine whether high or medium sensitivity views were within 1.5 miles of the CGSs. The visual impacts associated with each site are discussed in Sections 4.2 to 4.7 of this EA.

4.2 Alternative 1: Crass Site (CGS-1)

No significant impacts are expected.

No significant impacts are expected on **surface water or wetlands** because the nearest surface water or wetland is at least 300 feet from the copper ground plane. The nearest stream is 424 feet from the site, and the nearest wetland is 300 feet from the ground plane. At that distance, the impacts from copper leachate would be negligible. In addition, grass cover would be maintained on the site to prevent any possible erosion that might impact nearby wetlands.

Visual impacts would not be significant because there are no high or medium sensitivity views within 1.5 miles of the site.

4.3 Alternative 2: Steen Site (CGS-12)

No significant impacts are expected.

No significant impacts are expected on **surface water or wetlands** because the nearest surface water or wetland is more than 300 feet from the copper ground plane. The nearest stream is over 1,000 feet from the site, and the nearest wetland is 425 feet

northwest of the ground plane. At that distance, the impacts from copper leachate would be negligible.

Visual impacts would not be significant because there are no high or medium sensitivity views within 1.5 miles of the site.

4.4 Alternative 3: Gebauer Site (CGS-14)

No significant impacts are expected.

No significant impacts are expected on **surface water or wetlands** because the nearest surface water or wetland is more than 300 feet from the site. The nearest stream is 0.3 mile northwest; the nearest wetland is 0.4 mile east. At that distance, the impacts from copper leachate would be negligible.

No significant **visual** impacts are expected. The Green Grove 4-H Park is 0.8 mile northeast of the site. Under the criteria of Section 3.8.4, pages 3.8-3 through 3.8-5 of the FEIS, the park has high visual sensitivity as a popular recreation area. However, the park is bordered by a grove of 40- to 60-foot trees on its southwest side. The Big Rib River flows along this side of the park and the same 40- to 60-foot trees line the other side of the river. The combination of the canopy of trees bordering the park and the trees across the river restricts the angle of view for visitors to the park and would block views of the tower.

County Road M is medium sensitivity because it is used for access to Green Grove 4-H Park, although it primarily serves other destinations. The road lies 0.5 mile south of the park and between 0.25 to 0.75 mile north of the tower. Except for two short segments, 40- to 60-foot trees would partially block views of the tower for travellers driving along this road. The skyline complexity is low, there is no focal point sensitivity, and there is no competing feature interest for most portions of the road. Therefore, for most of the road, the tower would be visually codominant (VMC 3). For one segment of the road, a break in the trees would provide an unobstructed view of the tower for approximately 4 seconds at a distance of 0.5 mile from the tower. There is a strong competing feature interest at

that point provided by a residence adjacent to the south side of the road. The skyline complexity is low and there is no focal point sensitivity, so the tower would again be codominant from this segment of the road (VMC 3). The other segment of the road with a potential unobstructed view of the tower is only 380 feet long (0.25 mile from the site), so a traveller would view the tower for less than 3 seconds. For this reason, visual impacts would not be significant.

4.5 Alternative 4: Schubert Site (CGS-15)

No significant impacts are expected.

No significant impacts on **surface water or wetlands** are expected because the nearest surface water or wetland is more than 300 feet from the site. The nearest surface water is a pond, 1,500 feet east; the nearest wetland is over 1,000 feet away. At that distance, the impacts from copper leachate would be negligible.

Visual impacts would not be significant. The nearest residential street of Medford would be 1.2 miles southeast of the site and is high sensitivity. From houses on this street, the view of the tower would be blocked by 40- to 60-foot trees that lie between the street and the tower.

For houses in this same area within 1.2 and 1.5 miles of the tower, trees would partially block the tower, up to the bottom two-thirds of the tower. The skyline complexity is moderate and there is no focal point sensitivity. For some of the houses, there is also competing feature interest provided by houses across the street, between them and the tower. Houses on the north side of the streets have less competing feature interest. For all of these houses, due to screening from trees, moderate skyline complexity, and distance, the tower is considered visually subordinate (VMC 2) and would not result in a significant impact.

4.6 Alternative 5: Kasperek Site (CGS-17)

Significant impacts are expected.

Impacts on **surface water or wetlands** could be significant because a wetland lies within 300 feet of the site. An 8-acre shrub- and forest-covered wetland lies adjacent to and extending into the southwest corner of the site. The soils are acidic and the water table is shallow. Therefore, copper leachate may drain into the wetland causing copper concentrations to exceed state standards and resulting in a significant impact.

Visual impacts at this site would not be significant because there are no high or medium sensitivity views within 1.5 miles of the site.

4.7 Alternative 6: Miller Site (CGS-20)

Significant impacts are expected.

Impacts on **surface water or wetlands** could be significant because mapped wetlands occur within 300 feet of the site and may extend onto the site. The soils are acidic and the water table is shallow. Therefore, copper leachate could drain into the wetland, causing copper concentrations to exceed state standards and resulting in a significant impact.

Visual impacts at this site would not be significant. The only high or medium sensitivity view is a portion of County Road E, which passes 1.0 mile west of the site and provides access to the Esadore and Sackett lakes recreational areas 2.4 miles northwest. This road primarily serves other destinations, however, so it is medium visual sensitivity. The skyline complexity is low and there is no focal point sensitivity. For portions of the road, trees would partially block views of the tower. In the portions that would have unobstructed views of the tower, there is competing feature interest provided by several residences along County Road E and Center Avenue. Therefore, the tower would be visually subordinate from this road (VMC 2) and would not create a significant visual impact.

4.8 No Action Alternative

No environmental impact would result from adoption of the no action alternative.

