MEQB EXHIBIT 11

STATE OF MINNESOTA
COUNTY OF RAMSEY

MINNESOTA ENVIRONMENTAL QUALITY BOARD

In the Matter of the Proposed Amendments to Rules Relating to Siting Large Electric Power Generating Plants

No. EQB-81-005-AK

STATEMENT OF NEED AND REASONABLENESS

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I. INTRODUCTION

The Power Plant Siting Act (PPSA) gives the Minnesota Environmental Quality Board (Board) authority and jurisdiction for siting large electric power generating plants and for routing high voltage transmission lines (Minn. Stat. §§ 116C.51-116C.69 (1980)). Three power plants and over 800 miles of transmission lines have been sited and routed under the PPSA and the rules promulgated pursuant to the Act (6 MCAR §§ 3.071-3.082).

The Board is also required to adopt an inventory of large electric power generating plant study areas (Inventory) by the PPSA (Minn. Stat. § 116C.55 (1980)). The Inventory is intended as an advance planning tool to identify relatively large land areas (study areas) where it may be possible to locate power plants with less adverse impact than other areas. The Inventory is intended as a guide for power plant siting, but it does not identify specific power plant sites.

The proposed amendments would amend the Rules for Routing High Voltage Transmission Lines and Siting Large Electric Power Generating Plants to address two topics. First, the proposed amendments change the process by which power plant sites are selected by revising the site selection criteria and adding an avoidance area criterion that places limits on use of prime farmland for power plant sites. Second, the proposed amendments establish criteria, standards and administrative procedures for preparation of an Inventory.

The proposed amendments were developed over a three year period. They incorporate concerns expressed by interested persons at many public meetings throughout the state, and at numerous meetings with utilities and interested persons and agencies (Exhibits 14-56).

The need and reasonableness of the proposed amendments to the power plant site selection process will be discussed first. The need and reasonableness of the proposed amendments concerning the Inventory will be discussed second.

Under Minn. Stat. § 15.0412, subd. 4c (1980), the Board is required to "make an affirmative presentation of fact establishing the need for and reasonableness of the rule proposed for adoption[.]" The Rules of both the Office of Administrative Hearings and the Attorney General require submission of a Statement of Need and Reasonableness (9 MCAR § 2.104; 1 MCAR § 1.202 P.). Basically, the statute and rules require that the Board must present the reasons for its proposals and that the reasons must not be arbitrary or capricious. To the extent that need and reasonableness are separate tests, need means identification of the problem requiring administrative attention and reasonableness means that the solution proposed by the Board is appropriate.

In addition to this Statement, the Board's staff has prepared a Statement of Evidence (attached as Appendix 1) that lists the exhibits it intends to introduce and the expert witnesses it intends to call and also contains a brief summary of the testimony of the expert witnesses.

II. PROPOSED REVISIONS IN THE SITE SELECTION PROCESS

The proposed amendments revise the site evaluation criteria used by the Board to select power plant sites. These criteria are contained in 6 MCAR § 3.074 H. of the existing rules. There are three types of site evaluation criteria:

- Site selection criteria, which list 16 characteristics of preferred sites that are to be balanced by the Board as the Board compares alternative sites and designates the final site (6 MCAR § 3.074 H.1.);

- Exclusion criteria, which list areas where plant sites are prohibited (6 MCAR § 3.074 H.2.); and

- Avoidance areas, where a plant site is allowed only if there are no feasible and prudent alternatives with less adverse environmental impact (6 MCAR § 3.074 H.3.).

The proposed amendments contain three proposed revisions in the site selection criteria and add an avoidance area criterion that places limits on the use of prime farmland for power plant sites.

A. Proposed Revisions in the Site Selecton Criteria

The proposed revisions in the site selection criteria would expand the criterion on energy conservation to include consideration of cogeneration, use of biomass and development of waste-to-energy (solid waste as fuel) systems; delete the criterion that prefers sites that allow for future expansion; and add a criterion addressing community benefits and economic development. "Community benefits" is defined in proposed 6 MCAR § 3.072 S.

In general, the proposed revisions are necessary to update the site selection criteria in recognition of the smaller power plants likely to come before the Board in the future. For example, a 60 megawatt (MW) plant is proposed by Northern States Power Company (Exhibit 106, Exhibit G-2). The existing list of site selection criteria is designed to minimize adverse impacts of the large power plants previously anticipated. As explained below, there are additional concerns and opportunities associated with smaller plants. Under the PPSA, the Board's siting authority extends to all power plants 50 MW or larger. The proposed revisions are also necessary to update the site selection criteria to reflect new information on the feasibility of various methods to promote energy efficiency in power plants and new information on the potential benefits to the local community when a power plant is located nearby.

1. Proposed Amendment of 6 MCAR § 3.074 H.1.j. (Energy conservation criterion)

The proposed amendment would expand the existing criterion on energy conservation to include consideration of cogeneration, use of biomass and development of waste-to-energy (solid waste as fuel) systems.

The proposed revision is needed to update the criterion on energy conservation and supplemental fuels to acknowledge and incorporate recent technological advances. The Board is directed by the PPSA to evaluate "the effects of new electric power generation and transmission technologies and systems related to power plants designed to minimize adverse environmental effects" during its study, research, evaluation and designation of sites (Minn. Stat. § 116C.57, subd. 4 (3) (1980)).

The specified items are now technically feasible, so their inclusion in the criterion is reasonable.

