GROUND WAVE EMERGENCY NETWORK
FINAL OPERATIONAL CAPABILITY

ENVIRONMENTAL ASSESSMENT
FOR
CENTRAL MINNESOTA RELAY NODE

SITE NO. RN 8C935MN

26 February 1993

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FINDING OF NO SIGNIFICANT IMPACT

NAME OF ACTION: GROUND WAVE EMERGENCY NETWORK
CENTRAL MINNESOTA RELAY NODE

DESCRIPTION OF PROPOSED ACTION ALTERNATIVES:

The U.S. Air Force plans to construct a radio communications relay node in central Minnesota (Crow Wing County or Morrison County) as part of the Ground Wave Emergency Network (GWEN) communications system. Five action alternatives associated with five candidate GWEN sites (CGSs) in central Minnesota 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 central Minnesota 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 central Minnesota. Regional screening resulted in the identification of five CGSs in central Minnesota 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 five action alternatives and the no action alternative.

The proposed relay node in central Minnesota 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. Depending on the CGS selected, a radial ground plane, composed of 60 to 150, 0.128-inch-diameter copper wires buried about 12 inches underground, will extend out from 330 to 470 feet from the tower base. A 4-foot-high fence will be installed around the perimeter of the guy anchors.

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.

Five action alternatives are discussed in this Finding of No Significant Impact (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. A maximum of 11 acres of 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 farmland or former farmland and do not contain sensitive wildlife habitat. There would be no significant impacts on wetlands and no CGS is within a 100-year floodplain. Informal consultation with the U.S. Fish and Wildlife Service indicated that the project would not affect any threatened or endangered species. The Minnesota State Department of Natural Resources indicated that no state-listed threatened or endangered species 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 migratory 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 Minnesota Historical Society was consulted and concurred that the project would not likely 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 Weiland (CGS-3), Donaldson (CGS-5), Thesing (CGS-11), Schlegel (CGS-17), or Kapsner (CGS-18), site. Therefore, an environmental impact statement for a GWEN relay node at the cited locations in central Minnesota is not required.

David O. Williams, Colonel, USAF
Chairman
HQ ESC Environmental Protection Committee

15 Mar 93
Date

PREFERRED GWEN SITE REPORT
CENTRAL MINNESOTA

The U.S. Air Force is proposing to construct a relay node for the Ground Wavc Emergency Network (GWEN) in central Minnesota. 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 five CGSs identified in central Minnesota are referred to as the Weiland, Donaldson, Thesing, Schlegel, and Kapsner sites.

This report summarizes the process of selecting the preferred site from the five CGSs. This PGSR, along with a site-specific Environmental Assessment (EA) and Finding of No Significant Impact (FONSI), is 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 site.

Without an **operationally suitable** location, connectivity of the relay node in central Minnesota to the GWEN network cannot be achieved. 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. Ground conductivity measurements taken at four of the five sites are acceptable. Ground conductivity measurements were not taken at the Weiland site; therefore, the Weiland site can not be assumed to be operationally suitable. Thus, of the five CGSs, only four are considered 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 five CGSs was completed in February 1993. The environmental analysis found that no significant impact would result from construction of the GWEN relay node at any of the five CGSs. A FONSI for all five CGSs was completed on 15 March 1993. Thus, all four of the operationally suitable sites are also environmentally suitable, and none is environmentally favored over the others.

All five CGSs are are **suitable for development** as a GWEN relay node. The FAA has approved construction of the GWEN relay node at any of these five CGSs. However, the **construction cost** at each site varies and is a major discriminator in the selection of the preferred site. All sites are adjacent to three-phase power and telephone service, but three of the sites -- the Donaldson, Thesing, and Kapsner sites -- are set back from the road a considerable distance, requiring additional access road construction and extension of three-phase power and telephone services. Of these three, the Donaldson site is the most expensive to construct, followed in order by the Thesing and Kapsner sites. The Weiland and Schlegel sites abut the road right-of-way, so their additional construction costs are minimal. Thus, the four operationally, environmentally, and developmentally suitable sites can be ranked in order of lowest construction cost with the Schlegel site most favorable followed by the Kapsner, Thesing, and Donaldson sites.

Real estate negotiations have been completed for the Thesing and Kapsner sites. Both landowners prefer to lease their property. However, considerable uncertainty exists over the viability of a lease agreement for the Thesing site because of a pending foreclosure on the property. Negotiations have been suspended for the Weiland, Donaldson, and Schlegel sites. Thus, of the four operationally, environmentally, and developmentally suitable sites, the Kapsner site is favored for acquisition suitability.

With operational, environmental, developmental, and real estate acquisition factors evaluated and acquisition and construction costs considered, the Air Force prefers the Kapsner site. The Kapsner site is preferred because it is operationally, environmentally, and developmentally suitable; negotiations have been completed with the landowner; and the cost to construct the site is acceptable.

I have therefore selected the Kapsner site as the Air Force's preferred site for development as the GWEN relay node in central Minnesota. After reviewing the information received during the IICEP 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 March 93
(Date)

GROUND WAVE EMERGENCY NETWORK
FINAL OPERATIONAL CAPABILITY

ENVIRONMENTAL ASSESSMENT
FOR
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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 central Minnesota, 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 was located in Crow Wing and Morrison counties, in central Minnesota. The SSA discussed in this Environmental Assessment (EA) was centered 4 miles northwest of the village of Harding, in Crow Wing County, at latitude 46.16° N and longitude 94.08° W. The

principal town near the SSA is Brainerd, approximately 5 miles north of the SSA. The largest community in the SSA is the village of Lastrup, in Morrison County.

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. A field investigation for central Minnesota was conducted in September 1989. Twenty-three sites were identified during automobile-based surveys as potential candidate GWEN sites (PCGSs), including two sites on land owned by the Government at Camp Ripley. Attempts were made to contact the owners of the non-Government-owned 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 nine privately owned PCGSs. Rights-of-entry were not required for the two Government-owned PCGSs. Following evaluation against the environmental siting criteria set forth in the FEIS, six of the eleven PCGSs were recommended as candidate GWEN sites (CGSs) for further review. Despite a preference for use of Government-owned land, only one of the Government sites met the environmental criteria set forth in the FEIS and was included as one of the six recommended sites. However, this Government site was also dropped because it interfered with the helicopter training mission at Camp Ripley. Thus, five sites remained. These five CGSs were described in the Preliminary Site Evaluation Report (PSER) of November 1, 1989.

Subsequent to the PSER being issued, and site-specific studies being accomplished, two CGS landowners withdrew their properties from consideration (Weiland, CGS-3, and Schlegel, CGS-17). These landowners are no longer interested in leasing or selling land to the Air Force. However, since all 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 five siting alternatives in central Minnesota. It addresses

only those criteria that apply to the candidate sites. The sixth 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 at any of the five candidate sites would have no significant impacts. 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 constructed on any of the five sites, the project would have no significant impacts on air quality; water quality; land use; mineral resources; known paleontological resources; biological resources, including threatened and endangered species; 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 central Minnesota (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.

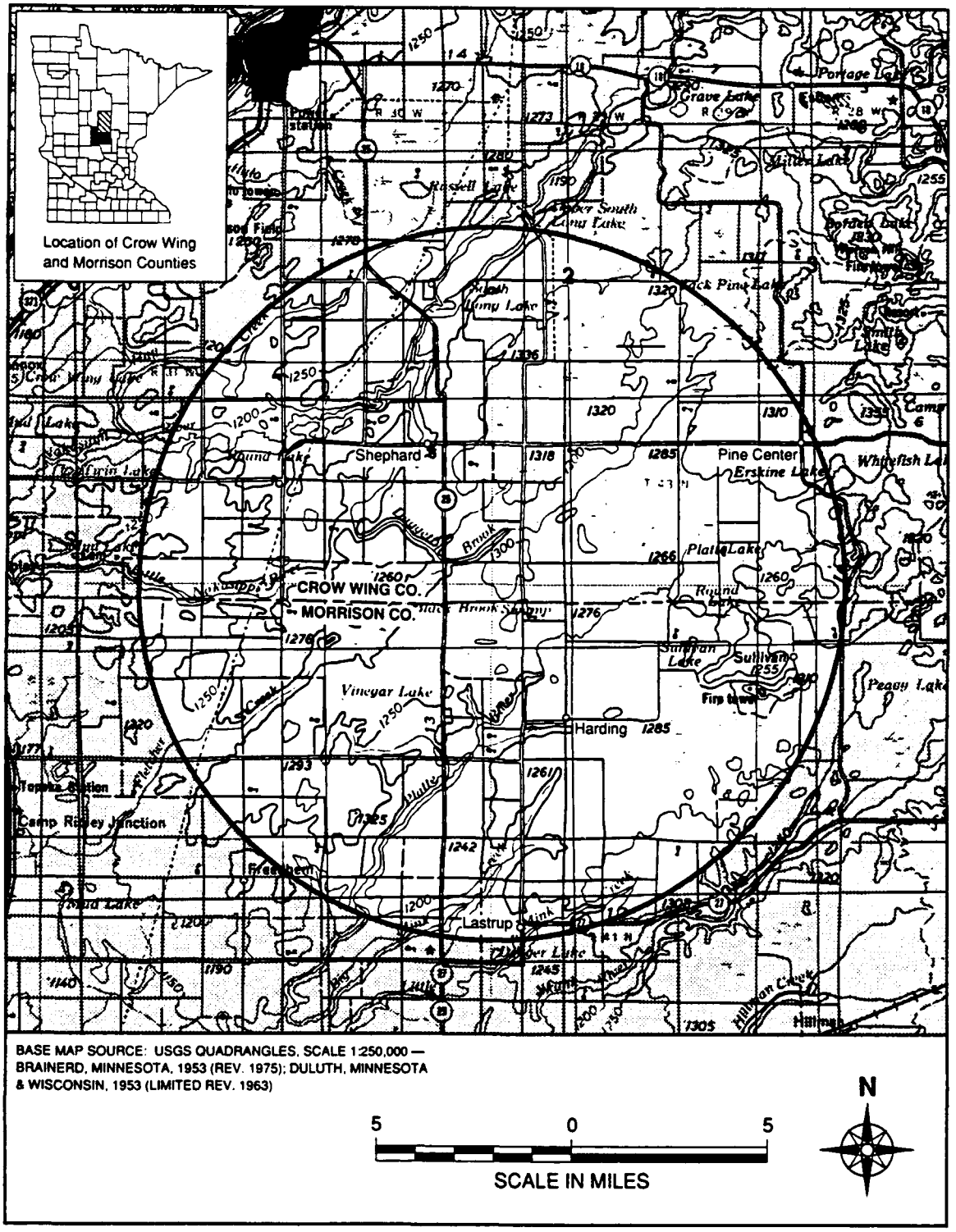


FIGURE 1.1 CENTRAL MINNESOTA SITE SEARCH AREA (SSA), CROW WING AND MORRISON COUNTIES, MINNESOTA

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The five 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 2.6 of this EA. Site descriptive data was obtained during field investigations conducted in September 1989. Figure 2.1 of this EA shows the five 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. 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.

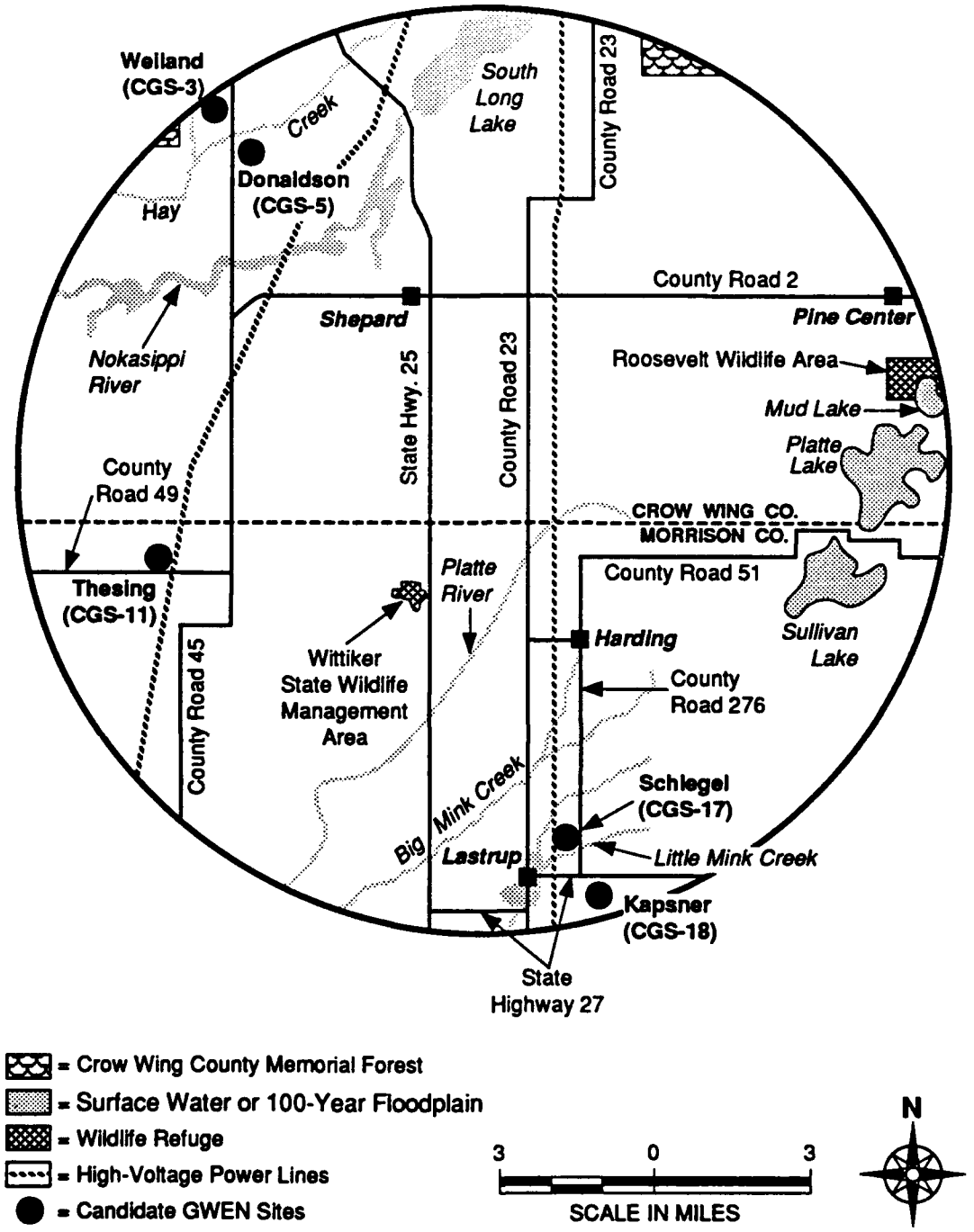


FIGURE 2.1 LOCATION OF CANDIDATE GWEN SITES (CGSs) RELATIVE TO SELECTED MAJOR FEATURES AND ROADS WITHIN THE CENTRAL MINNESOTA SITE SEARCH AREA