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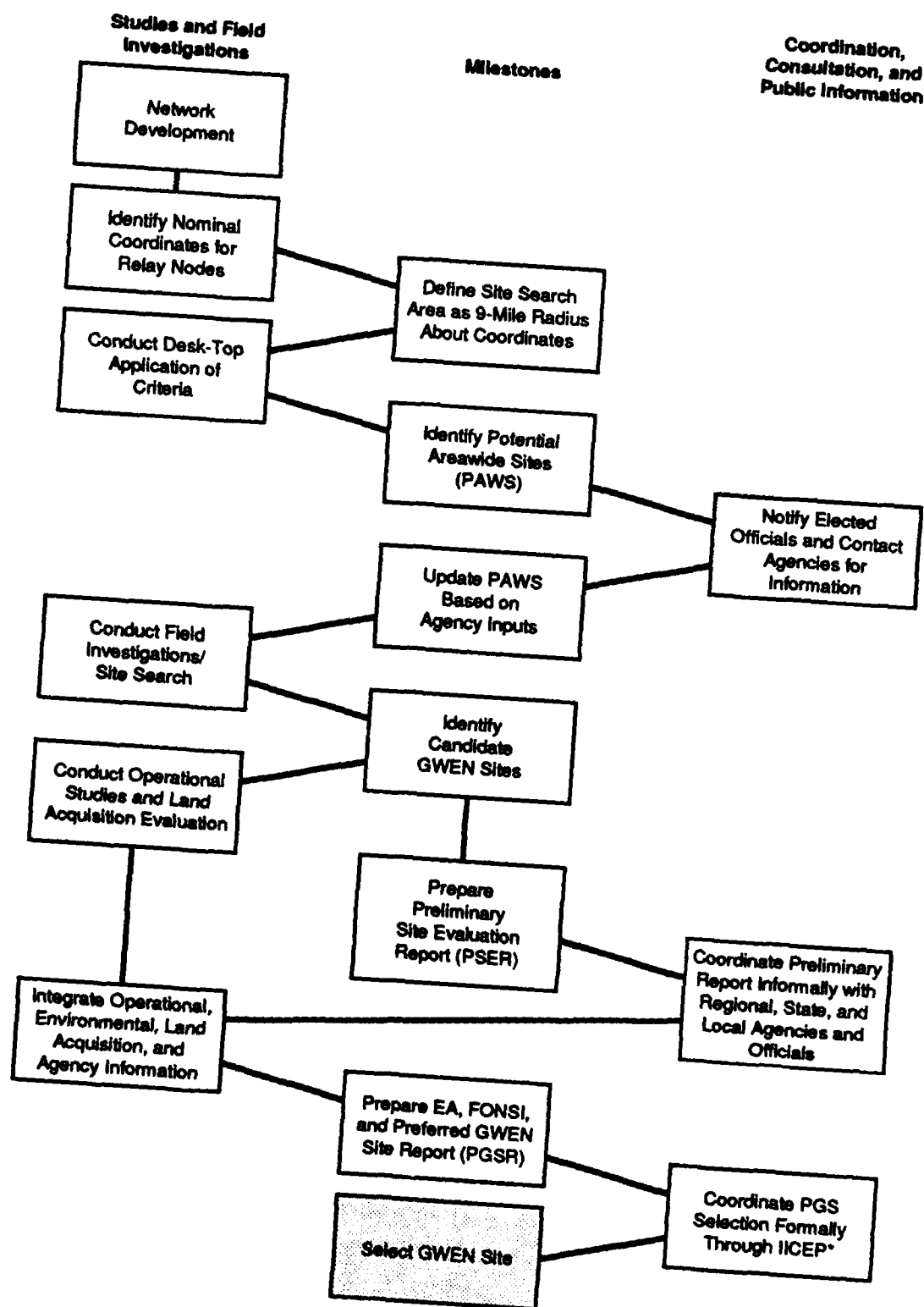
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APPENDIX A

SITE SELECTION PROCESS

SITE SELECTION PROCESS

Figure A.1 of this EA shows the sequence of events during the selection of individual GWEN sites. Figure A.2 of this EA describes the screening process used during the field investigation to choose the candidate GWEN sites (CGSs). The environmental siting criteria applied in the site selection process are defined in Tables 5-1 and 5-2, pages 5-7 through 5-14 of the FEIS.



*IICEP = Interagency/Intergovernmental Coordination for Environmental Planning.

FIGURE A.1 GROUND WAVE EMERGENCY NETWORK SITE SELECTION PROCESS

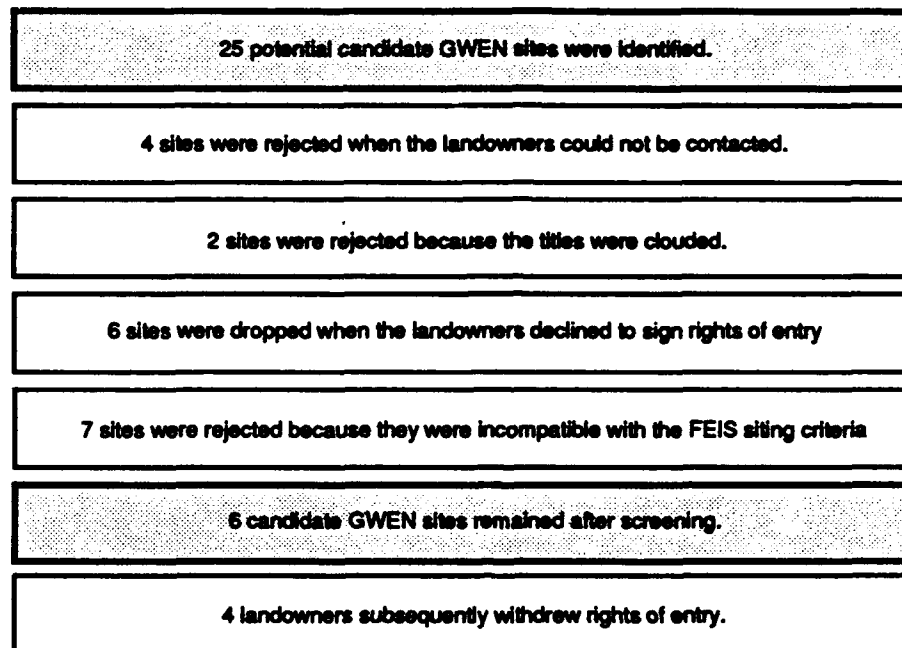


FIGURE A.2 RESULTS OF USING FEIS SITING CRITERIA TO SCREEN POTENTIAL CANDIDATE GWEN SITES IN THE NORTH CENTRAL WISCONSIN SITE SEARCH AREA