Cogeneration allows productive use of waste heat from power plants by recovering it as steam that can be used for industrial process needs or heating, or as hot water for heating. This improves energy efficiency and reduces the amount of water normally consumed in dissipating the heat (Exhibit 77, p. 13 and Exhibit 100, p. 50). Large plants can provide hot water, although difficulties and costs involved in modification of large plant steam design cycles make large plants less likely candidates for steam sources. Considerable information is now available on cogeneration opportunities (for example, Exhibits 76, 80, 117 and 138).

The references to "biomass" and "waste-to-fuel" concern potential supplemental fuels for the plant. Biomass is plant matter; the following types of biomass are generally considered potential fuels: agricultural crop residues, wood and wood residues, special energy crops (e.g., cattails), and peat. In its 1980 biennial report, the Minnesota Energy Agency concludes that "a rich biomass potential...can provide significant portions of Minnesota's energy needs" (Exhibit 74, p. 1-10). Exhibit 64 also discusses use of biomass in power plants. "Waste-to-fuel" refers to use of urban waste or garbage as fuel. Burning waste or garbage in a plant is beneficial because it reduces sanitary landfill requirements and attendent impacts. The technical feasibility of this option has also received much study (for example, Exhibit 58). The Board has funded such a study (Exhibit 86).

The inclusion of these factors in the energy conservation criterion is also reasonable because it reflects several statutory directives. In particular, the PPSA directs the Board to locate power plants "in an orderly manner compatible with environmental preservation and the efficient use of resources" (Minn. Stat. § 116C.53, subd. 1(1980)). Minn. Stat. § 116C.57, subd. 4(4)(1980) further directs the Board to evaluate "the potential for beneficial uses of waste energy" from proposed plants, which clearly applies to consideration of a site's potential for cogeneration. Since use of waste as a supplemental fuel will reduce landfill needs and the pollution resulting from landfills, the inclusion of waste-to-fuel also furthers the purpose of Minn. Stat. ch. 116D (1980) by minimizing pollution and impairment of the state's natural resources.

There is considerable citizen interest in having these factors considered when plant sites are being selected. Promotion of conservation of energy through cogeneration was a major concern expressed at the 1980 public meetings on the 1979 Draft Inventory (Exhibit 15). The 1979-1980 Power Plant Siting Advisory Committee (PPSAC) also strongly recommended the implementation of cogeneration (Exhibit 118, pp. 51-57). The 1979-80 PPSAC also strongly recommended consideration of alternative fuels, particularly biomass and urban waste (Exhibit 118, pp. 61-78).

2. Proposed Deletion of 6 MCAR § 3.074 H.1.n. (Site expansion criterion)

This amendment proposes deletion of the site selection criterion that states "[p]referred sites allow for future expansion". The subsequent two site selection criteria are then renumbered.

This site selection criterion was included in the original 1974 edition of the Power Plant Siting Rules. MEQC 74 (C) 3 (jj) stated that "[p]referred sites allow for larger rather than smaller generating capacity." Since that language was confusing, causing some people to interpret the rule as encouraging utilities to propose larger plants than necessary rather than indicating a preference for sites capable of expansion, as intended, the rule was changed to its present form in the 1978 edition of the rules.

The proposed deletion of the criterion is now necessary and reasonable in order to ensure that all appropriate siting opportunities are considered by the Board in the future. As now written, the criterion directs utilities to look for sites that are suitable for facilities larger than actually needed. This can exclude many reasonable sites for the plant size actually needed, because there are fewer reasonable sites for larger plants than smaller plants. Larger plants require more resources (e.g., water, land requirements for site and reservoir, rail access needs) and result in more adverse environmental impacts (e.g., air pollution, water pollution) than smaller plants (Exhibit 77). Therefore, the best site for the plant size actually needed may not be among those suitable for larger plants. This conflicts with the Board's responsibility under the PPSA to choose a site location that best minimizes adverse human and environmental impacts (Minn. Stat. § 116C.53, subd. 1 (1980)).

Further, the criterion conflicts with other proposed and existing site selection criteria. Sites suitable for larger plants tend to be located away from cities, which reduces the opportunities for conservation measures such as district heating and cogeneration, and realization of community benefits and economic benefits related to plant location near a city. This conflicts with proposed site selection criteria 6 MCAR § 3.074 H.1.j. and p. This also does not encourage location near large load centers, which conflicts with another site selection criterion (6 MCAR § 3.074 H.1.k.).

The proposed deletion is also reasonable and necessary because the criterion is no longer necessary to ensure that electric energy needs are met in an orderly and timely fashion, as directed by the PPSA (Minn. Stat. § 116C.53, subd.1 (1980)). The criterion is designed to handle a situation of rapidly increasing demand for electricity and new power plants, which was the situation when the criterion was adopted. For example, a 1976 multi-agency report evaluated the estimated percent growth rate in demand and estimated that as much as 70,000 MW of additional capacity would be needed in the next 25 years (Exhibit 98, p. 47). Clearly, under such circumstances, the need to establish an efficient procedure to site all of the anticipated facilities and the benefit of advance planning in minimizing the adverse impacts of these facilities made consideration of expansion potential a reasonable factor in each siting exercise.

However, it is no longer probable that expansion will be needed. Utility forecasts on the number and size of plants needed in the next 15 years have dropped dramatically since 1974. Table 1 documents a decrease of at least 4800 MW in plants proposed and projected to be located in Minnesota. Now, in addition to an 800 MW plant already sited, the latest 15-year advance forecast shows only a 60 MW plant for the Twin Cities Metro Area and 1183 MW that may or may not even be located in Minnesota.