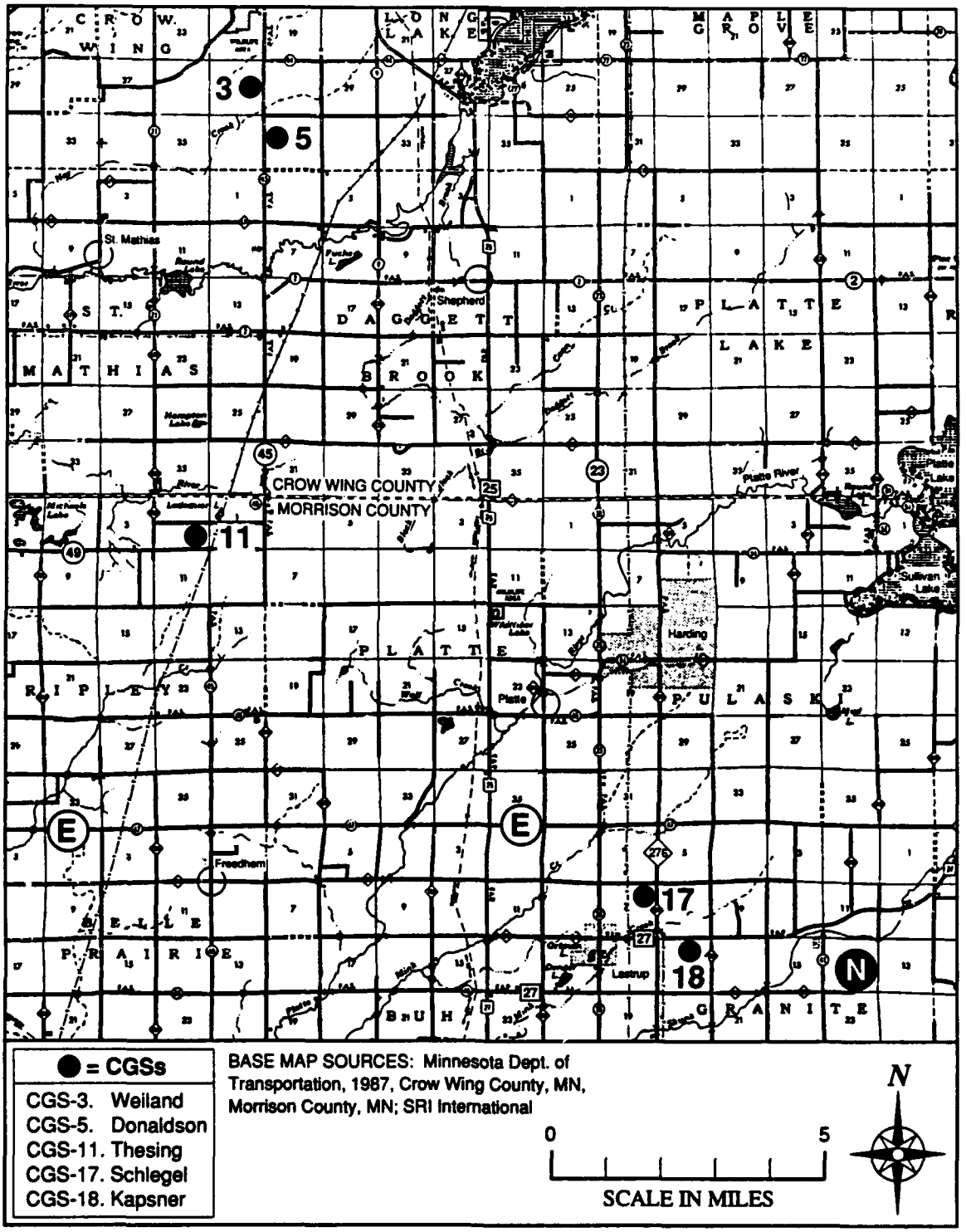


FIGURE 2.2 LOCATIONS OF CANDIDATE GWEN SITES (CGSs) IN CROW WING AND MORRISON COUNTIES, MINNESOTA

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 central Minnesota was conducted in September 1989. Twenty-three sites were identified during automobile-based surveys as potential candidate GWEN sites (PCGSs), including two sites on land owned by the Government, at Camp Ripley. Attempts were made to contact the owners of the non-Government-owned 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 nine privately owned PCGSs. Rights-of-entry were not required for the two Government-owned sites. Following evaluation against the environmental siting criteria set forth in this FEIS, six of the eleven PCGSs were recommended as CGSs for further review. Despite a preference for use of Government-owned land, only one of the Government sites met the environmental criteria set forth in the FEIS, and was included as one of the six recommended sites. However, this Government site was also dropped because it interfered with the helicopter training mission at Camp Ripley. Thus, five sites remained.

Subsequent to the PSER being issued, and site-specific studies being accomplished, two CGS landowners withdrew their properties from consideration (Weiland, CGS-3, and Schlegel, CGS-17). These landowners are no longer interested in leasing or selling land to the Air Force. However, since all 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 central Minnesota. These are

summarized in Sections 4.2 through 4.6 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 buried copper wires, extends out from the base of the tower. Each wire is 0.128 inch in diameter and is 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. For CGS-5, the ground plane has 150 copper wires, 330 to 470 feet long. At all the other CGSs, the ground plane has approximately 100 copper wires, about 330 feet long. A 4-foot-high fence is installed around the perimeter of the guy anchors to protect the guy anchors and to prevent inadvertent exposure to electric shock resulting from the buildup of static electric charge.

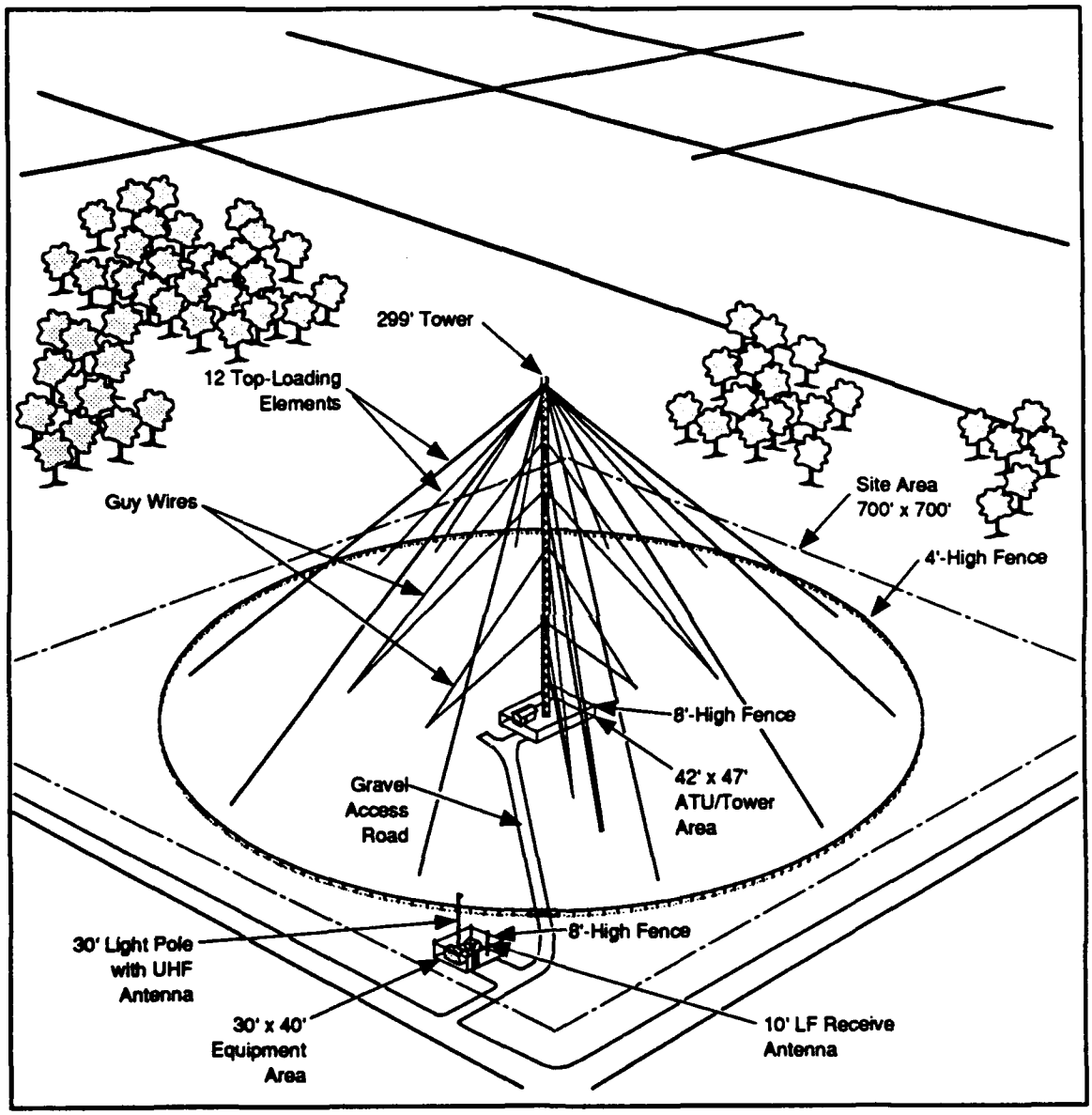


FIGURE 2.3 TYPICAL LAYOUT OF FOC RELAY NODE STATION

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.

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: Weiland Site (CGS-3)

The Weiland site is located on the west side of County State Aid Highway 45, hereinafter called County Road 45, in the southeast quarter of the northeast quarter (SE1/4 NE1/4) of Section 25, Township 44N, Range 31W, Crow Wing Township, Crow Wing County. The site is approximately 0.36 mile south of the intersection of County Road 45 and County State Aid Highway 44, hereinafter called County Road 44. Access would be across the county right-of-way from County Road 45. Approximately 60 feet of access road would be required to reach the site from County Road 45.

Three-phase power would be obtained from overhead lines located across County Road 45, approximately 130 feet from the site. Telephone lines would be connected to an underground cable located across County Road 45, also approximately 130 feet from the site. Grading requirements would be minimal, as the site is flat, level, and unobstructed.

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

2.3 Alternative 2: Donaldson Site (CGS-5)

The Donaldson site is located on the east side of County Road 45 in the SW1/4 NW1/4 of Section 31, Township 44N, Range 30W, Long Lake Township, Crow Wing County. The site is approximately 1.3 miles south of the intersection of County Road 45 and County Road 44, and is set back from County Road 45 approximately 585 feet. Access would be from County Road 45. Approximately 585 feet of access road and a culvert crossing the roadside ditch would be required to reach the site.

Three-phase power would be obtained from overhead lines, 538 feet from the site, along the east side of County Road 45. Telephone lines would be connected to an underground cable, also located along the east side of County Road 45, approximately 525 feet from the site. Grading requirements would be minimal, except for the construction of the access road.

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

2.4 Alternative 3: Thesing Site (CGS-11)

The Thesing site is located on the north side of County State Aid Highway 49, hereinafter called County Road 49, in the SE1/4 SE1/4 of Section 2, Township 42N, Range 31W, Ripley Township, Morrison County. The site is approximately 1 mile west of the intersection of County Roads 49 and 45. A 200-foot access road would be required to reach the site from County Road 49.

Three-phase power would be obtained from overhead lines, 250 feet from the site, along the south side of County Road 49. Telephone lines would be connected to an underground cable approximately 180 feet from the site along the north side of County Road 49. Grading requirements would be minimal, except for the construction of the access road.

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

2.5 Alternative 4: Schlegel Site (CGS-17)

The Schlegel site is located on the west side of County State Aid Highway 276, hereinafter called County Road 276, in the NE1/4 NE1/4 of Section 7, Township 41N, Range 29W, Granite Township, Morrison County. The site is approximately 1 mile north of State Numbered Trunk Highway 27, hereinafter called State Highway 27. A 42-foot access road would be required from County Road 276.

Three-phase power would be obtained from overhead lines along the east side of County Road 276, 110 feet from the edge of the site. Telephone lines would be connected to an underground cable located about 80 feet north of the site across an unnamed road. Grading requirements would be minimal, as the site is flat, level, and free of obstructions.

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

2.6 Alternative 5: Kapsner Site (CGS-18)

The Kapsner site is located on the south side of State Highway 27 in the NE1/4 NW1/4 of Section 17, Township 41N, Range 29W, Granite Township, Morrison County. The site is approximately 1.5 miles east of County State Aid Highway 23, hereinafter called County Road 23, and 0.5 mile east of County Road 276; it is about 1.3 miles east of the densely settled portions of the town of Lastrup. Access would be from State Highway 27, which would require a culvert and a 180-foot access road.

Three-phase power is available from overhead lines on the north side of the road, approximately 230 feet north of the CGS. Telephone lines would be connected to an underground cable, 165 feet away from the site, along the south side of State Highway 27. Minimal grading would be required, and the site is free of major obstructions.

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

2.7 No Action Alternative

The no action alternative is deletion of the central Minnesota 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 central Minnesota. Section 3.1 of this EA describes the general characteristics of the SSA, and Sections 3.2 through 3.6 of this EA describe the unique characteristics of each CGS within the SSA. Site descriptive data was obtained during field investigations conducted in September 1989. U.S. Geological Survey 7.5 minute topographical maps were used as data sources for distances, physiographic features, and topography (USGS, 1956, 1968a-b, 1973a-c, 1979, and 1981a-d).

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 in central Minnesota is a circular, 250-square-mile area in Crow Wing and Morrison counties, centered on the Morrison/Crow Wing county border, in the Canadian Shield physiographic province of the United States. The landforms of the SSA consist primarily of level to gently undulating till plains with a geologically immature drainage system.

The landforms, superficial sediments, and soils of the SSA are geologically quite young, dating from the end of the last continental glaciation, which occurred from 11,000 to 12,000 years ago. The underlying rocks, however, are composed of ancient basalts and slightly metamorphosed sedimentary rocks 2.7 billion years old or older, including buried southwestern extensions of the iron belts of the Cuyuna Range (King, 1977; Warren, 1989).

No active faults are known to exist in the SSA, but three earthquakes that occurred in this century had epicenters within 70 miles of the SSA (Howard *et al.*, 1978; Stover *et al.*, 1981). In 1917, an earthquake registering VI on the Modified Mercalli (MM) scale occurred

14 miles northwest of the SSA. In 1950, a quake registering V on the MM scale occurred 45 miles west of the SSA. And in 1980, a quake registering VII was centered 25 miles west of the SSA (Stover *et al.*, 1981; Stover *et al.*, 1986). The probability of future seismic activity is very low (Manitakos, 1989).

Mineral deposits of economic value appear to be limited to sand and gravel at this time. There are some iron deposits of possible long-term interest near Sitkin and south of Brainerd, but no development of these is likely during the life of the GWEN project (Christensen, 1989; Warren, 1989).

No known paleontological resources exist in the area. Neither the superficial sediments nor the underlying Precambrian rocks are fossil-bearing environments because of their glacial origin and great age, respectively. The glacial tills that mantle the SSA are rock dust, gravels, cobbles, and boulders left by the melting of the last continental glaciers and are free of all but post-glacial biological remains. The Precambrian rocks that lie under the till are very coarse-textured deposits (King, 1977) that predate by a billion years or more the first fossils of complex life forms, such as those found in the Burgess shale (Gould, 1989).

The soils of the SSA are predominantly derived from stony, noncalcareous till. Their drainage quality ranges from moderately good to poor, depending on local topography (SCS, 1965; SCS, 1991). The subsurface layers of the soils are typically cemented. Frost penetration exceeds 40 inches (Hunt, 1967). Acidity ranges from very strongly acidic to mildly alkaline (pH 4.5 to 7.8). The depth to the seasonally high water table varies from 1.0 to over 6 feet from the soil surface (SCS, 1965; SCS, 1991). Two of the sites (CGSs-17 and -18) have soils designated as prime farmland (SCS, 1991), and two (CGSs-3 and -5) have soils of local importance (Browning, 1991). Erosion hazards are generally slight to moderate (SCS, 1965; SCS, 1991). None of the soils is hydric (SCS, 1987). The specific soils on each CGS are discussed in Sections 3.2 to 3.6 of this EA.

Marshes, primarily shrub-covered wetlands, and swamp forests are common in the SSA, but lakes and streams are relatively rare. However, large water bodies bound the SSA to the north, east, and west. One of Minnesota's larger lakes, Mille Lacs Lake, lies to the east

of the SSA; to the north is the Brainerd Lakes area, and to the west, the Mississippi River, about 5 to 14 miles from the CGSs. Other major lakes, all at the edges of the SSA, are the South Long, Platte, and Sullivan lakes; each has from 2 to 4 square miles of surface area. The principal streams in the SSA are the Nokasippi and Platte rivers. The CGSs do not lie in any designated 100-year floodplain of these rivers (FIA, 1981; FIA, 1988a-b). Each CGS is at least 1,000 feet from a perennial or intermittent stream, although three CGSs (CGSs-11, -17, and -18) are within 300 feet of wetlands. Distances from each CGS to the nearest surface water or wetlands are given in Sections 3.2 through 3.6 of this EA.