APPENDIX B

TOPOGRAPHIC SETTINGS OF CANDIDATE GWEN SITES

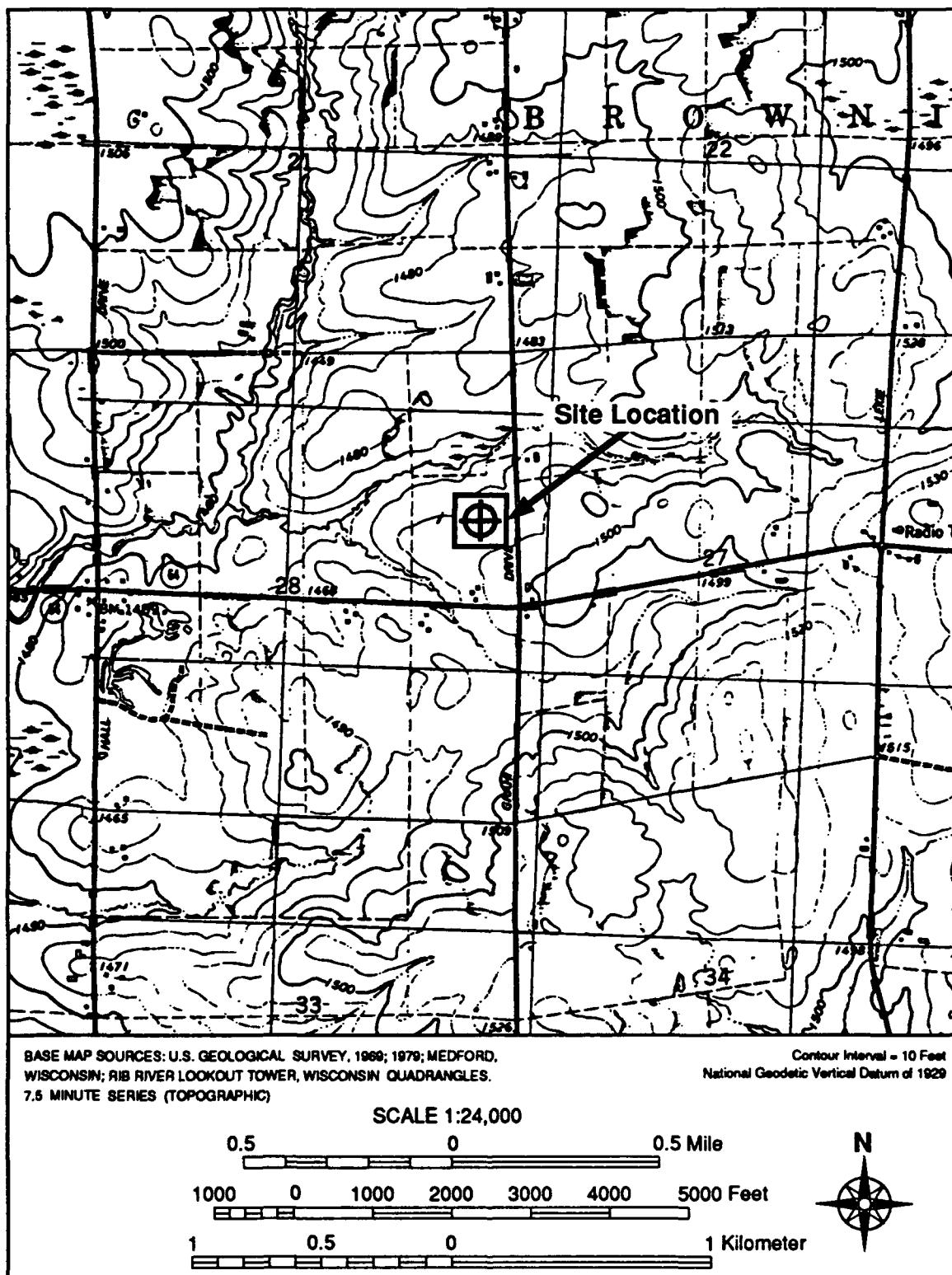


FIGURE B.1 TOPOGRAPHIC SETTING OF THE CRASS SITE (CGS-1)

COPY AVAILABLE TO DTIC DOES NOT PERMIT FULLY LEGIBLE REPRODUCTION

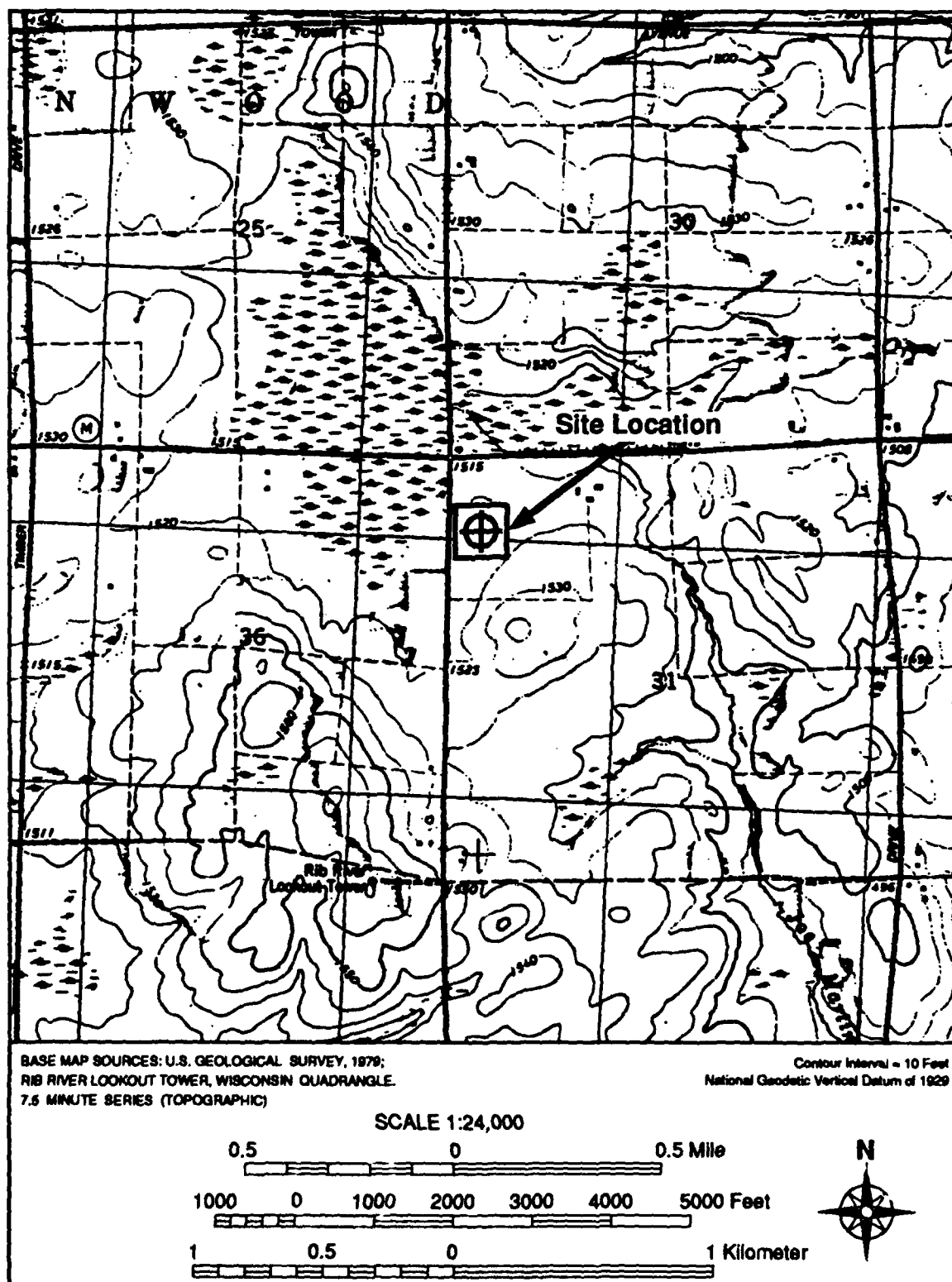


FIGURE B.2 TOPOGRAPHIC SETTING OF THE STEEN SITE (CGS-12)