Table 1

New Facilities Anticipated for Minnesota within 15 Years

Date of Advance Forecast	Proposed Facilities (MW)*		Projected Facilities (MW)	
	Minnesota Location	Unspecified Location	Minnesota Location	Unspecified Location
1974	2,560	0	4,300	0
1976	2,520**	0	0	6,000
1977 Update	2,400**	0	0	4,900
1978	3,350-3,400	100	0	2,445-2,495
1979 Update	1,500	150	0	1,178
1980	860	0	0	1,183

*These figures do not include facilities considered by the utilities to be "committed capacity".

**Approximate.

Source: 15-year advance forecasts submitted by the Minnesota/Wisconsin Power Suppliers. The 1978 and 1980 figures also include a forecast by the Southern Minnesota Municipal Power Agency (Exhibits 101-106).

The proposed deletion is also necessary and reasonable because it recognizes the difficulty in accurately evaluating expansion potential, which can limit the Board's ability to identify and select the sites that best fulfill the directives of PPSA and the other governing statutes. Changes continually occur in pollution control technologies and standards, plant design, resource availability and other factors that affect site suitability. These changes can diminish expansion potential at sites that once appeared suitable for expansion and open up siting opportunities in other areas. Examples of the first case include the growing awareness of the acid rain problem in the Boundary Waters Canoe Area (Exhibit 75, Chapter 4.3) and the Department of Natural Resources' development of protected flow levels on the Mississippi River which would limit water availability; these were not considered fully in the Board's decisions on the MP&L-P-2 site in St. Louis County and the NSP-P-1 site in Sherburne County. Examples of the second case include new technologies (like cogeneration) or plant designs (like improved air emission systems). Since more time will elapse between plant sitings in the future, the likelihood that major changes will occur is increased. Site expansion should be considered on a case-by-case basis under conditions existing when the expansion is actually needed.

The existing rule was adopted at a time when it appeared that expansion of existing sites would minimize adverse impacts. Staff testified during the 1977 rulemaking hearings that adverse effects of additional units may be only of an incremental nature as compared with the impacts of a totally new site (Exhibit 89, Finding 116). Now, it is clear that this is not always the case. Concentration of power generation results in major pollution impacts that, while perhaps less than the accumulated total of impacts from smaller dispersed plants, may still be significant. Further, minimizing pollution is but one aspect of siting a plant. The existing and proposed site selection criteria list several other factors that should be of at least equal weight.

Finally, the criterion proposed for deletion is not necessary to ensure that the benefits of expansion are considered by the Board on a case-by-case basis, as appropriate. Another site selection criterion in the existing rules states that "[p]referred sites maximize the use of already existing operating sites if expansion can be demonstrated to have equal or less adverse impact than feasible alternative sites" (6 MCAR § 3.074 H.1.1.).

The proposed deletion would remove from the rules an express preference for sites which allow for future expansion. The removal of that express preference does not establish a preference for sites which do not allow for future expansion. It merely results in the rules being silent on the matter. Determinations of whether new or existing sites should be used for future power plant development will be based upon a case by case determination of which option best fulfills the policies set forth in the Minnesota Environmental Rights Act (MERA) (Minn. Stat. ch. 116B), the Minnesota Environmental Policy Act (MEPA) (Minn. Stat. ch. 116D) and the PPSA.

Moreover, removal of the preference for sites which can be expanded does not contradict the principle of "nonproliferation" implicit in MERA, MEPA, and PPSA (as cited in People for Environmental Enlightenment and Responsibilities, Inc. v. Minnesota Environmental Quality Council, 226 N.W. 2d. 858 (Minn. 1978)). As discussed earlier, the Board would still be required by another site selection criterion to consider expansion of existing sites (6 MCAR § 3.074 H.1.1). In fact, the preference for sites capable of expansion may well contradict the "nonproliferation" principle for plants in general and for transmission lines in particular. Deletion of the preference for site expansion would increase the likelihood that sites with potential for cogeneration would be identified, which will decrease the need for more plants and thereby reduce transmission line requirements.

3. Proposed 6 MCAR § 3.072 S. and 6 MCAR § 3.074 H.1.p. (Community benefits definition and criterion)

These proposed amendments establish a new site selection criterion concerning economic development and community benefits and define the term "community benefits".

a. Proposed 6 MCAR § 3.072 S. (Definition of "community benefits")

This definition is necessary to specify the meaning of "community benefits", which is used in proposed 6 MCAR § 3.074 H.1.p., to distinguish these benefits from economic development benefits. The definition includes a list of reasonable examples, for further clarification. Each example is discussed in more detail in the discussion of the proposed site selection criterion.

b. Proposed 6 MCAR § 3.074 H.1.p. (Community benefits criterion)

This proposed amendment adds a new site selection criterion stating that preferred sites maximize opportunities for community benefits and economic development.

While there is growing recognition that there can be positive benefits to the local community from a nearby power plant, power plants are still generally perceived as a nuisance industry--something no community wants nearby. The existing site selection criteria reinforce this concept, because they stress minimizing the adverse impacts of plant location.

The potential positive benefits include those related to economic development (such as local employment opportunities at the power plant or economic development resulting from new industries attracted by cogeneration opportunities) and other community benefits. Examples of community benefits are given in the proposed definition of community benefits in proposed 6 MCAR § 3.072 S; they include:

- use of community solid waste as a supplemental fuel. This can preclude the need to expand a local landfill, thereby saving community moneys, freeing the land for other uses, and reducing the adverse environmental effects associated with landfills.

- joint water supply. Planning a water supply that can serve both plant and community can reduce costs and result in the benefit of reliable water supply to the local community.