Average annual runoff is 10 to 15 inches. Dissolved mineral concentrations in the groundwaters are relatively low, less than 1,000 parts per million (ppm), and concentrations in surface waters are in the range of 100 to 350 ppm. The waters are clear, with average suspended sediment concentrations below 280 ppm (USGS, 1970). Water hardness of surface waters is 120 to 180 ppm, and that of groundwater is 180 to 240 ppm (Geraghty *et al.*, 1973). All water is protected by basic water quality regulations, but some waters are covered by additional requirements as specified by Minnesota Rules 7050.0460. The Minnesota Department of Natural Resources (MDNR) refers to these as "protected waters" (Balcom, 1989), a practice followed in this EA.

The climate of the SSA is humid, marked by warm, short summers and cold, long winters. The mean temperature ranges from 6°F in January to 68°F in July. Average annual rainfall, mostly from thunderstorms, is 24 inches; about 80 percent of this falls during the frost-free period, between May 15 and September 25. An average of one damaging or excessive rainstorm occurs each summer. Severe storms, such as tornadoes and ice storms, occur occasionally (USDA, 1941). Snow falls between 40 and 60 days per year, for an annual accumulation of 50 inches or more (Visher, 1954).

Air quality in the SSA is good and does not exceed the National Primary and Secondary Ambient Air Quality Standards, which have been adopted by the State of Minnesota (MPCA, 1983; Seltz, 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 original vegetation of the SSA was a mixture of pine forests on the better-drained areas and spruce-fir forests in the lowlands, with admixtures of red oak, aspen, and other northern hardwoods (Braun, 1950; Küchler, 1964). The present vegetation is a mosaic of hayfields, pastures, corn, rye, and wheat fields; second-growth woodlands; and shrub- and forest-dominated wetlands. The only important forest species now are those used for the making of pulp: jack pine, bigtooth aspen, and quaking aspen (SCS, 1965). Alder, willow, and hazel dominate the shrubby wetlands. Balsam firs and white spruce with admixtures of white cedar and black spruce dominate the swamp forests.

Wildlife resources within the SSA are typical of central Minnesota. The big game population is mostly composed of deer, but moose, black bear, and various fur-bearers are resident in northern and central Minnesota and may occur in the SSA as residents or occasional visitors (Garrison *et al.*, 1977; Appendix C, Welford, 1990, pages C-5 through C-7 of this EA). The most abundant passerines are species that are common throughout the eastern states, such as the blue jay, song sparrow, red-winged blackbird, and brown-headed cowbird. However, 74 species of birds, about half of them passerines, are listed as common, and 9 species are abundant in the Sherburne National Wildlife Refuge, which is 30 miles south of the SSA. The red-tailed hawk, American kestrel, eastern screech owl, and, seasonally, the northern harrier and Cooper's hawk are the most abundant raptors (Jones, 1990). Ducks, geese, and other waterfowl are seasonally abundant in the lake district north of the SSA, but the SSA is east of the areas in Minnesota designated as priority breeding areas by the U.S. Fish and Wildlife Service (USFWS) (USFWS, 1988). However, recreational fishing in the Brainerd Lakes area immediately north of the SSA is the region's most prominently advertised recreational use of the region's wildlife. Walleye, northern pike, and muskellunge are the region's most popular game fish (Anonymous, 1989c; Chamber of Commerce, 1989a).

Wetlands are abundant in the SSA, although the area is relatively dry when contrasted with the lake districts to the north, east, and west. 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 for at least 7 days of the growing season (FICWD, 1989). This manual was used as the basis for wetland determination. Based on USGS topographic maps, field investigations (Holt, 1989), soils data (SCS, 1965; SCS, 1987; SCS, 1991), and consultation with the USFWS (Tolbers, 1991), none of the CGSs meets these three criteria. However, there are wetland areas of marginal value as wildlife habitat within 300 feet of the Thesing (CGS-11), Schlegel (CGS-17), and Kapsner (CGS-18) sites (Tolbers, 1991).

Wildlife management areas are limited within the SSA, but are common in adjacent areas. A small area in Morrison County is included in the Wittiker State Wildlife Management Area, near the center of the SSA, 2.8 miles west of Harding. The Roosevelt Wildlife Area, 1.75 miles southeast of Pine Center, is on the eastern edge of the SSA, along the north shore of Mud Lake. Each of the state wildlife management areas in or adjacent to the SSA is less than 320 acres in area. However, Mille Lacs Lake, which is very nearly the size of the SSA, is a state wildlife management area 5 miles east of the SSA (MDNR, undated; MDOT, 1987b). Portions of Mille Lacs Lake are a national wildlife refuge (Rand McNally, 1991). In addition, extensive tracts of Crow Wing County are designated as the Crow Wing County Memorial Forest (MDOT, 1987a). Only 2 percent of the SSA is in the memorial forest.

In compliance with Section 7 of the Endangered Species Act of 1973, as amended (16 United States Code [USC] 1531, *et seq.*, at 1536), a list of threatened and endangered species was obtained during informal consultation with the USFWS. Federally listed threatened or endangered species that may occur in the SSA are the gray wolf (*Canis lupus*) and the bald eagle (*Haliaeetus leucocephalus*) (Tolbers, 1991 and 1992; Appendix C, Welford, 1990, pages C-5 through C-7 of this EA). The gray wolf, originally found in both forest and grassland habitats, is now principally found in northeastern Minnesota, portions of which are designated as critical habitats. The SSA lies within the range of the gray wolf, but is more than 200 miles from the area designated as critical habitat (50 Code of Federal Regulations [CFR] 17.40 [d]).

The bald eagle requires a habitat combining tall trees or other elevated sites and good foraging for breeding. Preferred habitats are in coastal zones or areas near large rivers or

lakes. None of the CGSs is within 3 miles of rivers, lakes, or wetlands that have large expanses of open water. Consequently, no CGS is near areas that provide high-quality foraging habitat (fish, waterfowl, and carrion) (Ehrlich *et al.*, 1988) or good nesting sites for the bald eagle. Thus, adults might occasionally forage near or migrate past a CGS, but the newly fledged, inexperienced flyers are not expected to occur near any of the CGSs because the sites are well over 1 mile from good breeding habitat.

The state also lists the federally endangered bald eagle. Four additional species listed by the state as threatened or endangered may potentially occur in or near the SSA. They are the eastern hognose snake (*Heterodon platyrhinos*), Blandings turtle (*Emydoidea blandingi*), the osprey (*Pandion haliaetus*), and the sandhill crane (*Grus canadensis*) (Eliason, 1993; Perry, 1989).

The eastern hognose snake inhabits dry, sandy areas, woodlands, and fields (Collins, 1981), and might occur in habitats that meet the FEIS siting criteria for GWEN facilities. However, the other three species are primarily associated with aquatic habitats. The Blandings turtle is restricted to aquatic habitats that are excluded from consideration as CGSs by the FEIS siting criteria.

Osprey and sandhill cranes may pass through the CGSs, but the sites lack both the open water habitat that provides good foraging habitat for the osprey, and the marsh and grainfield habitats used by feeding cranes. Osprey are not expected to occur near the CGSs because the CGSs are set back 3 miles or more from the large lakes and rivers that comprise the best habitat for this fish-eating bird. Nor is the sandhill crane expected to be present at the sites because no site is near large areas of open, shallow water, the preferred habitat of this species (Ehrlich *et al.*, 1988). Moreover, the sandhill crane typically migrates at altitudes of 1,000 to 2,000 feet, well above the 299-foot height of a GWEN tower (Kessel, 1984).

There are no state or federally listed threatened or endangered plant species that potentially occur in the SSA (Balcom, 1991; Eliason, 1993; Heide, 1991; Tolbers, 1992, 1993; Appendix C, Welford, 1990, pages C-5 through C-7 of this EA).

3.1.3 Socio-Cultural Setting

The Dakota Sioux occupied the SSA until they were displaced by the Chippewa (Ojibwa) in the eighteenth and early nineteenth centuries. The Chippewa themselves were being displaced from areas further east when the Iroquois, with European weapons, drove all other tribes from the central and eastern Great Lakes (Billington, 1949). Euro-American settlement began in 1837 with the establishment of a trading post in Crow Wing County, near the Mississippi River; settlement became more extensive after treaties with the Sioux and Chippewa in 1838 and the 1850s, and establishment of a Winnebago reservation in 1846 (Anonymous, 1989a).

When the Chippewa sold large parcels of forest land to settlers in the 1850s, logging became a significant enterprise in the area. Minnesota became a state in 1858; in 1870, a rail crossing was established at Brainerd, and a year later, the town was established (Anonymous, 1989a). Mining test pits were sunk in the nearby Cuyuna Range in 1882 and abandoned. Mining for iron began in 1905 and lasted until the mid-1960s (Anonymous, 1989b).

The Minnesota State Historic Preservation Officer (SHPO) was consulted, as required by the National Historic Preservation Act (16 USC 470, *et seq.*). No archaeological sites or historic properties listed on the National Register of Historic Places are located within 1.5 miles of the CGSs (NRHP, 1989), and the Minnesota SHPO stated that the probability of finding significant unlisted sites is low. The CGSs are cultivated or formerly cultivated fields, so any potential archaeological sites would already have been disturbed. In addition, both Crow Wing and Morrison counties have been surveyed for significant historic buildings and other structures, and none was noted within the project limits. For these reasons, the Minnesota SHPO did not recommend any further archaeological or architectural surveys to identify any properties potentially eligible for the NRHP (Appendix C, Gimmestad, 1989, 1990, 1991, pages C-10 through C-12 of this EA). The area within 1.5 miles of the CGSs was considered the project limits because historic properties that occur within 1.5 miles of a CGS are potentially subject to adverse visual impacts from the relay node facility, as discussed in Section 4.8.1.3, beginning on page 4.8-2 of the FEIS.

In compliance with the American Indian Religious Freedom Act of 1978 (42 USC 1996), the Bureau of Indian Affairs (BIA), Minnesota Indian Affairs Council, and the Minnesota SHPO were consulted in order to locate tribes associated with the project area (Heide, 1992; Lofstrom, 1989; Sargent, 1991). The BIA indicated that the Sioux and Chippewa are the only federally recognized tribes living in Minnesota. Based on BIA recommendations, twelve tribal organizations were notified of the GWEN project and information was requested regarding traditional, religious, or sacred sites within the SSA; the Lower Sioux Indian Community Council, the Upper Sioux Community, the Prairie Island Indian Community, the Shakopee Mdewakanton Sioux Community, the Minnesota Chippewa Tribal Executive Committee, the Red Lake Tribal Council, and the business committees of the Leech Lake Reservation, Nett Lake Reservation, Mille Lacs Reservation, White Earth Reservation, Fond du Lac Reservation, and Grand Portage Reservation (Heide, 1992). Representatives of the Nett Lake Reservation Business Committee and the Lower Sioux Indian Community Council stated that they had no concerns about cultural resources at the candidate GWEN sites (Goodthunder, 1993; Whiteman, 1993). No response to letters or several attempts at phone communication have been received from any of the other tribes. A representative of the Minnesota Indian Affairs Council referred the matter to the Minnesota SHPO (Sargent, 1991). The Minnesota SHPO indicated that the potential for ancient Native American sites on the CGSs is slight because the CGSs are set back from lakes, streams, and large marshes (Lofstrom, 1989).

Land use in the SSA is primarily agricultural, but installation of a radio tower is consistent with the land use policies of the Morrison County Planning Commission (Ginder, 1989) and the Crow Wing County Planning Commission (Klein, 1989; Neiman, 1989).

All of the CGSs are within areas zoned Agricultural (Jay 1991; Smith, 1991).

The main north-south road through the SSA is State Highway 25. The main east-west road is County Road 2. Several other county roads crisscross the SSA, generally following section lines. The SSA has no railroads or airports.

Sources of ambient noise are limited primarily to the operation of farm equipment and traffic. 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; however Crow Wing (Traecler, 1991) and Morrison (Kuklok, 1991) counties do not have local noise ordinances.

The principal community in the region is Brainerd, a city of about 11,000 people, 5 miles north of the SSA. The two towns within the SSA, Lastrup and Harding, are much smaller, having populations of 408 and 93 persons, respectively, in 1980. The population density of the townships lying wholly or predominantly within the SSA is 14 persons per square mile (Census Bureau, 1982b); the total population of the 250-square-mile SSA is correspondingly estimated to be 3,500 to 3,600 persons. Both Crow Wing and Morrison counties experienced moderate population growth of 4 to 7 percent (Rand McNally, 1990) in the early 1980s, but Crow Wing County has the largest, non-resident-owner population in Minnesota. During the summer, the population increases 3- to 4-fold (MDOT, 1988).

The economy in Crow Wing and Morrison counties is diversified. Employment in Brainerd is based primarily in the government (24 percent), wholesale and retail trade (18 percent), manufacturing (17 percent), and service (15 percent) sectors. Finance, insurance, real estate, transportation, communications, and other business groups collectively account for the other 26 percent of the employment base (MDED, 1981). The income levels are below the state average; 13 percent of the families in Crow Wing County and 19 percent of the families in Morrison County have incomes below the federal poverty level, compared to 10.5 percent statewide (Census Bureau, 1982a).

Recreational resources and the tourist industry in the region lie to the north of the SSA, in the Brainerd Lakes area. Water sports are dominant and fishing is vigorously promoted. There is also an extensive set of snowmobile and cross-country ski trails in the lake district (Chamber of Commerce, 1989a; Chamber of Commerce, 1989b). Two of these cross-country ski trails border, but lie outside of, the SSA; snowmobile trails pass within 1 mile of each of the CGSs in Morrison County.

The visual resources of the SSA reflect its rural character. Patterns of development tend to be simple geometric shapes. Blocks of woodlands alternating with fields and pastures create skylines of generally low to moderate complexity, as defined in Section 4.8.1.3, page 4.8-10 of the FEIS. Power line poles and isolated trees provide the strongest vertical elements.

3.2 Alternative 1: Weiland Site (CGS-3)

The Weiland site is a flat, virtually level field. Soil on the site is Brainerd sandy loam, except for a small area of Nokay sandy loam in the northwestern corner of the site. Brainerd sandy loam is a moderately well drained soil, while the Nokay soil is somewhat poorly drained. Both are strongly acidic, with a pH range of 5.1 to 5.5. The Brainerd soils have slight susceptibility to erosion, and are moderately susceptible to frost action (SCS, 1965). The soil is not classified as prime farmland, but is of local importance (Browning, 1991). These soils are not hydric (SCS, 1987). The depth to the seasonally high water table is 1.5 to 2.5 feet (SCS, 1965).

There are no waters at the site that are designated by the State of Minnesota as protected waters. However there is a state-protected water 1 mile to the north and a protected wetland 1 mile to the northeast (Balcom, 1989). The nearest wetlands are 1,000 feet northwest of the site. There are also wetlands 1,600 feet south and 1,000 feet east. The site is also about 0.5 mile south of a 280-acre parcel of state trust fund land (Balcom, 1989). A willow- and alder-dominated area lies at the western edge of the site, but the soils associated with this hydrophytic vegetation are Brainerd and Nokay sandy loams, neither of which is a hydric soil. This area therefore is not a wetland under federal criteria (FICWD, 1989). The nearest stream, a perennial tributary of Hay Creek, is over 1,000 feet north of the site. CGS-3 is 4.7 miles from the Mississippi River.

The site was planted in corn in 1988, but is currently in a set-aside program. Vegetation consists of a mix of foxtail, horseweed, quack grass, and other weedy species that characterize recently abandoned land. The site is bordered by a hayfield and a willow thicket immediately to the west. An oak-aspen woodland lies about 0.1 mile to the west. The site is bounded to the north by an open fencerow of small trees, to the south by a

dense windbreak of pines, and to the east, across County Road 45, by a forest of young pines.

The MDNR noted that the CGS lies within broad avian flight corridors between wetlands along Hay Creek and its branches to the northwest and south, South Long Lake to the east, and Cooke Wildlife Management Area to the north. These corridors are reported to be heavily used by swans and sandhill cranes (Balcom, 1989).

The landowner's house is adjacent to a row of pines on the site's southern border and lies 50 feet from the site. The nearest residential community is Brainerd, 4.9 miles north of the CGS.