COPY AVAILABLE TO DTIC DOES NOT PERMIT FULLY LEGIBLE REPRODUCTION

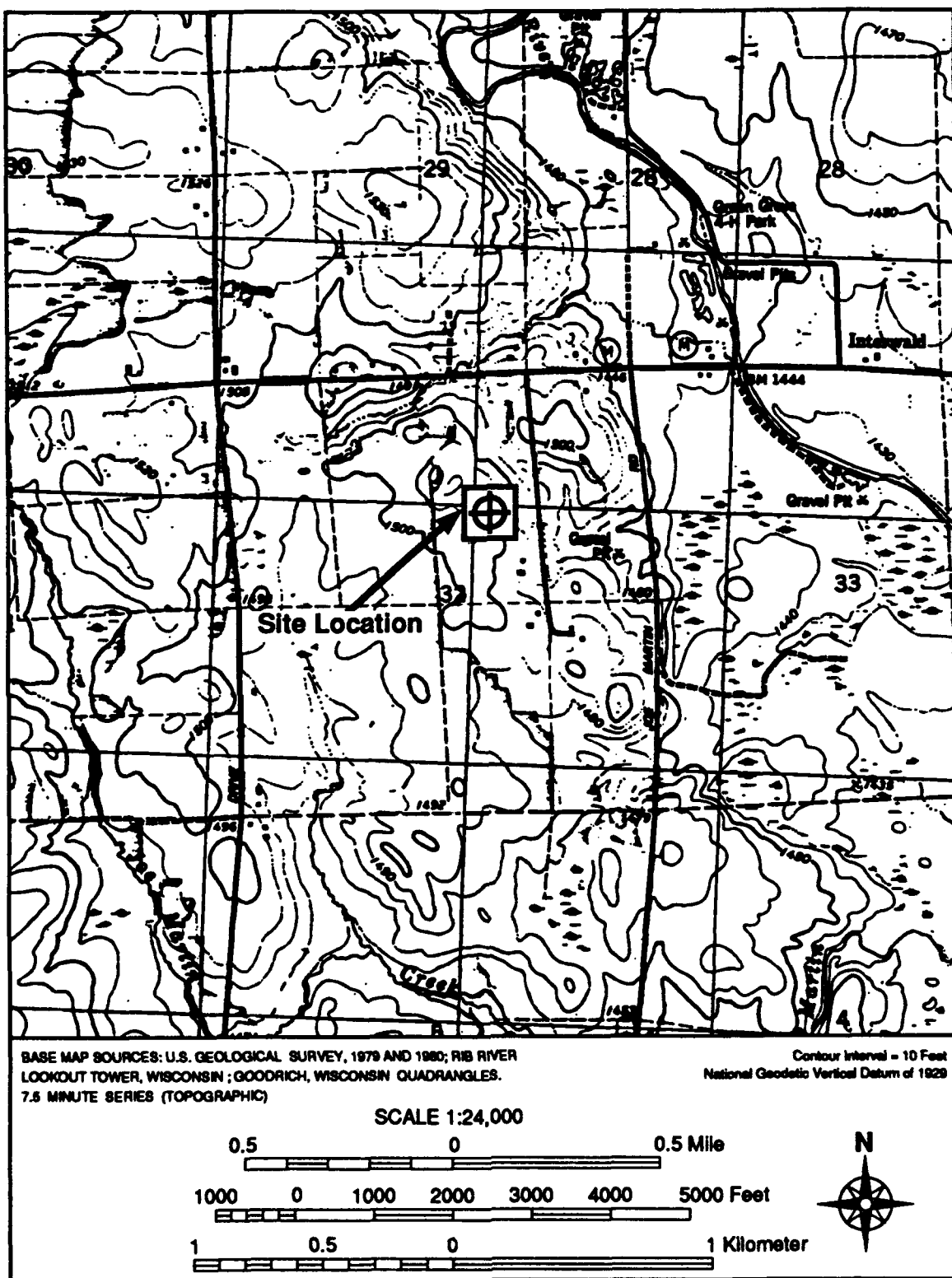


FIGURE B.3 TOPOGRAPHIC SETTING OF THE GEBAUER SITE (CGS-14)

COPY AVAILABLE TO DTIC DOES NOT PERMIT FULLY LEGIBLE REPRODUCTION

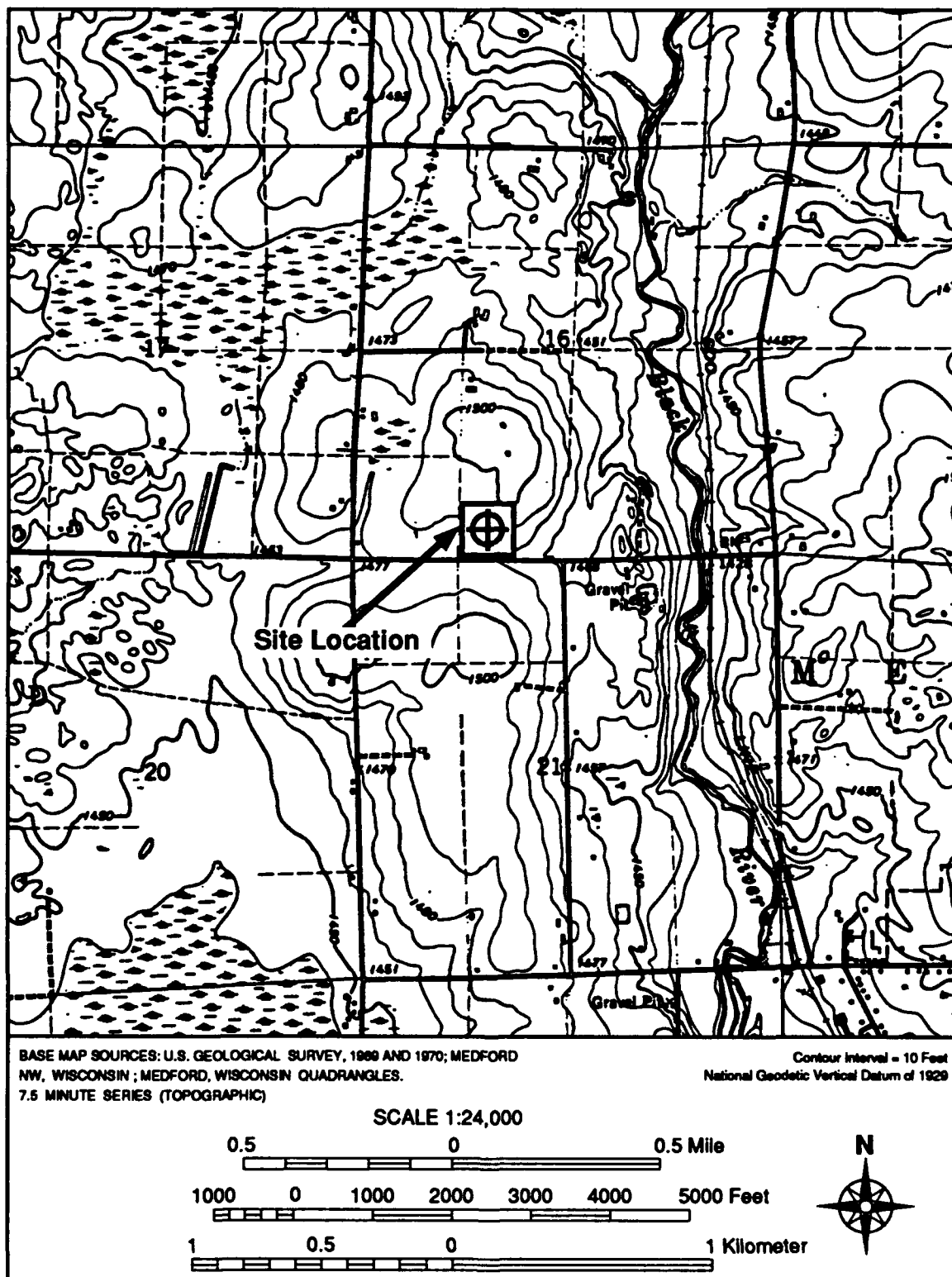


FIGURE B.4 TOPOGRAPHIC SETTING OF THE SCHUBERT SITE (CGS-15)