- improving the economic viability of existing rail lines. The addition of the plant's coal traffic can improve the economic viability of marginal rail lines. Power plants of 200 MW and 400 MW would require about 140 cars and 260 cars per week, respectively (Exhibit 77). The 1979 State Rail Plan indicates that certain "marginal" lines would be viable with such additions (Exhibit 73, Exhibit D). Keeping these lines open can help local rail users and perhaps serve to attract other rail dependent industries to the area.

- increased tax base. Plants provide a significant tax base. The benefits to the local area resulting from increased tax base are obvious.

The addition of this proposed site selection criterion is necessary to ensure that the Board considers these positive benefits of plant location during the site selection process. This will encourage the utilities and other parties to identify possible benefits and undertake the early planning necessary so that design changes needed to provide the benefits are actually incorporated in plant design or site arrangement.

The proposed criterion also furthers the mandate of the PPSA, which directs the Board to consider "analysis of the direct and indirect economic impact of proposed sites" (Minn. Stat. § 116C.57, subd. 4 (5) (1980)) in the study, research, evaluation and designation of sites; and to "choose locations that minimize adverse human and environmental impact" (Minn. Stat. § 116C.53, subd. 1 (1980)).

The proposed criterion is reasonable because it will improve the site selection process and also serve to make plant location more acceptable to the local area that bears the burden of the power plant. The potential positive benefits are realistic, as shown by the examples discussed above.

B. Proposed Avoidance Area Criterion Relating to Prime Farmland

The proposed amendments also contain a new avoidance area criterion that places limits on the use of prime farmland for power plant sites. Proposed 6 MCAR § 3.074 H.3.d. contains the major policy statement; two related definitions are contained in proposed 6 MCAR § 3.072 P. and R.

The proposed avoidance area criterion limits the amount of prime farmland in the developed portion of the plant site and in the water storage reservoir or cooling pond site to a certain amount based on the net generating capacity of the plant. The limits would not apply to certain urbanizing areas. Since this is an avoidance area criterion, the limits would apply unless there are no feasible and prudent alternatives.

The criterion as proposed contains a range of numbers for the allowable amount of prime farmland that can be taken. The criterion as adopted will contain one number for the developed portion of the plant site and one number for the reservoir or cooling pond.

The proposed criterion was developed after numerous meetings with Board member agencies, interested citizens, Power Plant Siting Advisory Committees (PPSAC), utilities and other interested agencies, and after considerable effort to reconcile opposing viewpoints and work out technical problems. Major changes were made in the criterion to incorporate recommendations received during this period.

In the broad sense the proposed amendments are necessary in order to protect the important natural resource of productive agricultural land in the siting of power plants. The proposals present a reasonable approach because they establish needed limits on the use of productive agricultural land for power plant sites, while still allowing siting opportunities in all major regions of the state.

1. Need for the Proposed Avoidance Area Criterion

Productive agricultural land is being converted to other uses at an alarming rate. This will affect the ability of the nation to provide sufficient crop yields at an acceptable environmental cost.

The Minnesota Legislature has declared it to be a policy of the state to preserve productive agricultural land from conversion to other uses (Minn. Laws 1979, ch. 315). There can be no debate that development of a power plant on top of productive agricultural land will adversely affect that land's productivity in a significant, and largely irreversible way. Therefore, the Board believes there is a need to exercise its responsibility to ensure that productive agricultural lands are suitably protected when sites for power plants are selected.

There is growing recognition that loss of productive agricultural lands is occurring at a rapid rate. This has sobering implications in terms of the nation's ability to produce sufficient crops for domestic and international consumption. This trend also has environmental implications, since, at some point, productivity needs may require farming other acres on which crop yields will be lower and environmental hazards and production costs (especially for energy needs) will be greater.

The U.S. Department of Agriculture (USDA) has taken the lead in studying this problem. The USDA has established policy concerning loss of the agricultural resource (Exhibit 137). The following information was obtained from recent USDA studies and papers.

In the eight years between 1967 and 1975, the United States experienced a net conversion of nearly one million acres per year of cropland (Exhibit 130, p. 1). The USDA Soil Conservation Service (SCS) suggests that "[e]ach acre taken from cropland by urban development usually means at least one more acre is 'leapfrogged' or isolated and lost to farm production". (Exhibit 63, p. 196). Until recently, the national cropland reserve (land which can be brought into protection) was estimated at 266 million acres; however, the SCS' 1975 Potential Cropland Study estimates that only 111 million acres have high or medium potential for conversion to cropland (Exhibit 130, p. 5). This study indicates that bringing the potential cropland into production will not be without conservation costs, since 76 million acres of the 111 million acres have problems that will require additional management before they can be converted them to cropland (Exhibit 130, p. 5).

The USDA is concerned about the loss of prime farmlands in particular. The SCS defines "prime farmland" as the land that gives the "highest yields with minimum inputs of energy or money and results in the least damage to the environment" (Exhibit 120, p. 240). An SCS paper estimates that eight million acres of prime farmland were lost between 1967 and 1975, or 34% of all agricultural land consumed by other uses (Exhibit 120). There were about 384 million acres of prime farmland in the nation in 1975, about 250 million of them cropped. Of the 134 million acres not cropped, less than 20% (24 million acres) could be converted to cropland with no particular problems. Another 24 million acres have moderate problems that would need to be addressed (Exhibit 120, p. 241).

This concern was echoed by the findings and conclusions of the 1981 National Agricultural Lands Study (NALS). The NALS was an interagency study cochaired by the USDA and the President's Council of Environmental Quality on the availability of the nation's agricultural lands, the extent and causes of their conversion to other uses and the ways in which these lands might be retained for agricultural purposes. The NALS issued a series of reports on these issues (Exhibits 107-116). The NALS found that:

- "the United States at present has approximately 413 million acres of cropland and about 127 million acres of potential cropland for a total of about 540 million acres. In addition, there are some 268 million acres of rural land with low potential for cultivated crops" (Exhibit 113, p. 8).