3.3 Alternative 2: Donaldson Site (CGS-5)

The Donaldson site is a flat parcel. The soils are mostly Brainerd sandy loam, a moderately well drained soil that is strongly acidic (pH 5.1 to 5.5), and Nokay sandy loam, a poorly to somewhat poorly drained soil that is very strongly acidic to medium acidic (pH 4.5 to 6.0). A small area in the northwest corner is Barrows sandy loam, a very poorly drained soil that is very strongly acidic to strongly acidic (pH 4.5 to 5.5). Susceptibility to erosion is slight and susceptibility to frost action is moderate (SCS, 1965). The soil is not classified as prime farmland, but is of local importance (Browning, 1991). These soils are not hydric (SCS, 1987). The depth to the seasonally high water table is 1 to 3 feet (SCS, 1965).

There are no protected waters at this site, but a ditch designated as a protected water lies 0.75 mile to the west. Also, a 280-acre parcel of state trust fund land is about 0.5 mile from the site (Balcom, 1989). The nearest wetland is 900 feet east of the site. There are also wetlands 1,300 feet west and 1,200 feet south of the site. CGS-5 is 5.5 miles from the Mississippi River.

The western portion of the site is an uncut hayfield with an admixture of broadleaf weeds. The southern portion, a recently plowed, reseeded hayfield, has a quantity of dock, ragweed, and foxtail. An aspen grove lies to the west of the CGS, visually screening it from

portions of County Road 45, but the remainder of the adjacent areas are cultivated lands and hayfields.

The MDNR noted that the CGS lies within broad avian flight corridors between the wetland complex along Hay Creek to the west, South Long Lake to the east, and Cooke Wildlife Management Area to the north. These corridors are reported to be heavily used by swans and sandhill cranes (Balcom, 1989).

The nearest residential community is Brainerd, 5.8 miles north of the CGS.

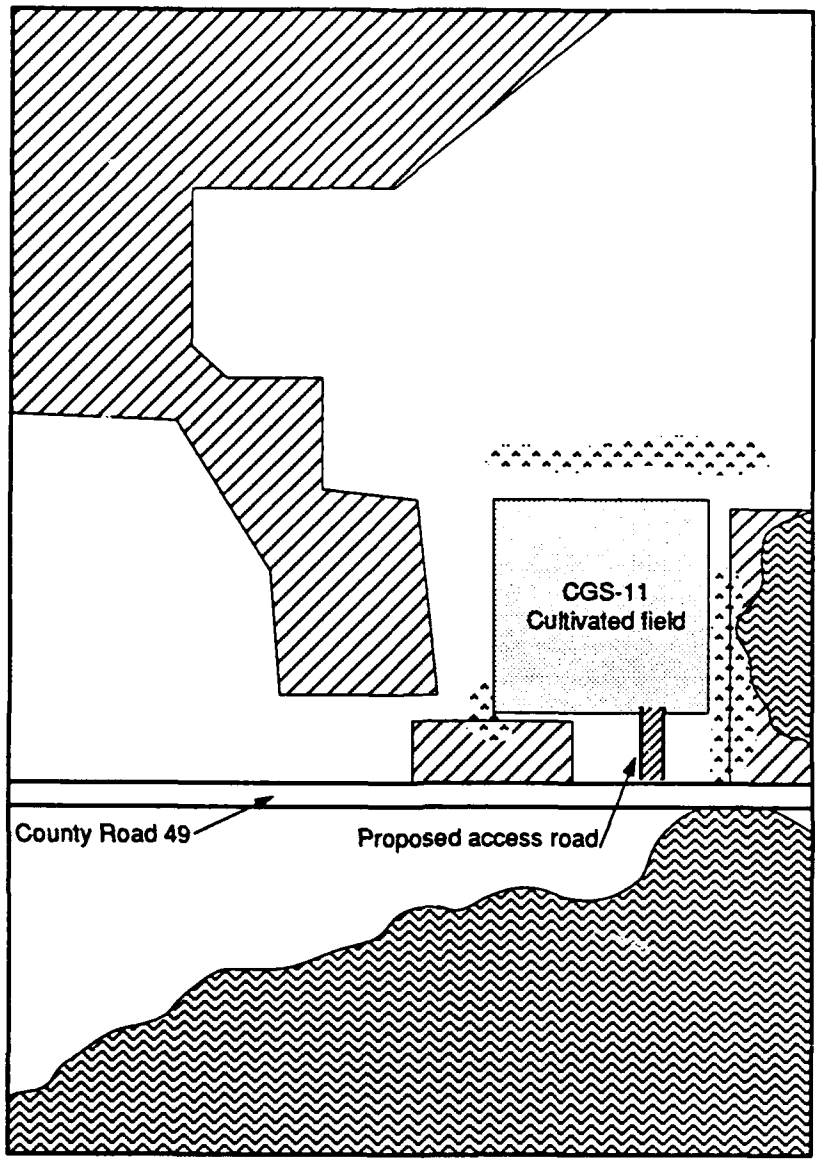
3.4 Alternative 3: Thesing Site (CGS-11)

The Thesing site is a flat tract. The soils are mostly Pomroy sandy loam, except for a small area of Mahtamedi sandy loam at the northern edge of the site. Both soils are moderately well drained, and susceptibility to erosion is slight. Both soils range in acidity from strongly acidic to mildly alkaline (pH 5.1 to 7.8). The depth to the seasonally high water table is more than 6 feet. These soils are not classified as prime farmland (SCS, 1991) and are not hydric (SCS, 1987).

There are no protected waters on the site, but a protected wetland is 0.5 mile to the north (Balcom, 1989). The nearest wetland, which is of marginal value as wildlife habitat, is 125 feet east of the site; there is another wetland 400 feet south (Tolbers, 1991) (see Figure 3.1 of this EA). CGS-11 is 6.3 miles from the Mississippi River.

The site is presently fallow but has been cultivated. Vegetation consists principally of weedy species associated with the last corn crop. Horseweed, quack grass, cinquefoil, dock, hawkweed, bull thistle, wild lettuce, and other early successional species are dominant. The grass cover is still incomplete; seedlings of both grasses and forbs were abundant during the site visit.

The adjacent lands comprise a mosaic of mostly upland fields and woodlands. A pond, roughly 10 acres in size, lies 0.3 mile to the south; wooded wetlands along the Little Nokasippi River are about 1 mile to the north. Lodemier Lake, which is shown as open



= Wetland
= Trees
= Areas covered by provisions of conservation easement

0 500 1000 1500
SCALE IN FEET

N

FIGURE 3.1 APPROXIMATE LOCATION OF WETLANDS AND PROPOSED CONSERVATION EASEMENT NEAR THE THESING SITE (CGS-11)

water on county road maps and marsh on the USGS topographic maps, lies 0.5 mile northeast of the proposed tower site. These bodies of water, woods, and wetlands receive relatively heavy bird use (Balcom, 1989). The USFWS noted the potential for the establishment of a conservation easement covering a wetland portion of the Thesing holdings (Appendix C, Welford, 1990, pages C-5 through C-7 of this EA), and this has been confirmed with the Farmer's Home Administration (FHA) (Barnier, 1991). The easement would cover lands that lie 40 feet to the south, 200 feet to the west, and 60 feet to the east of the site (see Figure 3.1 of this EA).

The nearest residential community is Lastrup, 9.5 miles southeast of the CGS.

3.5 Alternative 4: Schlegel Site (CGS-17)

The Schlegel site is a flat, level site. The soils are mostly Brainerd sandy loam with lesser amounts of Flak sandy loam located in the western half of the site. Both soils are moderately well drained and susceptibility to erosion is slight. Both soils range in acidity from very strongly acidic to neutral (pH 4.5 to 7.3). The depth to the seasonally high water table ranges from 1.5 to more than 6 feet. These soils are classified as prime farmland (SCS, 1991) and are not hydric (SCS, 1987).

The site is in line with a chain of lakes ranging in size from 40 to 1,200 acres extending from the Mississippi River to the lake complex just southwest of Mille Lacs Lake. However, the CGS is not near any of these large bodies of open water. Dinger Lake, the nearest and smallest lake in this chain, is 2 miles southwest of the site. The Pelkey, Frieze, and Piertz lakes are 6 to 10 miles to the southwest. Sullivan Lake, the northeastern terminus of this chain, is 6.3 miles away. No protected waters are present at the site, but a protected wetland lies 0.5 mile to the southwest. Little Mink Creek is 0.5 mile to the south (Balcom, 1989). The main stem of Big Mink Creek, a protected watercourse, lies 1.4 miles to the northwest. CGS-17 is 13.7 miles from the Mississippi River.

A small deep depression, 100 feet wide and 10 feet deep, lies 25 feet from the southern edge of the CGS. In some years, it contains a small, seasonal pond fringed with aspen, red oak, alder, and willow (see Figure 3.2 of this EA). Rocks and debris within the lower

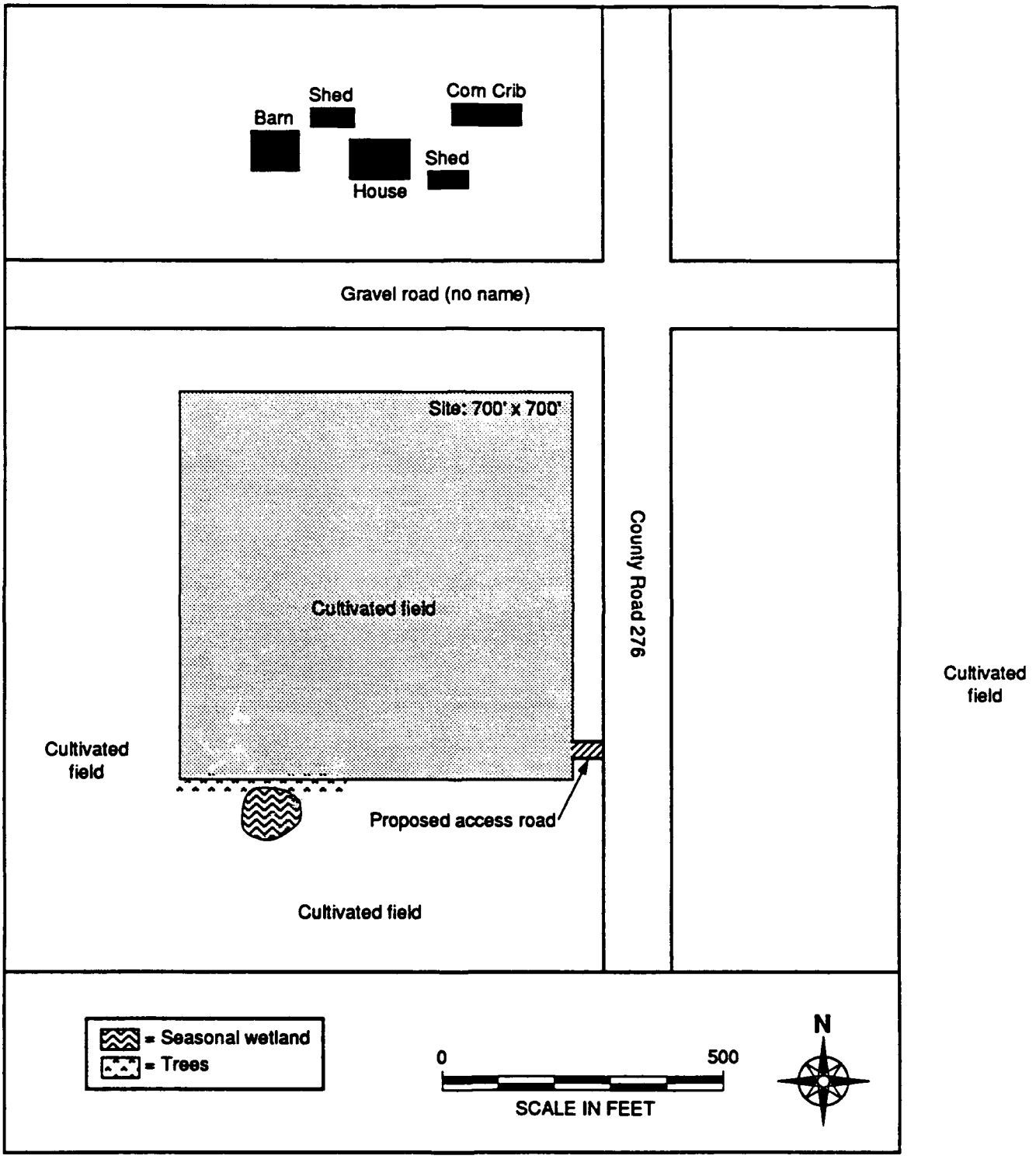


FIGURE 3.2 APPROXIMATE LOCATION OF THE WETLAND NEAR THE SCHLEGEL SITE (CGS-17)

half of this depression were coated with silt, indicating that the last high water level in this depression was about 5 feet below the soil surface. The resulting small pond is persistent enough in normal years to be designated a wetland on unpublished National Wetlands Inventory (NWI) maps (Tolbers, 1991) even though it may not meet all three criteria for a federal jurisdictional wetland because the soils are not hydric (SCS, 1987).

However, this wetland has marginal value as wildlife habitat (Tolbers, 1991). Wetlands also lie 450 feet north and 600 feet south of the site.

The site has been farmed regularly and is currently planted with alfalfa. Adjacent lands contain mostly cultivated fields or hay, but the general vicinity has substantial tracts of woodland.

The nearest residential community is Lastrup, whose densely settled portions are 1.2 miles southwest.

3.6 Alternative 5: Kapsner Site (CGS-18)

The Kapsner site is a fairly flat, but sloping tract on the southeastern-facing slope of a low hill. The soils are mostly Brainerd sandy loam with an area of Nokay sandy loam in the southeast corner of the site. Brainerd soils are moderately well drained, while Nokay soils are somewhat poorly to poorly drained. Susceptibility to erosion is slight for both soils. Both range in acidity from very strongly acidic to neutral (pH 4.5 to 7.3). The depth to the seasonally high water table ranges from 1.0 to 2.5 feet. These soils are classified as prime farmland (SCS, 1991) and are not hydric (SCS, 1987).

The site is primarily devoted to the cultivation of hay, but the northwestern portion is planted with corn, and the southwestern portion is pasture.

A forested wetland, which is of marginal value as wildlife habitat, lies 200 feet south of the CGS (Tolbers, 1991) (see Figure 3.3 of this EA). The regional setting is similar to that described in Section 3.5 of this EA. Extensive marshes and other wetlands lie about 2.5 miles to the southeast and small, scattered wetlands occur to the southwest and northwest.