COPY AVAILABLE TO DTIC DOES NOT PERMIT FULLY LEGIBLE REPRODUCTION

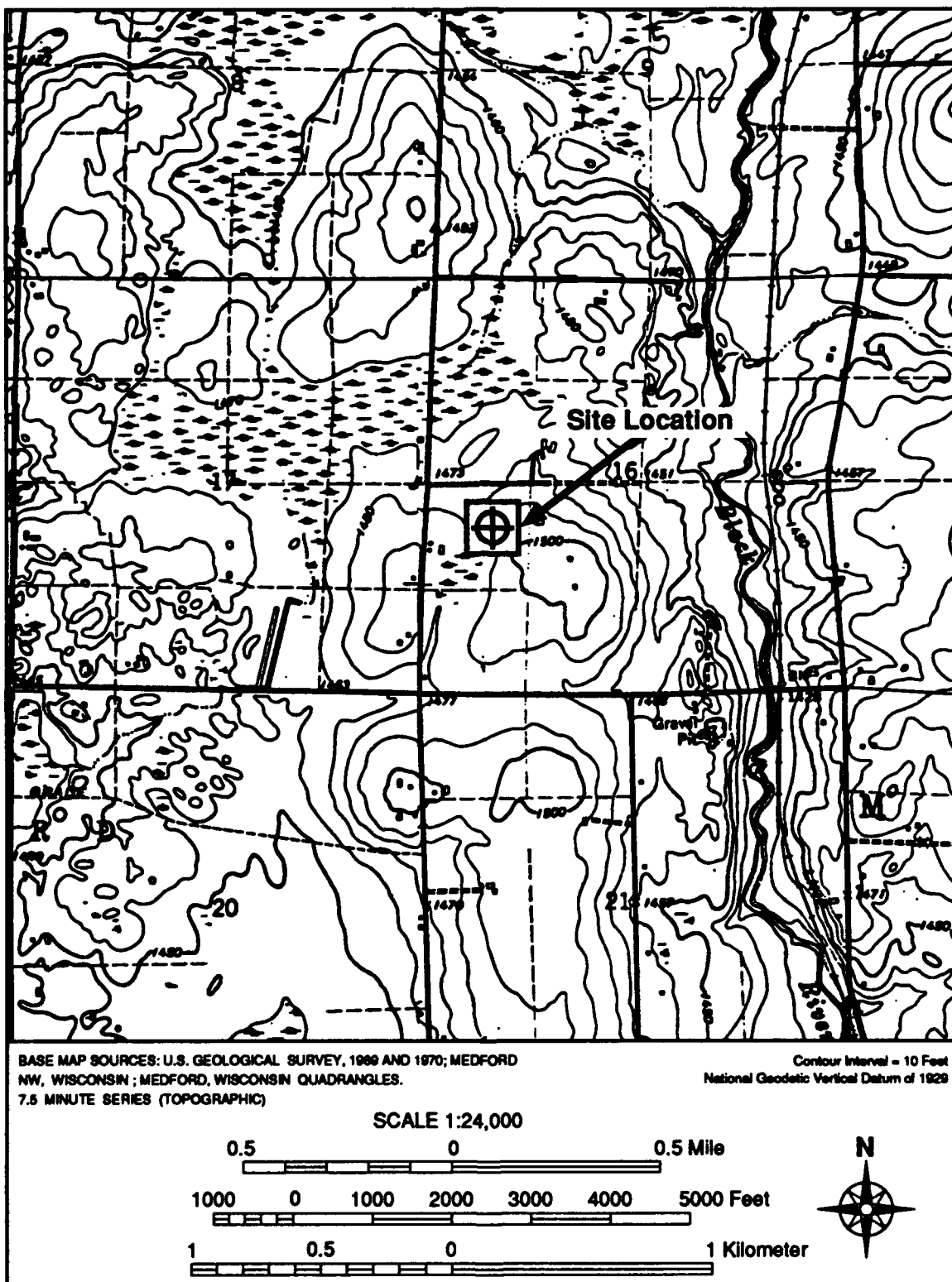


FIGURE B.5 TOPOGRAPHIC SETTING OF THE KASPAREK SITE (CGS-17)

COPY AVAILABLE TO DTIC DOES NOT PERMIT FULLY LEGIBLE REPRODUCTION

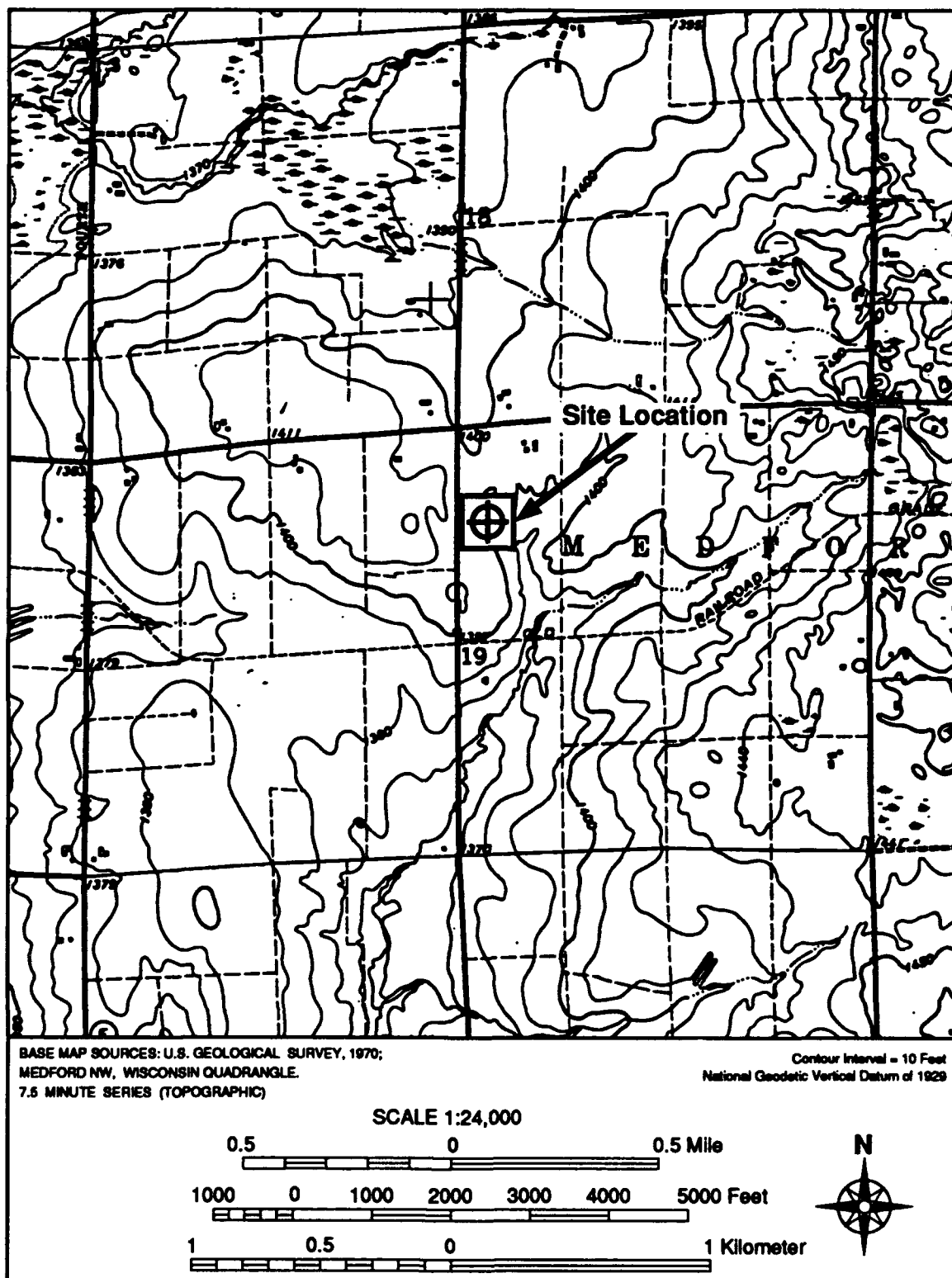


FIGURE B.6 TOPOGRAPHIC SETTING OF THE MILLER SITE (CGS-20)