- "the United States has been converting agricultural land to nonagricultural uses at the rate of about three million acres per year--of which about one million acres is from the cropland base" (Exhibit 113, p. 8).

- "agricultural land is converted to other uses in an incremental piece-by-piece fashion. Many of the effects are local but continued conversion of agricultural land at the current rate could have noteworthy national implications. The cumulative loss of cropland, in conjunction with other stresses on the U.S. agricultural system such as the growing demand for exports and rising energy costs, could seriously increase the economic and environmental costs of producing food and fiber in the United States during the next 20 years" (Exhibit 113, p. 8).

- in response to an increasing demand for U.S. agricultural products "[b]y the year 2000, most if not all of the nation's 540 million acre cropland base (existing cropland plus land with high or medium conversion potential) is likely to be in cultivation. When seen from this perspective, continuing nonagricultural demands upon the agricultural land base becomes a matter for national concern" (Exhibit 113, p. 8).

- "[s]hifts of land into cultivation of this magnitude are technically possible, but they will require some major adjustments in the U.S. agricultural system" (Exhibit 113, p. 15).

- "[h]igher real crop production costs are probable as well because potential cropland now coming into cultivation is more costly to till, is subject to more crop failures and yield variability, and produces poorer quality crops than cropland already in cultivation. Moreover, this land is usually more susceptible to erosion, groundwater overdrafts, and other environmental problems, hence its cultivation results in higher social costs either through conservation expenditures or through environmental degradation" (Exhibit 113, p. 15).

The NALS recommended that the federal government make the protection of good agricultural land a national policy (Exhibit 113, p. 15). It also recommended that state governments assume an active leadership role in protecting agricultural land (Exhibit 113, p. 18).

Other studies have explored the implications of these trends and concluded that the loss of prime agricultural lands must be minimized. For example, Worldwatch Institute points out that "[i]n a world of continuously growing demand for food, it must be viewed as an irreplaceable resource" (Exhibit 59, p. 38). The American Land Forum concludes that "sooner or later, conservationists and agriculturalists will have to face up to the fact that they have an issue in common" (Exhibit 57, p. 45). In the midwest, the Catholic bishops have recommended that public authorities should enact and enforce legislation to prevent the loss of this resource (Exhibit 67, p. 25).

There are similar concerns with the loss of productive agricultural land in Minnesota. Productive agricultural land is an important natural resource in Minnesota. Minnesota has over 30 million acres of agricultural land (Exhibit 70, p. 3)--over half the state. Nearly 23 million of these acres are in cropland (Exhibit 129, Table 3a). Minnesota has 19.5 million acres of prime farmland as defined by the SCS; 15.3 million acres are now being cropped (Exhibit 129, Table 18a). The NALS estimates that about 3.7 million acres of pasture, range, forest and other land have high or medium potential for conversion to cropland (Exhibit 108).

Estimates on loss of agricultural land in Minnesota vary depending upon the definition and the data collection methods used (Exhibit 62, p. 5). The NALS estimated a loss of 490,000 acres of agricultural land from 1967-1977 (Exhibit 108). A report from the Center for Urban and Regional Affairs at the University of Minnesota concluded that, after surveying various estimates, "an educated guess might be that Minnesota is losing about 50,000 acres of farmland per year" (Exhibit 62, p. 5). The State Planning Agency estimated in 1975 that, in the 15 year period between 1975 - 1990, 500,000 acres of agricultural land would be converted to other uses and that 333,000 acres of forest land might be shifted into agricultural use as replacement acreage (Exhibit 97, Table 5 and p. 15).

These numbers show that less than 1% of Minnesota's cropland base is likely to be lost each year. However, Minnesota faces the same problem as the nation in maintaining its ability to meet the demand for crops without sustaining environmental damage. The State Planning Agency study concludes that, "given a high crop demand and a moderate crop yield, a reasonable alternative, a total harvested acreage of 22.6 million acres would be needed in 1990. This level of production would approach the limits of available cropland in the state" (Exhibit 97, p. 15). This study further explores the environmental consequences of this level of production, particularly erosion, and cautions that "the major cause for concern is lack of a process to review tradeoffs between the quality of cropland lost to competing uses and the environmental and economic costs of bringing new land into production" (Exhibit 97, p. 18).

The Minnesota Department of Agriculture concludes, after considering the State Planning Agency information on demand for cropland, that "(p)laced in this perspective, the issue of preservation of the quantity of agricultural land assumes greater significance" (Exhibit 71, p. 7). The Department then cites its concern with the problem of maintaining the quality of agricultural land; erosion is one major problem. The Minnesota Pollution Control Agency's Water Quality Management Plan (the 208 Plan) points to cropland erosion as the most significant source of stream sediment in the state (Exhibit 94, p. 39).

Considerable concern about the loss of prime farmland has been expressed by Minnesota citizens. In a 1980 survey conducted by the State Planning Agency, the loss of prime agricultural lands was considered one of the two most significant land use problems by county and township officials (Exhibit 99, Table 1). That issue was the major concern expressed at

the 11 public meetings on the Information Meeting Draft: 1979 Inventory (of Power Plant Study Areas) (Exhibit 15). The Governor's Council on Rural Development has begun to study the issue of the quantitative and qualitative loss of productive agricultural land (Exhibit 65). The Minnesota Farmers Union and the Minnesota Project studied the issue of family farms and concluded that local, state and national governments should attempt to ensure that agricultural land is retained for agricultural purposes (Exhibit 93, p. iv).