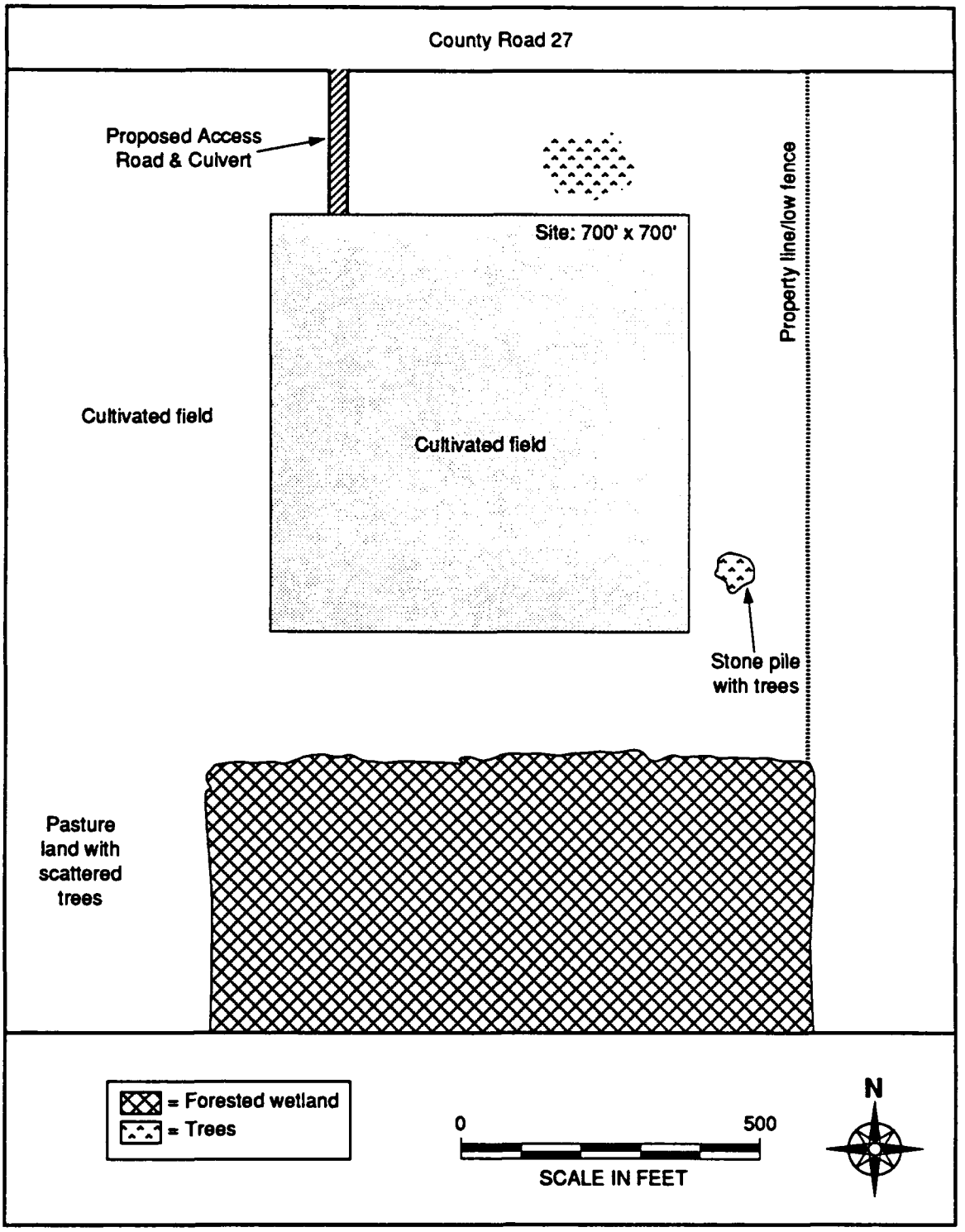


FIGURE 3.3 APPROXIMATE LOCATION OF THE WETLAND NEAR THE KAPSNER SITE (CGS-18)

The nearest perennial stream is the Skunk River 1.7 miles to the southeast; the nearest protected water is Big Mink Creek (Balcom, 1989), branches of which lie 0.5 and 2.0 miles to the northwest. CGS-18 is 14.3 miles from the Mississippi River.

The nearest residential community is Lastrup, whose closest residential area is 1.3 miles west of the proposed tower. An electric power transmission line, supported by large metal towers, runs north-south between Lastrup and the CGS, 0.9 mile west of the tower.

4.0 ENVIRONMENTAL CONSEQUENCES OF ACTION ALTERNATIVES

This section discusses the potential impacts of the GWEN project on the environmental setting of the five CGSs in central Minnesota. Several impacts which would be 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 4.6 of this EA. There would be no significant impacts at any of the five sites.

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 the off-site access road and installation of utility lines would have no significant impacts because the sites are on relatively level terrain and the access road would require little grading. Furthermore, the disturbed area would occur within previously graded private farmland and/or public highway rights-of-way. The amount of land disturbed for the access road and its right-of-way would range from 1,008 square feet to 14,040 square feet, depending on the site selected.

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 it would not significantly disturb the existing vegetation or create a significant erosion hazard.

Impacts to **mineral resources** would be minor, as indicated in Section 4.1.1.4, page 4.1-2 of the FEIS. In most cases, mineral resources were avoided in the siting process. The only mineral deposits of economic value in the SSA that might be developed during the life of the project are sand and gravel (Christensen, 1989; Warren, 1989). If any resources are present under a site, development of that 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 impact.

Impacts on **paleontological resources** are not anticipated because fossils are unlikely to occur on any CGS (Gould, 1989; King, 1977). However, if any fossils are found during construction, work that might affect them would be suspended while the Minnesota Geological Survey 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 less than 8 percent, 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.

No CGS lies within a **100-year floodplain** (FIA, 1981; FIA, 1988a; FIA, 1988b).

A maximum of 11 acres of **prime farmland** would be removed from production for the duration of the project. However, impacts of GWEN development on agricultural land would not be significant, as discussed in Section 4.1.1.3, page 4.1-2 of the FEIS.

No significant impacts on **drinking water** are expected, as discussed 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 ground plane is not anticipated to raise copper concentrations in any aquifer or surface water body by more than 26 micrograms per liter (µg/l). This represents 2 percent of the maximum allowable copper concentrations for raw water sources for potable water supply permitted by the State of Minnesota (MPCA, 1985).

Potential impacts on **surface water and wetlands** that support aquatic plants and animals could occur when the site is less than 300 feet from surface water or wetlands, if the soil is acidic, or the depth to the seasonally high water table is less than 3 feet from the ground plane (4 feet from the surface), as discussed in Section 4.2.1.1, page 4.2-3 of the FEIS. A setback of 300 feet would reduce the maximum increase in copper concentrations to less than 1 to 2 µg/l, even under the worst-case assumptions. This is 5 to 10 times lower than the state standard of 10 µg/l for fisheries and recreation (MPCA, 1985). The Donaldson site (CGS-5) is more than 400 feet from surface water or wetlands. The Thesing (CGS-11), Schlegel (CGS-17), and Kapsner (CGS-18) sites are within 300 feet of wetlands, so the potential exists for copper leachate to reach these wetlands from the ground plane of the proposed tower. However, based on the worst-case scenario for copper leachate at the closest wetland (CGS-17) and based on a water hardness of 140 mg/l of calcium carbonate (as measured in the Mississippi River at Royalton), the amount of copper reaching the wetlands would not exceed state standards and impacts would not be significant. The Minnesota Pollution Control Agency (MPCA) concurs with this determination (Kimball, 1991).

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. 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 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 Minnesota (MPCA, 1983).

4.1.2 Biological

Impacts on **wetlands and other wildlife habitats** would not be significant. No unique or high quality wildlife habitat occurs at or within 300 feet of any of the sites, all of which are cropland. The CGSs offer no cover for deer or other local game species because of their present uses. Vegetation on the CGSs consists of various forms of grassland, such

as pasture, hay, or recently fallowed fields. Although there are wetlands within 300 feet of three sites (CGSs-11, -17, and -18), no significant impacts are expected. These CGSs would not intrude into the wetlands. Also, the USFWS considers these wetlands marginal habitat (Tolbers, 1991) and has no concerns about impacts of this project on wetlands or riverine floodplain areas (Appendix C, Welford, 1990, pages C-5 through C-7 of this EA). The marginal wetlands support neither fish, waterfowl, nor other wildlife, with the possible exception of the small pond south of CGS-17, which offers marginal waterfowl habitat in some years (Tolbers, 1991; Wallstein, 1991). In addition, although the potential exists for copper leachate to reach these wetlands from the ground plane of the proposed tower, the MPCA concurs that copper reaching the wetlands would not exceed state standards and impacts would not be significant (Kimball, 1991).

Bird collisions with the tower or its guy wires may occur but are not expected to be significant. Section 4.4.1.5, beginning on page 4.4-5 of the FEIS states that the majority of 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). Areas with high concentrations of bird flight activity, feeding and nesting habitats, raptor roosting areas, and prominent topographical features such as high ridges and waterways that could concentrate avian flight lanes were avoided. None of the CGSs is in constricted flight corridors where the potential for bird collisions would be high. Impacts on passerines therefore are not expected to be significant.

Impacts on raptors from bird collisions are also not expected to be significant, for the same reasons outlined for passerines, and, because of the rarity of collision of these agile flyers with towers and guy wires, as noted in Section 4.4.1.5, page 4.4-6 of the FEIS. The tower would also not provide any attractive nesting or roosting site for hawks and other large birds because the top of the tower is occupied by a strobe light in a housing with a pointed roof.

Although the potential for impacts to waterfowl is possibly higher than the potential for impacts to passerines or raptors, it is nonetheless not expected to be significant because

the sites are set back 5 to 14 miles from the Mississippi River and the region's major lakes along the river. Moreover, the SSA is outside the broad zone of heaviest duck migration across Minnesota, which is from the eastern portion of the prairie pothole breeding grounds to the wintering grounds (Bellrose, 1980). Although the SSA's mosaic of small lakes, wetlands, and agricultural fields enhances the potential for frequent local, low-altitude flights as waterfowl move between water bodies and agricultural fields, these foraging flights generally occur just before dawn or during daylight when the weather is clear. Only local (resident) birds are likely to be aloft on these short flights in fog when visibility is impaired; migrants remain on the ground when fog is present (Hochbaum, 1955). Because the number of birds aloft on such low, local flights is expected to be quite small when visibility is poor, the probability of significant impacts is negligible.

No federally listed **threatened or endangered species** would be affected. The SSA is at the periphery of the range of the gray wolf, and the project would have no effect on the gray wolf. The bald eagle is more likely to occur in the SSA, but impacts would not be significant. There are no known eagle nests within 1 mile of any CGS (Eliason, 1993; Appendix C, Welford, 1990, pages C-5 through C-7 of this EA). None of the CGSs is within 3 miles of large rivers, lakes, or wetlands with large expanses of open water that provide the best foraging habitat for bald eagles. Therefore, none would be good nesting sites. In addition, although any one of the CGSs could be within the path of a migrating bald eagle because the SSA is surrounded by areas of excellent foraging habitat, the probability of an eagle passing close to any one of these sites is low. There are no topographic features that would tend to channel flight past any CGS. Although an alignment of wetlands and lakes exists in the southeastern part of the SSA near CGSs-17 and -18, this is not a unique feature in central Minnesota, and there is no reason to expect collisions between these agile, diurnal-flying birds and a GWEN tower. The USFWS concurs with this determination (Appendix C, Welford, 1991, pages C-8 and C-9 of this EA).

In addition, there would be no significant impacts to state-listed species. The osprey is not expected to occur near the CGSs, which are set back 3 miles or more from the large lakes and rivers that comprise the best habitat for these fish-eating birds. Likewise, the sandhill crane is not expected to be present at the sites because large areas of open, shallow water, the preferred habitat of this species, are absent (Ehrlich *et al.*, 1988). Moreover, the

sandhill crane typically migrates at altitudes of 1,000 to 2,000 feet, well above the height of a GWEN tower (Kessel, 1984). Absence of suitable habitat at the CGSs precludes impacts on that species. The similarity of the vegetation cover to be maintained on the GWEN site to that now present would preclude impact on the eastern hognose snake, a species that inhabits sandy areas, open woods, fields, and other upland sites (Collins, 1981). The MDNR concurs with this determination (Balcom, 1991; Heide, 1991).

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 according to representatives of Morrison (Ginder, 1989) and Crow Wing counties (Klein, 1989; Neiman, 1989). Care was taken in the site selection process to maintain setbacks from institutional uses such as schools, churches, recreational areas, and areas zoned residential. The tower would not significantly affect property values because non-noxious, nonresidential land uses, such as the proposed relay node, have no systematic effect on housing values, as stated in Section 4.7.1.3, page 4.7-8 of the FEIS.

Construction **noise** impacts would be temporary and insignificant. Operational noise from the back-up 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 Crow Wing (Traecler, 1991) and Morrison (Kuklok, 1991) counties have no noise ordinances, 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. In addition, the BUPG would only operate at this noise level

for 2 hours per week during testing and during commercial power outages. Potential noise impacts to the residence located 50 feet south of the Weiland site (CGS-3) are discussed in Section 4.2 of this EA.

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 discussed in Section 4.12.1.1, page 4.12-1 of the FEIS. Radio-frequency emissions would not cause adverse health effects, as discussed 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 tower would comply with FAA requirements and would be sited at least 9 miles from the nearest runway at the Brainerd/Crow Wing County Airport.

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. No known archaeological resources that are listed or eligible for listing on the NRHP occur on or near the sites (NRHP, 1989). The Minnesota SHPO determined that no unrecorded

archaeological resources are expected on the CGSs as they are all cultivated or previously cultivated fields (Appendix C, Gimmestad, 1989, page C-10 of this EA). However, if any archaeological resources are found during construction, work that might affect them will be suspended while the Minnesota SHPO and the Office of the State Archaeologist are notified in accordance with the provisions of 16 USC 470, *et seq.*, at 470f.

Impacts on **historic properties** would not be significant. No known historic buildings listed or eligible for listing on the NRHP occur on or near the sites (NRHP, 1989). Crow Wing and Morrison counties have been surveyed for significant historical buildings and other structures, and none was noted within 1.5 miles of any CGS (Gimmestad, 1991; Appendix C, Gimmestad, 1990, 1991, pages C-11 and C-12 of this EA). The Minnesota SHPO did not recommend additional surveys to locate unrecorded historic properties (Appendix C, Gimmestad, 1989, page C-10 of this EA).

Significant impacts to **Native American traditional, religious, or sacred sites** are not anticipated. The BIA indicated that the Sioux and Chippewa are the only federally recognized tribes living in Minnesota (Heide, 1992). Based on BIA recommendations, twelve tribal organizations were notified of the GWEN project and information was requested regarding traditional, religious, or sacred sites within the SSA: the Lower Sioux Indian Community Council, the Upper Sioux Community, the Prairie Island Indian Community, the Shakopee Mdewakanton Sioux Community, the Minnesota Chippewa Tribal Executive Committee, the Red Lake Tribal Council, and the business committees of the Leech Lake Reservation, Nett Lake Reservation, Mille Lacs Reservation, White Earth Reservation, Fond du Lac Reservation, and Grand Portage Reservation (Heide, 1992). Representatives of the Nett Lake Reservation Business Committee and the Lower Sioux Indian Community Council stated that they had no concerns about cultural resources at the candidate GWEN sites (Goodthunder, 1993; Whiteman, 1993). No response to letters or several attempts at phone communication have been received from any of the other tribes. A representative of the Minnesota Indian Affairs Council referred the matter to the Minnesota SHPO (Sargent, 1991). The Minnesota SHPO indicated that the potential for ancient Native American sites on the CGSs is slight because the CGSs are set back from lakes, streams, and large marshes (Lofstrom, 1989).

Visual impacts associated with a GWEN tower are discussed in Sections 3.8 and 4.8, pages 3.8-1 and 4.8-1, respectively, 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 ar ı state parks; designated scenic routes; designated national, state, or local historic sites where setting is important to their historic significance; and travel routes providing 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. 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 have low sensitivity, even though this use is recreational, because snowmobiling involves high-speed travel in which safe operation requires the attention of the operator to be on the path, not the surrounding countryside, whereas hiking trails, in which the pace of travel allows leisurely views, have 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 any CGS. The visual impacts associated with each site are discussed in Sections 4.2 to 4.6 of this EA.

4.2 Alternative 1: Weiland Site (CGS-3)

No significant impacts are expected.

Impacts from **bird collisions** would not be significant, despite the relatively large number of birds that fly over the site, as explained in Section 4.1.2 of this EA. The site, which has been recently farmed, has little habitat value to wildlife. This would remain the case for the duration of the project because the site will be maintained as a regularly cut grassland. While the tower would be in the midst of broad flight corridors between the wetlands to the

northwest, southwest, and east of the site, lakes east of the site, and the Cooke Wildlife Management Area north of the site (Balcom, 1989), there are no topographic features that would attract birds over the CGS.

To minimize **noise** impacts to the residence located 50 feet south of the site, the BUPG would be located at least 100 feet from the residence with its exhaust side facing away from the residence. This would ensure that noise levels were below 65 dBA, the residential standard established in Section 3.5-3, page 3.5-2 of the FEIS.

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

4.3 Alternative 2: Donaldson Site (CGS-5)

No significant impacts are expected.

Impacts from **bird collisions** would not be *significant*, despite the relatively large number of birds that fly over the site, as explained in Section 4.1.2 of this EA. The site, which is currently used as cropland, has little habitat value to wildlife. This would remain the case for the duration of the project because the site will be maintained as a regularly cut grassland. While the tower would be in the midst of broad flight corridors between the wetlands east, west, and south of the site, lakes east of the site, and the Cooke Wildlife Management Area northwest of the site (Balcom, 1989), there are no topographic features that would attract birds over the CGS.