COPY AVAILABLE TO DTIC DOES NOT PERMIT FULLY LEGIBLE REPRODUCTION

APPENDIX C
CORRESPONDENCE

CORRESPONDENCE

Appendix C documents contacts with the following federal and state agencies and Native American groups:

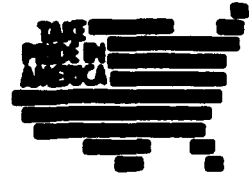
<u>Individual Contacted</u>	<u>Agency</u>	<u>Date</u>	<u>Response</u>
K. L. Stromborg, Acting Field Supervisor	U.S. Department of the Interior, Fish and Wildlife Service	10-19-89	Attached
J. M. Smith, Field Supervisor	U.S. Department of the Interior, Fish and Wildlife Service	08-22-90 06-11-92	Attached Attached
R. W. Dexter, Chief, Compliance Section	The State Historical Society of Wisconsin, Division of Historic Preservation	11-01-89	Attached
J. L. Kolb, Archaeologist	The State Historical Society of Wisconsin, Division of Historic Preservation	07-17-90	Attached
G. Miller, Chairman	Menominee Indian Tribe of Wisconsin	08-18-92	Attached
D. Moore, Sr., Chairman	Bad River Tribal Council	Letter sent on 08-07-92, but no response has been received to the letter or to several attempts at phone communication.	

<u>Individual Contacted</u>	<u>Agency</u>	<u>Date</u>	<u>Response</u>
J. Crawford, Chairman	Forest County Potawatomi General Council		Letter sent on 08-07-92, but no response has been received to the letter or to several attempts at phone communication.
Gaiashkibos, Chairman	Lac Courte Oreilles Tribal Council		Letter sent on 08-07-92, but no response has been received to the letter or to several attempts at phone communication.
M.W. Allen, Sr., President	Lac du Flambeau Tribal Council		Letter sent on 08-07-92, but no response has been received to the letter or to several attempts at phone communication.
R. Hill, Chairman	Oneida Executive Committee		Letter sent on 08-07-92, but no response has been received to the letter or to several attempts at phone communication.
R. Gurnoe, Chairman	Red Cliff Tribal Council		Letter sent on 08-07-92, but no response has been received to the letter or to several attempts at phone communication.

<u>Individual Contacted</u>	<u>Agency</u>	<u>Date</u>	<u>Response</u>
R.A. McGeshick, Sr., Chairman	Sokaogon Chippewa Tribal Council		Letter sent on 08-07-92, but no response has been received to the letter or to several attempts at phone communication.
D. Saros, President	St. Croix Council		Letter sent on 08-07-92, but no response has been received to the letter or to several attempts at phone communication.
R.C. Miller, President	Stockbridge-Munsee Tribal Council		Letter sent on 08-07-92, but no response has been received to the letter or to several attempts at phone communication.
J. Jones, Executive Officer	Wisconsin Winnebago		Letter sent on 08-07-92, but no response has been received to the letter or to several attempts at phone communication.



United States Department of the Interior



FISH AND WILDLIFE SERVICE

GREEN BAY FIELD OFFICE (ES)
Univ. of Wisconsin-Green Bay
Green Bay, Wisconsin 54311-7001

IN REPLY REFER TO:

October 19, 1989

Mr. Buford R. Holt
Senior Consultant
SRI International
333 Ravenswood Avenue
Menlo Park, CA 94025

re: Air Force Radio Tower
Medford
Taylor County, Wisconsin

Dear Mr. Holt:

Your letter of July 6, 1989, requested U.S. Fish and Wildlife Service (Service) threatened and endangered species comments on a proposal by the Air Force to place a guyed, 299-foot radio tower in the Medford area. We apologize for our delayed response. Priority work items and time constraints have precluded an earlier response.

We note from review of the U.S. Geological Survey's quadrangle maps that numerous wetlands exist in the area of consideration for project construction. We recommend that your project be situated in a fashion that would not require wetland filling. Impacts to streams, lakes, and rivers should also be avoided. Wetland or waterway fills may require permits from the Wisconsin Department of Natural Resources (Wisconsin Department) and the U.S. Army Corps of Engineers (Corps). Information on permits can be obtained by contacting the Wisconsin Department's Northwest District Office at Spooner, Wisconsin (715) 635-2101 and the St. Paul District Corps Office at (612) 220-0354.

This project should be coordinated with the Wisconsin Department for their input and concerns. The Environmental Impact Coordinator for the Wisconsin Department's Northwest District is Mr. William Clark who can be reached by calling (715) 635-4226.

Federal Threatened and Endangered Species

A review of our files indicates that the following federally listed species are present in Taylor County, Wisconsin.

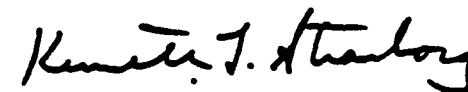
<u>Classification</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Habitat</u>
threatened	bald eagle	<u>Haliaeetus</u> <u>leucocephalus</u>	breeding

Review of information in our files indicates that there is one bald eagle nest in the vicinity of your area of consideration. The nest is located in Township 33 North, Range 1 West, Section 25 NESE SENE. We recommend your project avoid this area. The environmental assessment for this project should clearly indicate distances of the alternative project sites from the bald eagle nest as well as describe measures to be taken to preclude adversely affecting the nesting area.

The Service is providing the most current information known to date. There is a possibility however, that before this project is constructed that other species may be listed or additional bald eagle nest sites may be identified. The Service should be consulted for information on federally threatened and endangered species prior to project construction.

Further information on the above can be obtained by contacting Ms. Catherine Carnes of my staff who can be reached at (414) 465-2682

Sincerely,


Kenneth L. Stromborg
Acting Field Supervisor

cc: WDNR, Northwest District, Spooner, WI.
Attn: Bill Clark.

WDNR, Northwest District, Ladysmith, WI
Attn: Frank Vanecek



United States Department of the Interior

Fish and Wildlife Service
Green Bay Field Office
1825 South Webster Avenue, Bldg. 2
Green Bay, Wisconsin 54301



In Reply Refer to:

August 22, 1990

Mr. Buford Holt
SRI International
333 Ravenswood Avenue
Menlo Park , California 94025

re: Air Force
Ground Wave Emergency Network
Medford Area Tower Sites
Taylor County, Wisconsin

Dear Mr. Holt:

In a letter dated May 11, 1990, you requested the U.S. Fish and Wildlife Service's (Service) concurrence with your determination that the six proposed Ground Wave Emergency Network tower sites near Medford, Wisconsin would not adversely affect the bald eagle. We offer these further comments at this time.

The towers have a high potential to adversely affect migratory birds, especially waterfowl, if they are located near open water or river corridors. To reduce avian collisions, the selected tower site should be well removed from any open water area. We note that some of the towers are near wetlands or open water (Sites 1, 12, and 17). Assessment of these wetlands should be made to determine the presence of open water and waterfowl use. If the wetlands near a tower site support waterfowl, we recommend that the site not be used.

All bird species in the United States, except the house sparrow, European starling, and rock dove, are protected by the Migratory Bird Treaty Act (16 U.S. C. 703-711) (Act). The Act states in part that "...it shall be unlawful at any time, by any means, or in any manner to ...take..., any migratory bird, any part, nest, or eggs of any such bird..." which is protected by the Act. The provisions of the Act could impact this project in two ways. First, collisions of birds with man-made structures can and may be considered a taking activity under the Act. Accordingly, to minimize the potential for taking we recommend that the towers be painted a fluorescent color to enhance their visibility to birds in flight and that the guy wires and other structures greater than 50 feet in height be marked to enhance their visibility to flying birds. Commonly used marking materials include yellow aviation marker balls, yellow plastic plates, or spiral vibration dampers.