Legislative concern for the preservation of the natural resource of productive agricultural land is reflected in several policy statements including the Minnesota Environmental Rights Act (MERA) (Minn. Stat. ch. 116B (1980)), the Minnesota Environmental Policy Act (MEPA) (Minn. Stat. ch. 116D (1980)), the Power Plant Siting Act (Minn. Stat. §§ 116C.53 to 116C.69 (1980)), the Metropolitan Agricultural Preserves Act (Minn. Stat. ch. 473H (1980)), and Minn. Laws 1979, ch. 315. Perhaps the clearest expression of legislative concern is found in Minn. Laws 1979, ch. 315 which created a joint legislative committee on agricultural land preservation. The legislature declared it to be state policy "that Minnesota lands that are well suited for the production of agricultural products be used and managed for that purpose by ...[p]ermanently preserving certain parcels of prime agricultural land from conversion to other uses[.]" Id. The legislature specifically found that this policy would be best served by:

> (a) Defining and locating lands well suited for the production of agricultural products;
>
> (b) Assuring that state agencies conduct their activities in a manner that considers and seeks to minimize negative impacts on agricultural activities, in accordance with other social, economic and environmental considerations[.]

Id.

The Metropolitan Agricultural Preserves Act, Minn. Stat. ch. 473H (1980), contains a similar policy statement on preservation of productive agricultural land.

In both MERA and MEPA the legislature declares the preservation of the air, water, productive land and other natural resources to be the policy of the state. Minn. Stat. § 116B.01 (1980); Minn. Stat. § 116D.02 (1980). As the Minnesota Supreme Court has stated, both MERA and MEPA prohibit:

> any activity which significantly affects the quality of the environment if there is a "feasible and prudent alternative" consistent with the "state's paramount concern for the protection of its air, water, land and other natural resources from pollution, impairment or destruction. Economics alone shall not justify such conduct. Minn. Stat. § 116B.09, subd. 2 (1978).

Floodwood-Fine Lakes et. al, v. MEQC, 287 N.W. 2d 390, 397 (Minn. 1979).

As delineated in MERA, protectible natural resources include "all mineral, animal, botanical, air, water, land, timber, soil, quietude, recreational and historical resources." Minn. Stat. § 116B.02, subd. 4 (1980). The Supreme Court has further determined that protectible resources are those resources the destruction of which "is noncompensible and injurious to all present and future residents of Minnesota." People for Environmental Enlightenment and Responsibility, Inc. v. Minnesota Environmental Quality Council [hereinafter cited as PEER], 266 N.W. 2d 858, 869 (Minn. 1978).

While the Minnesota Supreme Court has not yet explicitly accorded productive agricultural land full status as a protectible natural resource, the Court has made it clear that productive agricultural land is entitled to substantial protection. In State by Skeie v. Minnkota Power Cooperative, 281 N.W. 2d 372 (Minn. 1979), the Minnesota Supreme Court refused to hold that interference with the economic operations of farming constituted a violation of the legislative protection afforded land and soil under MERA. However, the Court noted that if there had been evidence showing that the proposed action would have made "the soil sterile; or caused its erosion; or limited its cropping potential, in some significant, irreversible way, we would have a different situation." Id. at 374. The protection to be accorded productive agricultural land is not absolute, and as a dissenting justice in the Skeie case noted, "[w]hen productive farm lands are compared with [the traditionally-recognized] natural resources, the latter should typically receive protection, absent unusual and extraordinary circumstances." Id at 375. (Yetka, J. dissenting). This was the result in County of Freeborn by Tuveson v. Bryson, 309 Minn. 178, 243 N.W. 2d 316 (1976), where the Court held that a proposed highway must be routed through agricultural land in order to preserve a natural wildlife marsh.

The enforcement of MERA and MEPA is a clear statutory obligation of the Board in siting a power plant under the PPSA. Minn. Stat. § 116D.03, subd. 1 (1980); Minn. Stat. § 116C.53, subd. 1 (1980); PEER, supra at 865-866; No Power Line v. Minnesota Environmental Quality Council, 262 N.W. 2d 312, 325-326 (Minn. 1977). Thus, in siting a power plant the Board is required under MERA, MEPA and the PPSA, as interpreted by the Supreme Court, to determine whether the likely environmental impacts of a site on productive agricultural land are more or less significant than the likely impacts on other natural resources. It is then required to select the power plant site with the least significant adverse impacts unless other extraordinary circumstances compel a different site.

The existing rules governing the power plant siting process do not provide sufficient protection for the natural resource of productive agricultural land, as required by MERA, MEPA and PPSA. Agricultural lands are now considered as one of 16 site selection criteria that are used by the Board to evaluate alternative plant sites and select the final plant site. 6 MCAR § 3.074 H.1.g. states:

> Preferred sites minimize the removal of valuable and productive agricultural, forestry or mineral lands from their uses.

The existing rules provide little guaranteed protection for the productive natural resource because the 16 site selection criteria are balanced against each other and the final site need not meet all the criteria. At most the rule would serve to select the alternative site that uses the least amount of productive agricultural land--a choice that may be between alternative sites that each occupy significant amounts of productive agricultural land.

The proposed avoidance area criterion would complement the existing site selection criterion. The Board would use the existing site selection criterion when alternative sites are being compared, first, to minimize the removal of valuable and productive nonprime soils, as well as prime soils, and second, to consider valuable agricultural uses (e.g., turkey farms or livestock operations) other than cropland.