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

4.4 Alternative 3: Thesing Site (CGS-11)

No significant impacts are expected.

Impacts from **bird collisions** would not be significant. The MDNR noted the existence of a protected wetland 0.5 mile north of the site (Balcom, 1989), and the USFWS noted the potential for the establishment of a conservation easement covering a portion of the Thesing holdings (Appendix C, Welford, 1990, pages C-5 through C-7 of this EA). This was confirmed with the FHA, and it is expected that areas 40 feet south, 200 feet west, and 60 feet east of the CGS will be so designated (Barnier, 1991). However, neither the CGS nor its access road would intrude into these areas. In addition, the site is a fallow field with little cover or forage for wildlife and is set back 0.5 mile from the protected wetland. The small wetland areas 125 feet east and 400 feet south of the site are considered marginal wildlife habitats (Tolbers, 1991). Therefore, the tower would not be in the flight path of birds during takeoff or landing in the wetlands, and the low risk of bird strikes cited in Section 4.1.2 of this EA would also apply to this site.

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

4.5 *Alternative 4: Schlegel Site (CGS-17)*

No significant impacts are expected.

Impacts from **bird collisions** would not be significant. The position of the site in a chain of small lakes between the Mississippi River and Mille Lacs Lake may enhance the potential for migrants to move across the site, but the potential for this is low, and neither the USFWS nor the MDNR expressed specific concerns about this site (Balcom, 1989; Appendix C, Welford, 1990, pages C-5 through C-7 of this EA).

Visual impacts would not be significant. Under the criteria of Section 3.8.4, beginning on page 3.8-3 of the FEIS, the residential areas of Lastrup, 1.2 miles southwest of the site, have high visual sensitivity. However, when looking toward the tower from Lastrup, intervening transmission lines and towers provide competing feature interest; the skyline complexity is moderate due to the irregularities caused by alternating blocks of woodlands and fields; and there is no focal point sensitivity. The lower half of the tower would be obscured by both the trees and the power lines. At that distance, the tower would appear

as a thin grey line. Thus, the tower would be noticeable, but visually subordinate (VMC 2) when viewed from Lastrup, and there would be no significant impact.

4.6 Alternative 5: Kapsner Site (CGS-18)

No significant impacts are expected.

Impacts from **bird collisions** would not be significant. The position of the site in a chain of small lakes between the Mississippi River and Mille Lacs Lake may enhance the potential for migrants to move across the site, but the potential for this is low, and neither the USFWS nor the MDNR expressed specific concerns about this site (Balcom, 1989; Appendix C, Welford, 1990, pages C-5 through C-7 of this EA).

Visual impacts would not be significant. Under the criteria of Section 3.8.4, beginning on page 3.8-3 of the FEIS, the town of Lastrup has high visual sensitivity. However, the tower would be visually subordinate, although noticeable (VMC 2) when viewed from the eastern edge of Lastrup, 1.3 miles west. At that distance, the tower would be seen as a thin grey line and would be partially shielded by trees along the crest of the hill upon which the site is located. The complexity of the skyline is low because the trees form a uniform mass when seen at this distance, but about one-third of the tower would be screened from view by the trees and another third would be seen through the power lines.

4.7 No Action Alternative

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

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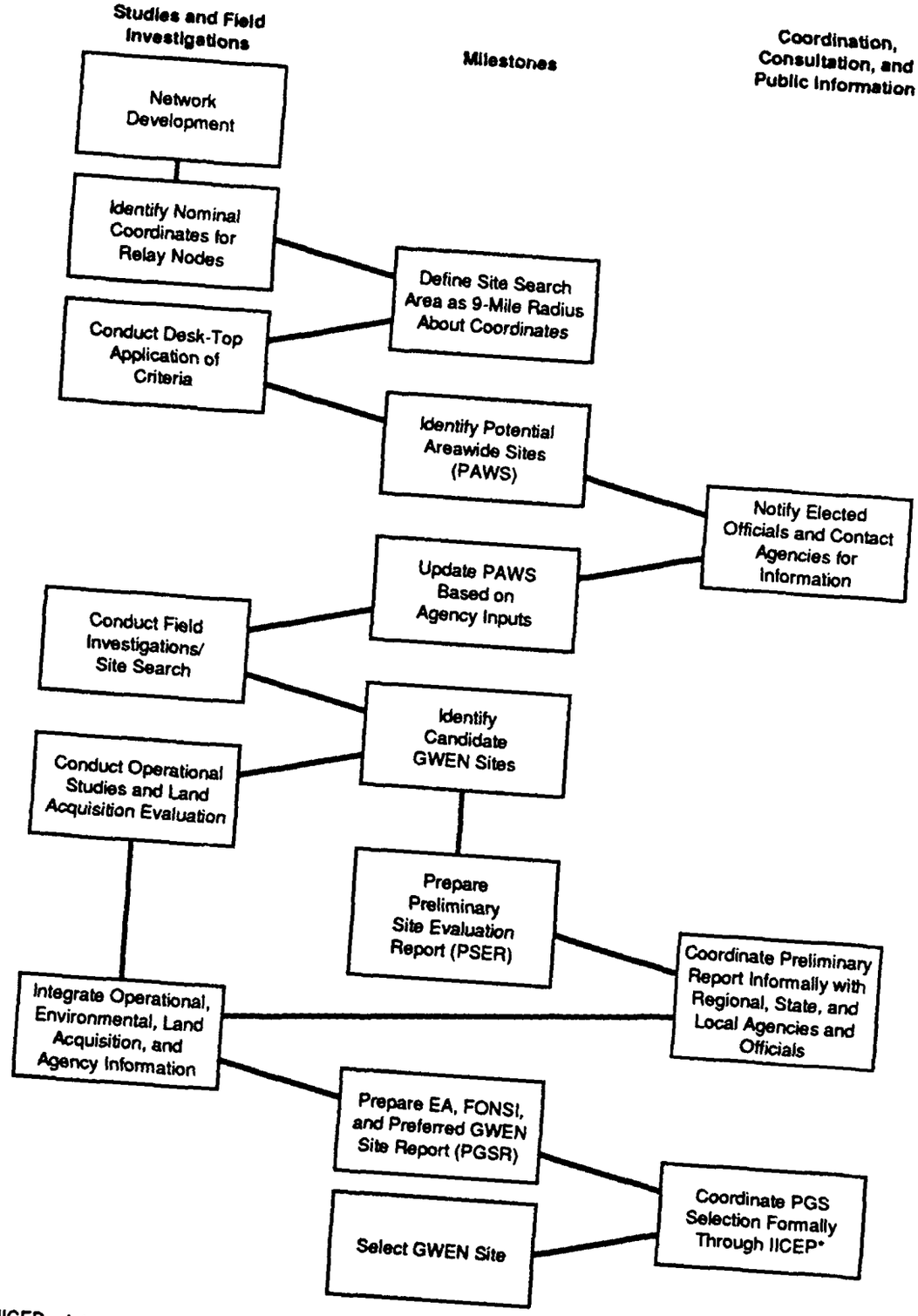
APPENDIX A

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 five 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

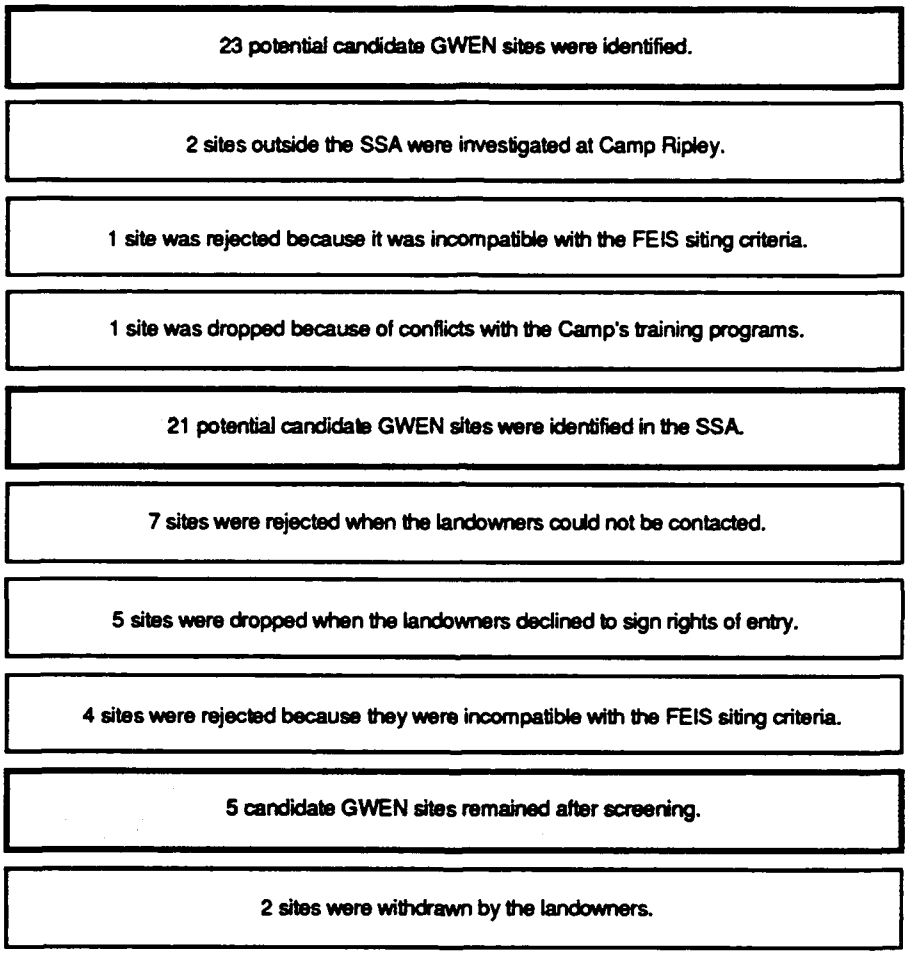


FIGURE A.2 USE OF FEIS SITING CRITERIA TO SCREEN POTENTIAL CANDIDATE GWEN SITES IN THE CENTRAL MINNESOTA SITE SEARCH AREA

APPENDIX B

TOPOGRAPHIC SETTINGS OF CANDIDATE GWEN SITES

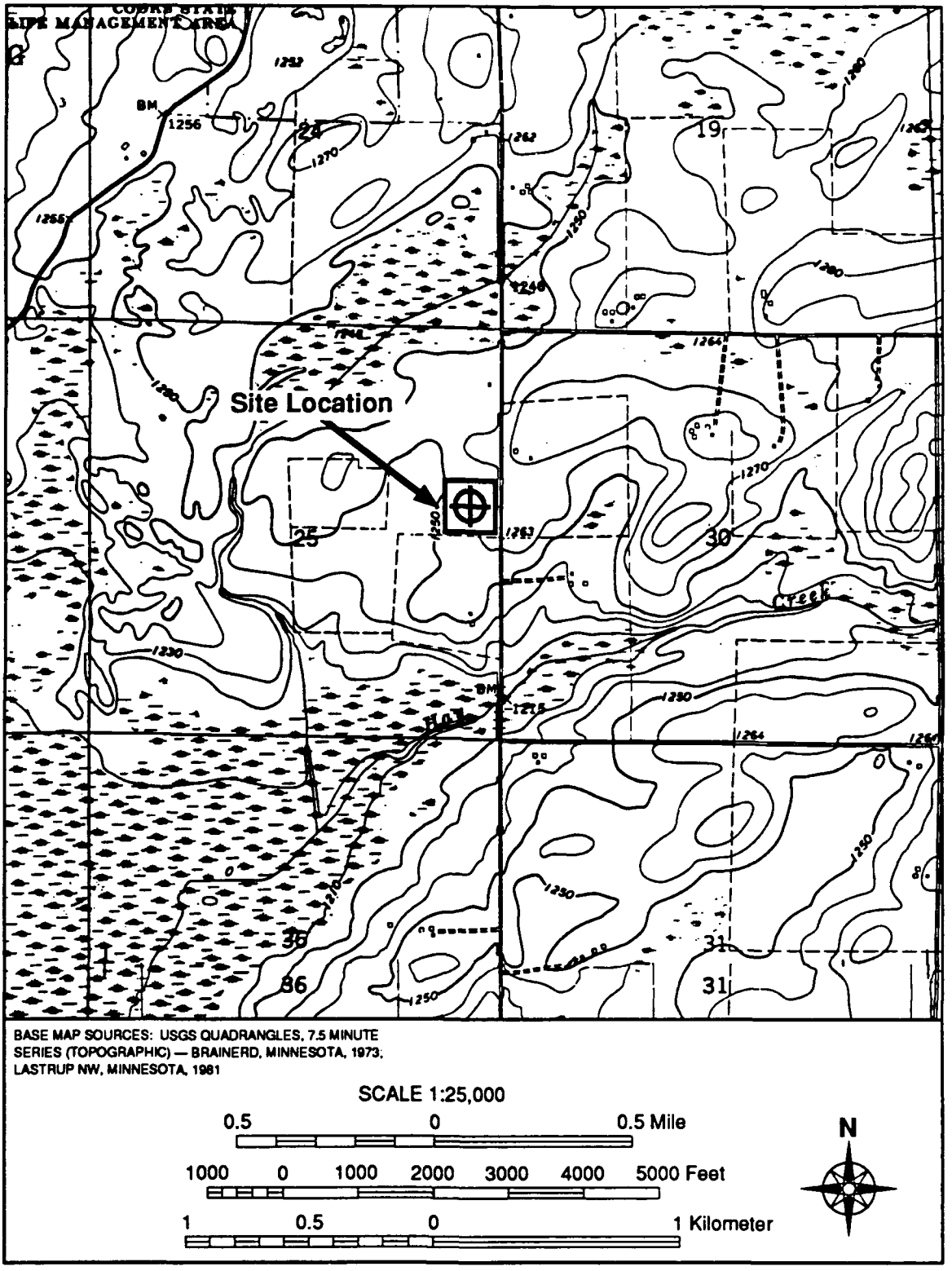


FIGURE B.1 TOPOGRAPHIC SETTING OF THE WEILAND SITE (CGS-3)

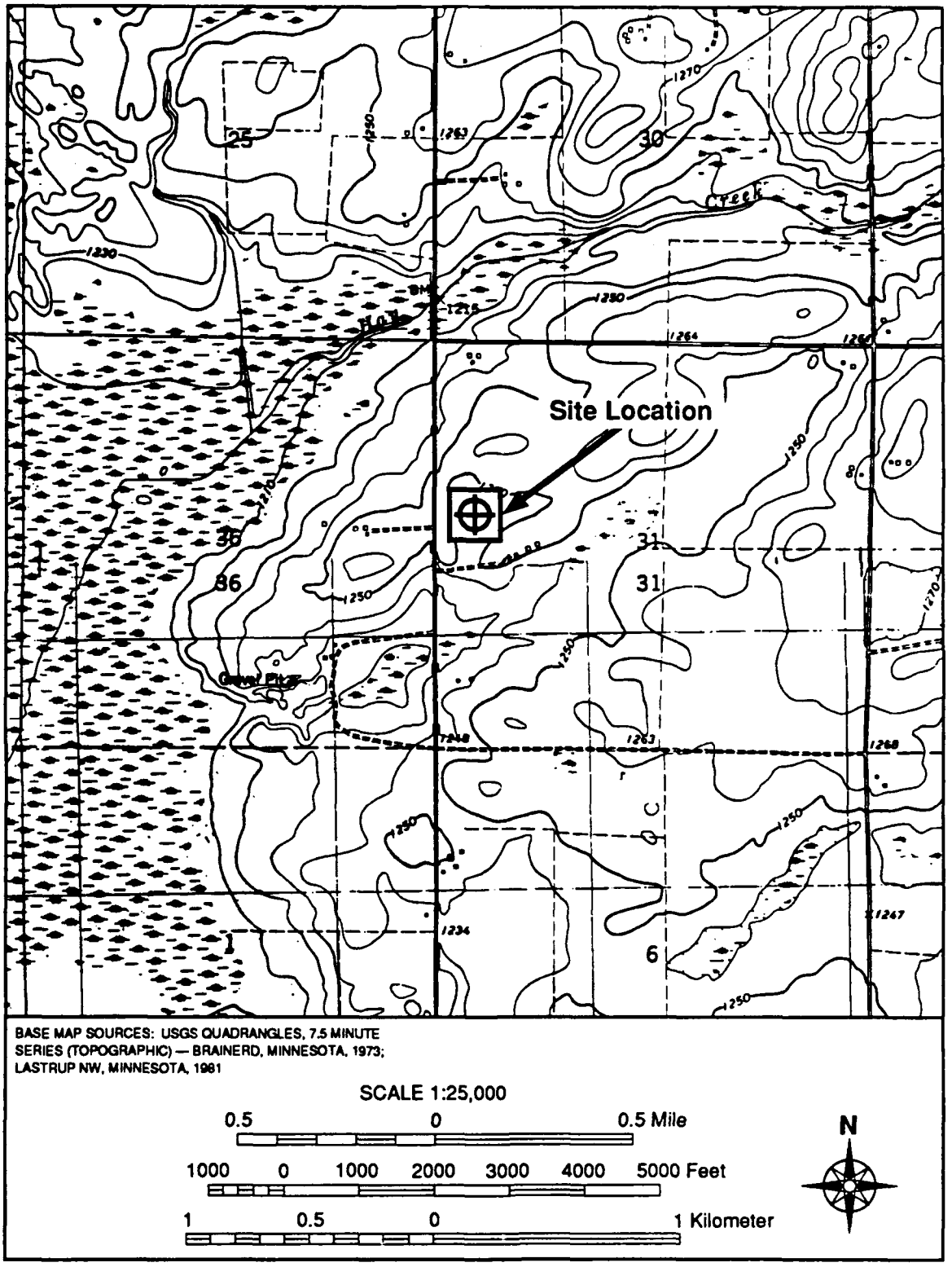


FIGURE B.2 TOPOGRAPHIC SETTING OF THE DONALDSON SITE (CGS-5)