Provisions of the Act also extend to the nests, eggs, or young of birds. Accordingly, we recommend that prior to any project activities planned during the primary nesting season (April 1 to July 15) that could result in the taking of a migratory bird nest, egg, or young, that a survey be conducted by the applicant. Any active nests, eggs, or dependent young should be reported immediately to this office.

These comments relating to migratory bird concerns are in concurrence with those from the Service's St. Paul, Minnesota; and Grand Island, Nebraska Field Offices which are also reviewing potential tower sites for this project.

Federal Threatened and Endangered Species

Based on the location of the six proposed tower sites, which are well removed from the closest bald eagle nest (11.6 miles), we concur that these sites should not adversely affect the bald eagle. However, we recommend, that prior to project construction, you contact this office for a final determination relative to the impact of the structures on federally threatened or endangered species. There is a possibility that before this project is constructed that other species may be listed or additional bald eagle nest sites may be identified.

Any questions should be directed to Ms. Catherine Carnes of my staff who can be reached by calling 414-433-3803.

Sincerely,



Janet M. Smith
Field Supervisor

cc: WDNr, Northwest District, Spooner, WI Attn: Bill Ganz
WDNR, Northwest District, Ladysmith, WI Attn: Frank Vanecek
USFWS, Law Enforcement, Suamico, WI Attn: Roy Owens
USFWS, Law Enforcement, St. Paul, MN Attn: Kevin Adams



THE STATE HISTORICAL SOCIETY OF WISCONSIN

H. Nicholas Muller III, Director

816 State Street
Madison, Wisconsin 53706
608/262-3266

November 1, 1989

Mr. Buford R. Holt
SRI International
333 Ravenswood Avenue
Menlo Park, California 94025

SHSW: #89-1153

RE: Air Force Project in Taylor County

Dear Mr. Holt:

We have reviewed the above-referenced project as required for compliance with Section 106 of the National Historic Preservation Act and 36 CFR Part 800: Protection of Historic Properties, the regulations of the Advisory Council on Historic Preservation governing the Section 106 review process.

There are no structures listed in the National Register of Historic Places located within the area of the proposed undertaking. Furthermore, we are not aware of any structures that may be eligible for the National Register in this area.

There are no known archeological sites in the project area, but the area has never been surveyed for such resources. Based on our knowledge of similar locations elsewhere in Wisconsin, we believe there is a high probability that the project area may contain archeological material. For this reason, we recommend that all areas of proposed development practices be surveyed by a qualified archeologist to locate and evaluate the significance of any archeological sites that may be present. When the survey has been completed, two copies of the archeologist's report should be forwarded to our office for our review and comments.

This report should be accompanied by a copy of our letter requesting the survey, which contains identifying information that is essential in order to unite the report with our previous project records. In the event a copy of our letter is omitted, we will, at our discretion, return the report to the sender with a request for the necessary identifying information.

We remind you that 36 CFR 800.4 includes the requirement that you seek information, as appropriate to the undertaking, from parties likely to have knowledge of or concerns with historic properties in the project area - such as Indian tribes, local governments, and public and private organizations.

If there are any questions concerning this matter, please contact Gretchen Block of my staff at (608) 262-2732.

Sincerely,


Richard W. Dexter
Chief, Compliance Section
DIVISION OF HISTORIC PRESERVATION

RWD:JK/lkr

0399/1667a

cc: Mr. Charles Hillerson, CORPS
Omaha District



THE STATE HISTORICAL SOCIETY OF WISCONSIN

H. Nicholas Muller III, Director

816 State Street
Madison, Wisconsin 53706
608 262-3266

July 17, 1990

Mr. Buford R. Holt
SRI International
333 Ravenswood Avenue
Menlo Park, California 94025

IN REPLY PLEASE REFER TO
SHSW: #89-1153

RE: GWEN North Central Wisconsin Air Force Project

Dear Mr. Holt:

We have reviewed the archeological report entitled "A Phase I Cultural Resources Survey of the Six U.S. Air Force Ground Wave Emergency Network Sites in the Towns of Medford, Greenwood, and Browning, Taylor County, Wisconsin."

The survey procedures utilized were sufficiently thorough to justify the conclusion that there are no archeological resources eligible for inclusion on the National Register of Historic Places within the areas surveyed.

As indicated in the report, it is always possible that deeply buried archeological sites may be found during construction. If such finds are made, please contact our office at (608) 262-2970. Should burials be discovered during construction, you must contact our office immediately for compliance with S. 157.70, Wis. Stats., which provides for the protection of human burial sites.

This completes our review of this project, with this letter constituting our final comments. Should project plans be modified, please submit any changes for review. Thank you for your cooperation.

Sincerely,

Jennifer L. Kolb
Archeologist
DIVISION OF HISTORIC PRESERVATION

JLK:1kr

0397a/1669a

cc: Joyce McKay
Fred Finney

C-11



IN REPLY REFER TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Green Bay Field Office
1015 Challenger Court
Green Bay, Wisconsin 54311-8331

TAKE
PRIDE IN
AMERICA

June 11, 1992

Mr. Stephen T. Martin, Lt. Col, USAF
Program Manager, GWEN
Department of the Air Force
Hanscom Air Force Base,
Massachusetts 01731-5000

re: Endangered Species Update
GWEN Project
Taylor County, Wisconsin

Dear Mr. Martin:

Your letter of April 24, 1992 requested an endangered species update on the U.S. Air Force's Ground Wave Emergency Network (GWEN) project in Taylor County.

Federal Threatened and Endangered Species

As identified in our letter of October 19, 1989, bald eagle breeding habitat occurs in Taylor County. No additional species of Federal concern have been listed for Taylor County. No bald eagle nest or critical habitat is known to occur at any of the six sites identified in your correspondence of May 11, 1990.

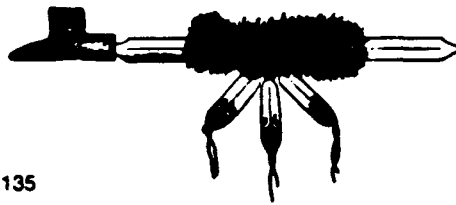
Please forward us a copy of the environmental assessment once completed for our review.

Questions pertaining to these comments should be directed to Ms. Catherine Carnes who can be reached by calling 414-433-3803.

Sincerely,

Janet M. Smith
Field Supervisor

Menominee Indian Tribe of Wisconsin



P.O. Box 397
Keshena, Wisconsin 54135

1-715-799-5100
FAX 1-715-799-4525

August 18, 1992

Holly Mendel
SRI International, Rm. AG 349
333 Ravenswood
Menlo Park, California 94025

Dear Ms. Mendel,

I would like to take this opportunity to thank you for your letter of notification regarding the GWEN project here in central Wisconsin. The Menominee Tribe has widespread historical interests throughout the state and we are currently registered with the Burial Sites Preservation Board and the State Historical Preservation Office as interested parties in areas that are presently known as well as new areas that are found. Although you have supplied the Tribe with several reports, it is our understanding that your company will provide for archaeological surveys/reports on these potential sites. This will enable us to make specific determinations regarding your project. Our present position is that if and when you do come upon an archaeological site, we request notification of the finding and provision of time for our representatives to make an onsite visit so that the Menominee Tribal Legislature can take an official position at that time. Please let us know if you have anything further on this project.