The proposed avoidance area criterion is necessary to provide sufficient protection of the natural resource of productive agricultural land during selection of power plant sites in light of the legislative directives discussed earlier. This is the case regardless of the amount of land that might be taken for power plant sites. If current utility forecasts are accurate, the amount of land taken by plants in the next 15 years will be small--perhaps less than 1500 acres plus land needed for reservoir sites. This is a small amount, only part of the total amount lost each year. However, it does not alter the fact that productive agricultural lands as defined in the proposed avoidance area criterion are an irreplaceable productive resource. Loss of any productive agricultural land reduces the total amount available and must be of concern to the Board.

For a similar reason, the existence of a significant acreage of productive agricultural lands, as defined in the proposed criterion, that are not now used for crops does not render adoption of the proposed criterion unnecessary. The Board must be concerned with the loss of any productive agricultural land.

The proposed criterion seeks to protect prime agricultural land--those soils that meet the specification of 7 C.F.R. § 657.5(a) (1980). These soils have high sustained crop yields under normal management without degrading the environment. It is not appropriate to assume that non-prime soils can replace the productivity of prime soils converted to other uses. Productivity on non-prime soils can be increased through intensive farming with investment of management effort, money and energy (for example, by farming erosive soils or irrigating sandy soils), or, proportionately more acres of the non-prime soils can be put into cropland. However, these options require more resources and will likely have more adverse impacts on the environment. For example, irrigation requires substantial capital investment and increases the demand for surface and ground water. The use of non-prime soils to replace prime soils must be viewed with concern.

In conclusion, the proposed avoidance area criterion is necessary to ensure that the natural resource of productive agricultural lands is given sufficient protection when power plants sites are selected. This

is consistent with legislative mandates expressed in MERA, MEPA, PPSA and other applicable statutes.

2. Reasonableness of Proposed Avoidance Area Criterion

As discussed above, the proposed amendments are needed to fulfill the Board's mandate for protecting productive agricultural land. The proposed amendments are reasonable because they encourage the wise use of productive agricultural land by limiting use of such land for power plant sites but still providing siting opportunities in all major regions of the state.

The proposed amendments appropriately do not accord absolute protection to productive agricultural land. Instead, the protection is limited to only significant conversion of prime agricultural land. The proposed amendments represent the Board's determination that significant conversion of prime agricultural land should be subject to the same limitations as impairment of other "traditional" natural resources. "Prime" agricultural land is that land of special quality which meets the definition provided under 7 CFR 657.5(a)(1980). A "significant" conversion is one which exceeds the acres-per-megawatt standard in the proposed rule.

The proposed amendments explicitly make significant conversion of productive agricultural land subject to the "feasible and prudent alternative standard" of MERA and MEPA by designating prime farmland as an avoidance area criterion. This is reasonable because it is in accord with the legislative directives and court interpretations discussed above.

It would be inappropriate for the proposed criterion on prime farmland to be designated as either an exclusion area criterion or a site selection criterion. If it were designated as an exclusion criterion under 6 MCAR § 3.074 H.2., the "feasible and prudent alternative" standard would not be applicable and agricultural land would assume an importance above most other "traditional" natural resources. Such a consequence is not intended by the proposed amendments and would be inappropriate in light of the Minnesota Supreme Court's decision in Skeie, supra., which does not accord productive agricultural land full status as a protectible natural resource. On the other hand, if the proposed criterion on prime farmland were designated as a general site selection criterion, the protection proposed to be afforded prime agricultural land would dissolve. The general criteria in 6 MCAR § 3.074 H.1. are stated as "preferences" and are not applicable to "all plants in the same degree." The legislative directives, as interpreted by the Court, clearly mandate according protection against significant conversions of prime farmland more than mere status as a "preference."

Designation as an avoidance criterion is also appropriate in light of Minn. Stat. § 116C.66 (1980), which provides that "[n]o rule adopted by the board shall grant priority to state owned wildlife management areas over agricultural land in the designation or (sic) route avoidance areas" (emphasis added). While the statute specifically applies only to routing of transmission lines, it gives a strong indication of the appropriate protection to be accorded to productive agricultural land. Under the present rules, state owned wildlife management areas are designated as avoidance areas with respect to the siting of power plants (3 MCAR § 3.074 H.3.a.) and, thus, it is appropriate to accord similar protection to prime farmland.

The proposed amendment includes language from PEER, supra., that limits the types of human impacts that can be balanced on an equal footing with environmental impacts to human impacts that are noncompensible.

The reasonableness of the proposed definition of prime farmland, the definition of developed portion of the site and the avoidance area criterion are discussed in greater detail below.

a. Proposed 6 MCAR § 3.072 R. (Definition of "prime farmland")

The definition of "prime farmland" in proposed 6 MCAR 3.072 R. identifies the lands that the Board believes should be identified as the natural resource of productive agricultural land and given the protection of the avoidance area criterion proposed in 6 MCAR § 3.074 H.3.d. The proposed definition states that prime farmlands are those soils that meet the specifications of 7 C.F.R. § 657.5 (a)(1980), which is the prime farmland definition established by the U.S. Department of Agriculture Soil Conservation Service (SCS) as part of the SCS's Important Farmland Inventory Program.

The proposed definition is necessary to specify which lands the Board considers prime farmlands for purposes of implementing the proposed avoidance area criterion concerning prime farmland. This clarification is vital. The term "prime" can take on many meanings, ranging from "my land" to "all agricultural land". Many of them have been used by various participants during the development of this policy.

The proposed definition is reasonable. It identifies a natural resource of productive agricultural lands. These soils are "prime" because they are best suited for sustained crop yield with minimum adverse environmental consequences. The definition is based on specific standards, so it is less subject to variation in interpretation. Soils that meet the definition can be readily identified, so the proposed avoidance area criterion can be administered consistently. The definition was developed after extensive study by an agency with considerable expertise in the area. Finally, the definition is better than other possible options.