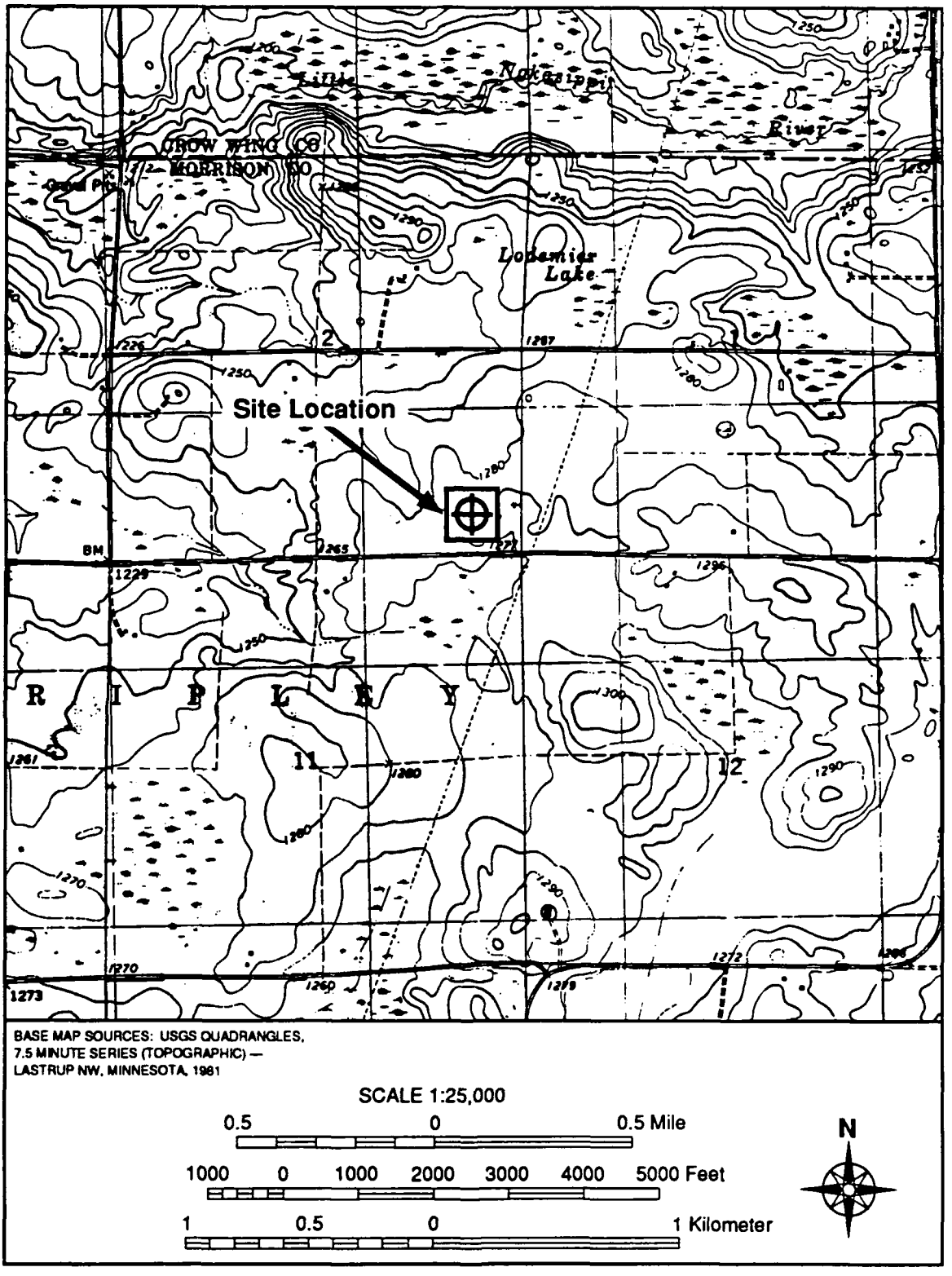


FIGURE B.3 TOPOGRAPHIC SETTING OF THE THESING SITE (CGS-11)

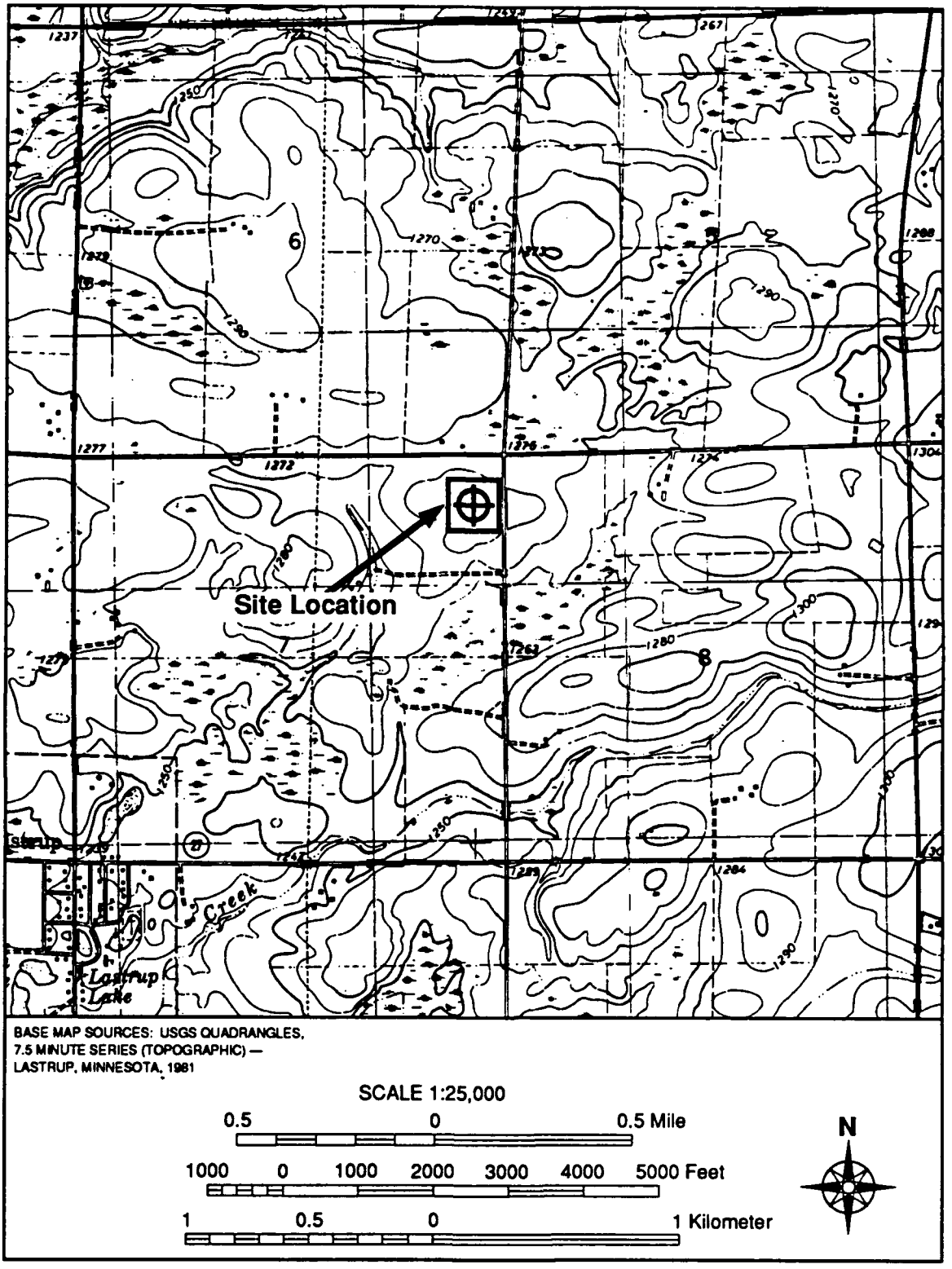


FIGURE B.4 TOPOGRAPHIC SETTING OF THE SCHLEGEL SITE (CGS-17)

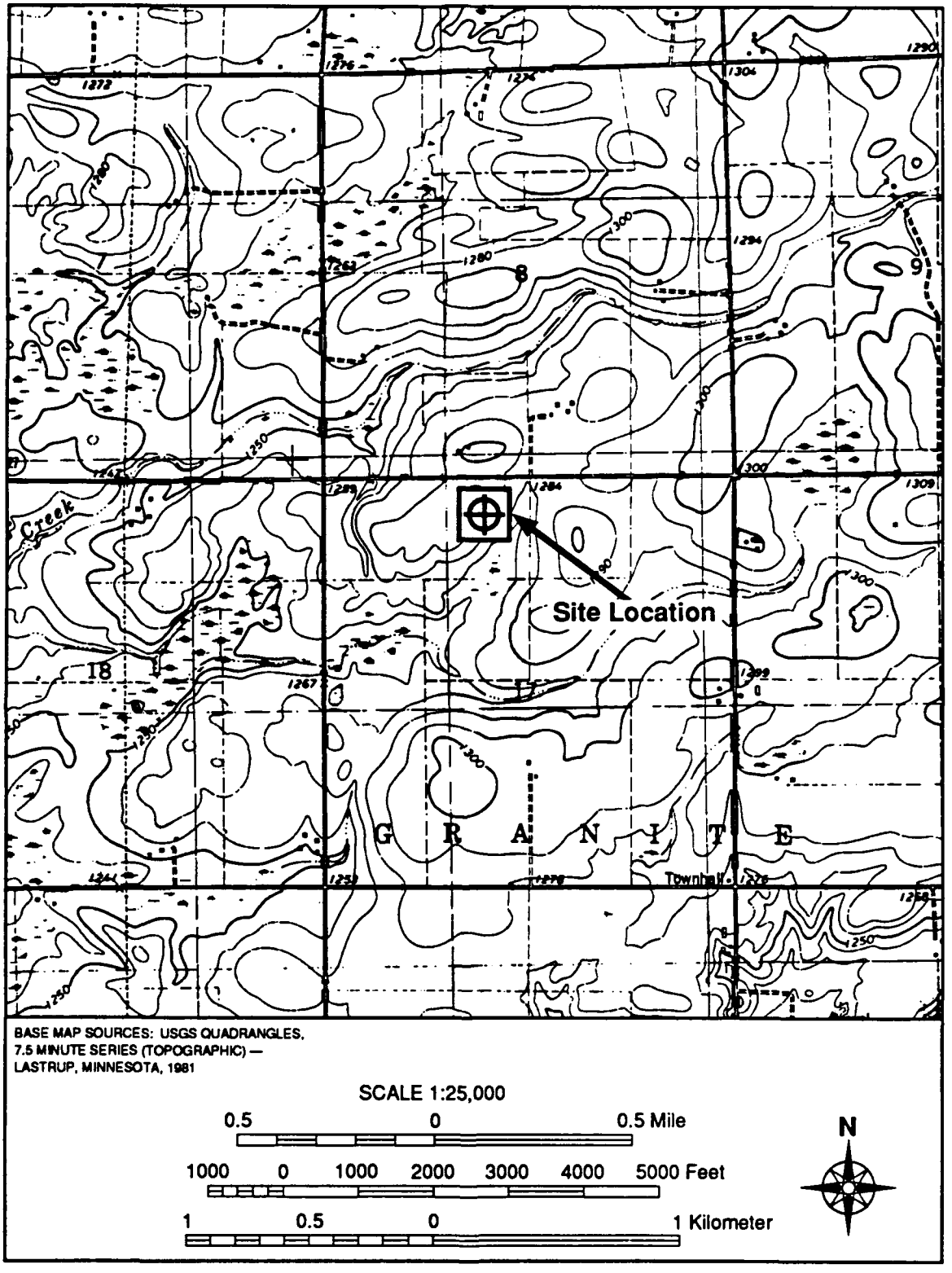


FIGURE B.5 TOPOGRAPHIC SETTING OF THE KAPSNER SITE (CGS-18)

APPENDIX C

CORRESPONDENCE

CORRESPONDENCE

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

Individual	Agency	Date	Response
Robert F. Welford, Field Office Supervisor	U.S. Department of the Interior, Fish and Wildlife Service	01-16-90 02-21-91	Attached Attached
Dennis A. Gimmestad, Deputy SHPO	Minnesota Historical Society	12-20-89 02-01-89 08-02-91	Attached Attached Attached
Earl Sargent, Northern Representative	Minnesota Indian Affairs Council, Bemidji, Minnesota	Letter was sent 09-22-89. No written response has been received. Phone communication on 02-11-91 (see page 5-7 of this EA).	
J. Goodthunder, President	Lower Sioux Indian Community Council, Morton, Minnesota	Letter was sent 08-25-92. No written response has been received. Phone communication on 01-13-93 (see page 5-4 of this EA).	
E. Boshey, Sr., Chairman	Nett Lake Reservation Business Committee, Nett Lake, Minnesota	Letter was sent 08-25-92. No written response. Phone communication with W. Whiteman 01-07-93 (see page 5-9 of this EA).	

Individual	Agency	Date Response
D. Blue, Chairperson	Upper Sioux Community of Minnesota, Granite Falls, Minnesota	Letter was sent 08-25-92. No response has been received to the letter or several attempts at phone communication.
F. Johnson, Chairman	Prairie Island Indian Community of Minnesota, Welch, Minnesota	Letter was sent 08-25-92. No response has been received to the letter or several attempts at phone communication.
S. Crooks, Chairman	Shakopee Mdewakanton Sioux Community of Minnesota, Prior Lake, Minnesota	Letter was sent 08-25-92. No response has been received to the letter or several attempts at phone communication.
D. Wadena, President	Minnesota Chippewa Tribal Executive Committee, Cass Lake, Minnesota	Letter was sent 08-25-92. No response has been received to the letter or several attempts at phone communication.
G. Brun, Chairman	Red Lake Chippewa Tribal Council, Red Lake, Minnesota	Letter was sent 08-25-92. No response has been received to the letter or several attempts at phone communication.