Sincerely,

A handwritten signature in black ink, appearing to read "G. Miller". The signature is written in a cursive style with a large, looping initial "G".

Glen T. Miller, Chairman
MENOMINEE TRIBAL LEGISLATURE
Menominee Indian Tribe of WI

cc: Real Estate Services
State Historical Preservation Office
Burial Sites Preservation Board

APPENDIX D

GLOSSARY

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Abbreviations and Units of Measure

AM	Amplitude modulation
ATU	Antenna Tuning Unit
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
Btu	British thermal unit
BUPG	Back-up power group
CGS	Candidate GWEN site
COE	U.S. Army Corps of Engineers
dBA	Decibels on the A-weighted scale, which is a measure of the intensity of the sounds people can hear
EA	Environmental Assessment
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement; in this document, the term refers to the FEIS for the GWEN Final Operational Capability that was released in September 1987 by the U.S. Air Force, Electronic Systems Division, Hanscom Air Force Base, Massachusetts

FICWD	Federal Interagency Committee for Wetland Delineation
FOC	Final Operational Capability, the third phase of development of GWEN
FONSI	Finding of No Significant Impact
GWEN	Ground Wave Emergency Network
HEMP	High-altitude electromagnetic pulse
IICEP	Interagency and Intergovernmental Coordination for Environmental Planning, the formal review process for the EA
kHz	Kilohertz
LF	Low frequency
MM	Modified Mercalli
µg/l	Micrograms per liter (1 µg/l = 1 ppb)
NRC	National Research Council, the principle operating agency of the National Academy of Sciences and the National Academy of Engineering
NRHP	National Register of Historic Places
PAWS	Potential areawide sites; the portion(s) of an SSA left after application of those siting criteria that do not require a field survey, such as the location of national and state parks

PCGS	Potential candidate GWEN site; any site that is identified from roadside surveys as suitable for further investigation
PGS	Preferred GWEN site; the CGS identified by the Government that represents the Government's preferred location for a relay tower
ppb	Parts per billion
ppm	Parts per million
PSER	Preliminary Site Evaluation Report
SCS	Soil Conservation Service, a unit of the United States Department of Agriculture
SHPO	State Historic Preservation Officer; the person responsible for administering the National Historic Preservation Act at the state level, reviewing National Register of Historic Places nominations, maintaining data on historic properties that have been identified but not yet nominated, and consulting with federal agencies concerning the impacts of proposed projects on known and unknown cultural resources
SSA	Site search area; the 250-square-mile area within which four to six CGSs are identified; the SSA is the area within a 9-mile radius of a set of nominal coordinates in the network design. It is used as a manageable range in which to conduct siting investigations.
TLCC	Thin Line Connectivity Capability; the second phase of development of GWEN

UHF	Ultrahigh frequency (band); specifically 300 to 3,000 megahertz
USAF	United States Air Force
USC	United States Code
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VMC	Visual Modification Class
WDNR	Wisconsin Department of Natural Resources
WDT	Wisconsin Department of Transportation

Definitions

Air pollutant	An atmospheric contaminant, particularly the 15 atmospheric contaminants specified in federal and most state regulations
Bracken fern	<i>Pteridium aquilinum</i> , a fern with horizontal leaf blades attached to vertical stalks, commonly found in open woods and other disturbed upland areas throughout the boreal forests
Candela	A unit of measure of the intensity of light equal to the brightness of one candle
Convective storm	A storm, such as a thunderstorm, resulting from strong vertical movement of air above strongly heated surfaces

Cultural resource	Prehistoric, Native American, and historic sites, districts, buildings, structures, objects, and any other physical evidence of past human activity
Cyclonic storm	A storm, such as a gentle rainstorm, resulting from strong vertical movements of large air masses at a continental scale
Evaluative criteria	Applied to portions of a potential siting area for a GWEN facility to determine its suitability. Areas that rank low against evaluative criteria may be excluded from consideration, or given a low priority in the site selection process
Exclusionary criteria	Criteria used to eliminate or exclude highly sensitive areas or areas that do not meet the limits of acceptable performance from consideration for GWEN facilities
Federal jurisdictional wetland	As defined in the <i>Federal Manual for Identifying and Delineating Jurisdictional Wetlands</i> (GPO 1989-236-985/00336), a wetland is a class of habitats distinguished by the presence of saturation to the surface or standing water during at least 1 week of the growing season (wetland hydrology), a soil type characteristic of saturated or poorly drained conditions (hydric soils), and the predominance of plants that only or mostly occur on wet sites (hydrophytic vegetation)
Glacial till	Unsorted and poorly sorted sediments deposited by melting glaciers
Glaciated	Areas affected by the former presence of glaciers and continental ice sheets
Glossaqualfs	A soil class allied to, but wetter than, the glossoboralfs, whose members are typically somewhat poorly drained and have a lower base saturation than the glossoboralfs

Glossoboralfs	A soil class found in relatively humid, cool regions whose members typically are freely drained, have a moderately high base content, at least moderately deep bedrock, loamy or clayey texture, and a clay layer characterized by tongues of bleached material
Grey-brown podzolics	A class of strongly leached soils found in middle to high latitudes that typically formed under deciduous or mixed deciduous and evergreen forests
Ground plane	A part of the antenna system consisting of buried copper wires that extend radially from the base of a GWEN tower for a distance of approximately 330 feet
Historic properties	Those cultural resources that are listed, or eligible for listing, in the National Register of Historic Places
Igneous rock	Rock formed from a molten state, such as basalt or granite
Leachate	A substance transported out of the soil in solution
Loamy	Describes the characteristics of a rich, crumbly soil that contains a relatively equal mixture of sand and silt and a somewhat smaller proportion of clay
Mesic forest	Forest having a balanced supply of moisture
Metamorphosed rock	Rocks that have been transformed through the action of intense pressures and high temperatures, such as marbles (metamorphosed limestones) and slates (metamorphosed shales)

Modified Mercalli (MM) scale	A measure of the intensity of seismic activity based on human perception of the event and the potential for damage; the intensity is rated on a Roman numeral scale ranging from I to XII. An earthquake of MM intensity I would be detectable only by seismographs; MM intensity V would shake buildings, break dishes and glassware, and cause unstable objects to fall; MM intensity X would destroy most masonry and frame structures, bend railroad rails slightly, and cause large tidal waves and landslides; MM intensity XII would cause nearly total destruction of all buildings. Another commonly used seismic intensity scale, based on readings from a seismograph, is the Richter scale, which was developed in 1935. The Modified Mercalli scale is often used when the historic period to be covered includes data prior to 1935
Paleonto- logical	Pertaining to fossils or the study of fossils
Phase I archaeological survey	A survey conducted by a trained archaeologist that is designed to test for the presence or absence of archaeological resources; it involves walking an area at predetermined intervals and may involve digging small shovel pits if ground visibility is low
Precambrian	The geological periods that preceded the appearance of hard-bodied, multicellular life forms about 600 million years ago
Prime farmland	Land that contains soils having high crop production either naturally or through modification; the U.S. Soil Conservation Service is responsible for designating prime farmland
Sedimentary rock	Rock formed by the consolidation or cementation of particles deposited by water or wind

**Top-loading
element**

Portions of the antenna that extend diagonally from the top of the tower, which strengthen the signal and provide additional structural support like guy wires