Individual	Agency	Date Response
D. Brown, Chairperson	Leech Lake Reservation Business Committee, Cass Lake, Minnesota	Letter was sent 08-25-92. No response has been received to the letter or several attempts at phone communication.
M. Anderson, Chairperson	Mille Lacs Reservation Business Committee, Onamia, Minnesota	Letter was sent 08-25-92. No response has been received to the letter or several attempts at phone communication.
R. Peacock, Chairman	Fond du Lac Reservation Business Committee, Cloquet, Minnesota	Letter was sent 08-25-92. No response has been received to the letter or several attempts at phone communication.
D. Wadena, Chairman	White Earth Reservation Business Committee, White Earth, Minnesota	Letter was sent 08-25-92. No response has been received to the letter or several attempts at phone communication.
J. Hendrickson, Chairman	Grand Portage Reservation Business Committee, Grand Portage, Minnesota	Letter was sent 08-25-92. No response has been received to the letter or several attempts at phone communication.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ST. PAUL FIELD OFFICE (ES)
50 Park Square Court
400 Sibley Street
St. Paul, Minnesota 55101

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
SPFO

January 16, 1990

Lt. Colonel Stephen T. Martin
Program Manager, GWEN
Department of the Air Force
Headquarters Electronic Systems Divisions (AFSC)
Hanscom Air Force Base, Massachusetts 01731-5000

Dear Colonel Martin:

This responds to your recent request for U.S. Fish and Wildlife Service (Service) comments relative to five candidate sites which are presently being evaluated by the U.S. Air Force for the construction of a Ground Wave Emergency Network (GWEN) relay node in Central Minnesota.

These comments are provided as technical assistance and predevelopment consultation and do not constitute a Service report under authority of the Fish and Wildlife Coordination Act (Coordination Act) (16 U.S.C. 661 et seq.) on any required Federal environmental review or permit.

The Service has responsibility under a number of authorities for conservation and management of fish and wildlife resources. Chief among the Federal statutes with which our office deals are the Fish and Wildlife Coordination Act, Endangered Species Act, and the National Environmental Policy Act. The Coordination Act requires that fish and wildlife resources be given equal consideration in the planning, implementation, and operation of Federal and federally funded, permitted, or licensed water resource developments. Section 7 of the Endangered Species Act outlines procedures for interagency consultations on the effects of Federal actions on federally listed threatened and endangered species. The Service participates in scoping and review of actions significantly affecting the quality of the environment under authority of the National Environmental Policy Act. In addition to these statutes, the Service has authority under several other legislative, regulatory, and executive mandates to promote conservation of fish and wildlife resources for the benefit of the public.

In Minnesota, the Service has special concerns for migratory birds (in particular waterfowl), threatened and endangered species, and other important fish and wildlife resources. We also are concerned about any impacts on Federal and State Waterfowl/Wildlife refuges and management areas and other public lands, as well as to other areas that support sensitive habitats. Habitats frequently associated with important fish and wildlife resources are wetlands, streams, and riparian (streamside) woodlands.

To reduce avian impacts, the Air Force should construct this 300-foot tower and associated facilities in a location and manner that will minimize the potential avian collisions and other forms of avian mortality. We support the recommendations that were made by the Minnesota Department of Natural Resources (MDNR) in their letter of December 14, 1989 relative to each of these five candidate sites. The MDNR indicated that the two candidate sites in Crow Wing County have the greatest potential for avian impacts and that locating this 300-foot tower at either of these two sites could result in significant bird mortality. They also indicated that the Thesing site was the least preferable of the three candidate sites in Morrison County from an avian collision standpoint because of a large wooded wetland complex nearby which likely receives heavy bird use.

In the United States, all bird species except the house sparrow (Passer domesticus), European starling (Sternus vulgaris), and rock dove (Columba livia) are afforded protection under the Migratory Bird Treaty Act (16 U.S.C. 703-711) (the 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 may impact the GWEN project in two ways. First, collisions of birds with man-made structures can and may be considered a taking activity under the Act. Accordingly, we recommend that (1) the towers be painted a fluorescent color to enhance their visibility to birds in flight, and (2) that the guy wires and other structures $\geq$ 50 feet above ground 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. Further, because the provisions of the Act extend to the nests, eggs, or young of birds, we recommend that project activities that could result in the taking of a migratory bird nest, egg, or young, be conducted only after nesting surveys are undertaken by the Air Force during the primary nesting season from April 1 to July 15. Any active nests, eggs, or dependent young should be reported immediately to this office.

To facilitate compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies or their representatives are required to obtain information from the Fish and Wildlife Service concerning any species, listed or proposed to be listed, which may be present in the area of the proposed action. Therefore, we are furnishing you the following list of species which may occur within these five candidate GWEN sites:

Common Name	Scientific Name	Classification	Counties
Gray wolf	Canis lupus	Threatened	Crow Wing
Bald eagle	Haliaeetus leucocephalus	Threatened	Crow Wing and Morrison Counties

Presently, there is no designated critical habitat for threatened or endangered species within Crow Wing or Morrison Counties.

Crow Wing County is within the peripheral range of the gray wolf, a federally listed threatened species in Minnesota. However, because of the location and type of activity proposed, this project will not affect the gray wolf. Crow Wing and Morrison Counties are both within the breeding range of the bald eagle, a federally listed threatened species. Although our review has indicated that no bald eagle nests presently are located in the vicinity (within 1 mile) of any of these five candidate GWEN sites, we cannot provide the same "will not affect" determination regarding the bald eagle. It is the responsibility of the Federal action agency to determine whether their activity "may affect" listed species or critical habitat. If the Federal action agency determines that a project may affect listed species, or critical habitat, formal Section 7 consultation should be requested from this office. If you determine that there will be no effect, further consultation is not necessary.

Another potential environmental concern we have become aware of relative to this project is that the SE 1/4 of Section 2 of Ripley Township in Morrison County, which includes the Thesing site, will likely become a Farmers Home Administration (FmHA) Inventory Tract in the near future. If so, the Service may recommend that the FmHA place a Conservation Easement on portions of this property to protect any wetlands or floodplain areas. Thus, we recommend that this project also be coordinated with the FmHA. Contacts in this regard should be directed to Mr. Christopher Barnier, County Supervisor, Farmers Home Administration, Ag Service Center, Route 4, Little Falls, Minnesota 56345 (telephone 612/632-3658).

Our review of the information provided with respect to this project revealed that no Service lands are located in the vicinity of any of these five candidate GWEN sites and that no wetland or riverine floodplain areas would be impacted.

We look forward to continued coordination on this project as it progresses. If we can be of further assistance, please do not hesitate to call Dick Tolbers of my staff at 612/290-3131.

Sincerely,

Robert F. Welford
Field Office Supervisor

cc: Steve Colvin, MN Dept. of Natural Resources, St. Paul
Christopher Barnier, County Supervisor, Farmers Home Admin., Little Falls, MN

United States Department of the Interior

FISH AND WILDLIFE SERVICE

TWIN CITIES FIELD OFFICE
4101 East 80th Street
Bloomington, Minnesota 55425-1665

IN REPLY REFER TO

COMM: (612) 725-3548
FAX: (612) 725-3609

FWS/AFWE-TCFO

FEB 21 1991

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

Dear Mr. Holt:

This responds to your January 31, 1991, letter requesting supplemental U.S. Fish and Wildlife Service (Service) endangered species comments relative to five candidate sites that are still being considered by the United States Air Force (USAF) for the construction of a Ground Wave Emergency Network (GWEN) facility in central Minnesota. Specifically, your letter requested our concurrence (or nonconcurrence) with your determination that this project would not adversely impact the bald eagle or gray wolf, both of which are federally listed threatened species that may occur within these candidate GWEN sites in Crow Wing and Morrison Counties.

In the Service's letter of January 16, 1990, to Colonel Stephen T. Martin, USAF, we indicated that in our view this proposed project would not affect the gray wolf but that we could not make the same "will not affect" determination regarding the bald eagle. However, based on the additional information now provided in your January 31 letter relative to the bald eagle, and our subsequent discussions of these five potential GWEN sites with the Minnesota Department of Natural Resources, we concur with your determination that this proposed project will not affect the bald eagle, gray wolf, or any other federally listed or proposed threatened or endangered species or their critical habitat. This precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. However, if the project is modified or new information becomes available which indicates that any federally listed or proposed threatened or endangered species may be affected, consultation with this office should be reinitiated.

Effective November 19, 1990, the St. Paul ES Field Office has a new office designation and mailing address. Please refer all future correspondence to:

U.S. Fish and Wildlife Service
Twin Cities ES Field Office
4101 East 80th Street
Bloomington, Minnesota 55425-1665

Our new office telephone number is (612) 725-3548 (commercial) and 725-3548 (FTS). For facsimile transmission please dial (612) 725-3609 (commercial) and 725-3609 (FTS).

Sincerely,

for Jerome V. Dicken

Robert F. Welford
Field Supervisor

cc: Mr. Steve Colvin, Minnesota Department of Natural Resources,
500 Lafayette Road, St. Paul, Minnesota 55155

MINNESOTA HISTORICAL SOCIETY
FOUNDED IN 1849
Fort Snelling History Center St. Paul MN 55111 • (612) 726-1171

December 20, 1989

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

Dear Mr. Holt:

Re: Radio tower in Air Force's Ground Wave Emergency Network (GWEN)
Crow Wing and Morrison Counties
MHS Referral File Number: 89-2986

Thank you for the opportunity to review and comment on the above-referenced project. It has been reviewed pursuant to responsibilities given the State Historic Preservation Office by the National Historic Preservation Act of 1966 according to 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 reported historic or archaeological properties listed in the vicinity of the project areas. Because none has been examined by an archaeologist, unreported historic structures or archaeological sites may be present. However, it is staff opinion that the probability of such sites being present is low. The fact that each is located on cultivated or formerly cultivated land further diminishes the likelihood that significant sites would be affected since such sites would already be disturbed. We therefore do not recommend additional surveys to locate unreported historic properties.

However, projects such as this are often controversial, and possible damage to unreported historical or archaeological sites is often alleged by project opponents. You may therefore wish to conduct a cultural resources reconnaissance survey of the project areas to eliminate that area of controversy. In regard to the existing township hall, we cannot evaluate it without a photo and date of construction.

If you have questions regarding this matter, please contact Ted Lofstrom at the address and telephone number on the letterhead.

Sincerely,

Dennis A. Gimmestad
Deputy State Historic Preservation Officer

DAG:dmb

MINNESOTA HISTORICAL SOCIETY
FOUNDED IN 1849
Fort Snelling History Center, St. Paul, MN 55111 • (612) 726-11

February 1, 1990

Lt. Colonel Stephen T. Martin
Department of the Air Force
Headquarters Electronic Systems Division (AFSC)
Hanscom Air Force Base, Massachusetts 01731-5000

Dear Lt. Colonel Martin:

Re: 5 Ground Wave Emergency Network (GWEN) Relay Node Station sites
Weiland Site (CGS-3), SW/4 NE/4 S25, T44, R31, Crow Wing County
Donaldson Site (CGS-5), SW/4 NW/4 S31, T44, R30, Crow Wing County
Thesing Site (CGS-11), SE/4 SE/4 S2, T42, R31, Morrison County
Schlegel Site (CGS-17), NE/4 NE/4 S7, T41, R29, Morrison County
Kapsner Site (CGS-18), NE/4 NW/4 S17, T41, R29, Morrison County
MHS Referral File Number: 90-0284

Thank you for the opportunity to review and comment on the above-referenced project. It has been reviewed pursuant to responsibilities given the State Historic Preservation Office by the National Historic Preservation Act of 1966 according to 36 CFR Part 800: Protection of Historic Properties, the regulations of the Advisory Council on Historic Preservation governing the Section 106 review process.

We have reviewed the project areas to determine whether they contain reported historical or archaeological properties listed on the National Register of Historic Places or in other inventories. No properties are reported in or in the immediate vicinity of any of the project areas.

In the absence of reported sites, we have also evaluated the likelihood that unreported historic or archaeological sites may be present in the project area. Such sites, if present, could be damaged or destroyed by the proposed work. Although we cannot state with certainty that there are no significant unreported historical or archaeological sites within the project area, we feel that the probability of such sites being present is low. This county has been surveyed for significant historical buildings and other structures, and none was noted within the project limits. It is also our opinion that the project does not contain the kinds of shoreline and other settings in which prehistoric archaeological sites are typically found.

If you have questions regarding this matter, please contact Ted Lofstrom at the address and telephone number on the letterhead.

Sincerely,

Dennis A. Gimmestad
Deputy State Historic Preservation Officer

DAG:dmb

MINNESOTA HISTORICAL SOCIETY
FOUNDED IN 1849
Fort Snelling History Center, St. Paul, MN 55111 • (612) 726-1171

August 2, 1991

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

Dear Mr. Holt:

Re: U. S. Air Force Ground Wave Emergency Network Project
Central Minnesota, Morrison and Crow Wing Counties, Relay Node
MHS Referral File Number: 90-0284

Thank you for your letter of 18 June regarding the above referenced project.

We have reviewed the proposed sites and our current inventory information on cultural resource sites within 1.5 miles of the proposed sites. We agree that this radius constitutes a reasonable area of potential effect.

There are no recorded historic or archaeological properties within 1.5 miles of any of the five above referenced sites. As we have stated in earlier correspondence, we believe that the probability of any unknown archaeological sites is low, and do not believe that an archaeological survey of the areas is necessary. Moreover, we also conclude that the potential of unrecorded historic properties is low, and that a survey of the buildings in the area is unwarranted in light of the potential of effect on those buildings.

Therefore, we conclude that, based on the above considerations, there are no properties eligible for or listed on the National Register of Historic Places within the proposed projects' areas of effect.

Please contact me if you have any questions regarding our review.

Sincerely,

Dennis A. Gimmestad
Government Programs and Compliance Officer

DAG:dmb

APPENDIX D

GLOSSARY

GLOSSARY

Abbreviations and Units of Measure

AM	Amplitude modulation
ATU	Antenna tuning unit
BIA	Bureau of Indian Affairs
BUPG	Back-up power group
CFR	Code of Federal Regulations
CGS	Candidate GWEN site
dBA	Decibels on the A-weighted scale, which is a measure of the intensity of the sounds people can hear
EA	Environmental Assessment
EPA	Environmental Protection Agency
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
FEMA	Federal Emergency Management Agency

FHA	Farmer's Home Administration
FIA	Federal Insurance Administration
FICWD	Federal Interagency Committee for Wetland Delineation
FOC	Final Operational Capability, the third phase of development of GWEN
FONSI	Finding of No Significant Impact
GPO	Government Printing Office
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
MDED	Minnesota Department of Economic Development
MDNR	Minnesota Department of Natural Resources
MDOT	Minnesota Department of Transportation
MM	Modified Mercalli, a scale of the severity of earthquake effects

MPCA	Minnesota Pollution Control Agency
µg/l	Micrograms per liter
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
NWI	National Wetlands Inventory
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
PGSR	Preferred GWEN Site Report
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
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VMC	Visual Modification Class

Definitions

Air pollutant	An atmospheric contaminant, particularly the 15 atmospheric contaminants specified in federal and most state regulations
Anaerobic	Occurring in the absence of free oxygen
Burgess shale	A shale deposit in western Canada that has yielded fossils of soft-bodied animals that are among the oldest known fossils
Candela	A unit of measure of the intensity of light equal to the brightness of one candle
Cultural resource	Prehistoric, Native American, and historic sites, districts, buildings, structures, objects, and any other physical evidence of past human activity
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 *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (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)
Floodplain	Land adjacent to a river that is commonly covered by water during high flow periods
Glacial till	Unsorted and poorly sorted sediments deposited by melting glaciers
Glaciated	Areas affected by the former presence of glaciers and continental ice sheets
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	For the purposes of this EA, historic properties are those aboveground structures and cultural resources that are listed or eligible for listing on the National Register of Historic Places
Hydric soil	A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part
Metamorphic 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 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 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
Noncalcareous till	Characterized as not chalky
Paleonto-logical	Pertaining to fossils or the study of fossils
pH	A measure of acidity in which the lower the number, the more acid the substance; 7 represents neutrality
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

Protected waters	Waters covered by additional requirements by the State of Minnesota
Sedimentary rock	Rock formed by the consolidation or cementation of particles deposited by water or wind
Soils of local importance	Soils deemed by the Soil Conservation Service or a local agricultural agency as being among the better agricultural soils in the local area even though they do not qualify as prime farmland
Top-loading element	Portions of the GWEN antenna that extend diagonally from the top of the tower, which strengthen the signal and provide additional structural support like guy wires