First, as is essential to receive this level of protection under MERA and MEPA, the definition specifies an irreplaceable, noncompensible natural resource. The definition is based on the physical, chemical and climatic attributes of soils that influence the inherent ability of the soil to produce sustained high crop yields with minimal adverse environmental impacts under normal management.

7 C.F.R. § 657.5 (a)(1980) states that "prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops... It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields...". It summarizes these characteristics as follows: "In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation [irrigation is a factor in states with low rainfall], a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding." 7 C.F.R. § 657.5 (a)(1980) then lists the specific technical standards that soils must meet in order to be classified as prime farmlands.

Indeed, an SCS paper indicates that the intent was to select those lands that are highly productive and energy efficient yet environmentally "safe" to crop over a long period of time. (Exhibit 132, p. 1)

This is also shown by discussion in the background paper that accompanied an early draft of the SCS definition of prime farmland:

> The criteria for identification of prime farmlands are entirely related to soil characteristics and other physical criteria. They were set up to facilitate the identification and inventory of the nation's most productive farmlands in a reasonable time by using existing soil surveys. In addition, the physical criteria chosen are stable criteria that accurately measure the soil's responsiveness to modern management techniques. Factors such as nearness to market, transportation facilities, and other economic data are useful in making land use decisions, but they do not affect the intrinsic quality of the land. If land use decisionmakers wish to add information on these factors to the inventory, the basis for making land use decisions will be improved. These factors change with time and technology, however, and we decided that they should not be included in the criteria.
>
> Most of the prime farmland is now used for crops; however, it could be in pasture, range, forest, or other land uses and still qualify as prime farmland. Urban builtup land and water are excluded. The rationale for this approach is that land not committed to irreversible uses may be available for cropping. Decisionmakers must be aware of the long-term implications of various land use options for the production of food, feed, etc., and the trade-offs involved. Actions that put high quality farmland in irreversible uses will be

initiated only if these actions are clearly in the public interest.... (emphasis supplied) (Exhibit 128, p. 1).

Finally, it is important to emphasize that prime farmlands are some of the most important resources of the nation. These exceptional lands can be farmed continuously or nearly continuously without degrading the environment. They will produce the most food, feed, etc. with the least amount of energy used. They respond exceptionally well to fertilizer and other chemical applications with limited loss of residues by leaching or erosion. These lands have the highest percentage of soils that can be minimum tilled. They are the most responsive to management and require the least investment for maintaining productivity (emphasis supplied)(Ibid, p. 4).

It is reasonable that the definition is keyed to crop production. Many other agricultural uses and operations, such as turkey farms or dairy operations, are not tied to the inherent productive capacity of the land. Because they can be moved with little or no loss of production at a finite economic cost, it would not be appropriate to attempt to protect them in some special manner. Similarly, non-prime soils should not be given the same level of protection as prime soils. Although soils that do not meet the definition of "prime farmlands" may achieve yields as high as those from prime soils, considerable investment of management, money and energy are involved; these investments are economic in nature. Compensible factors are balanced when alternative sites are being compared under the site selection criteria. An existing site selection criterion seeks to minimize loss of valuable and productive agricultural land (6 MCAR § 3.074 H.1.g).

It must be emphasized that crop productivity is not being considered in a purely economic sense. While it is clear that crop yield does translate into dollars, the major concern is the inherent productive capacity of the land as a natural resource. The value being considered is the ability of the land to produce sustained crop yields with minimum environmental degradation.

Minnesota is fortunate that many of its acres are considered prime. The SCS estimates that nearly 19.5 million acres in Minnesota would meet this definition (Exhibit 129, Table 18a). However, this does not invalidate the definition. It simply reflects the fact that Minnesota's soils are very productive soils for several crops.

Second, the definition is reasonable because it was developed by an agency with considerable expertise in the area, the U.S. Department of Agriculture (USDA). The USDA is the federal agency charged with caring for the nation's agricultural resource. It clearly has the expertise to best identify the factors that compose the best cropland. Further, as the following discussion demonstrates, the definition received substantial review and comment from experts in the USDA, other agencies and universities and other persons with pertinent information during the five year development period.

The definition of "prime farmlands" in 7 C.F.R. § 657.5 (a)(1980) was developed by the Soil Conservation Service (SCS) in response to Title III of the Rural Development Act of 1972. Section 302 of that Act directed the Secretary of Agriculture to carry out a program "...for the identification of prime agricultural producing areas...". This program is called the Important Farmland Inventory.

The definition of "prime farmlands" was developed over a period of five years (Exhibit 124). Early drafts were developed by task forces of staff members from the SCS and other U.S. Department of Agriculture divisions. In September, 1973, the state SCS offices reviewed the drafts. In June, 1975 input was requested from SCS cooperators, soil conservation districts, agricultural experiment station leaders and others. A Seminar on the Retention of Prime Lands was held in July, 1975 so that representatives of universities, private agencies or groups and other public agencies could give the U.S.D.A. further input into the definition (Exhibit 122). Directors of the SCS technical service centers were polled in September, 1975 to finalize the draft definitions of prime and unique farmlands. The draft definition was contained in the Land Inventory and Monitoring Memorandum-3 (LIM-3), released on October 15, 1975. The definition was proposed as a federal regulation in the Federal Register on August 23, 1977; following some modification, it was published as a final Rule in the Federal Register on January 31, 1978 (Exhibit 127).

Indeed, the SCS developed the definition to provide information to those who make land use decisions. As stated in an article by SCS soil scientists, "The Department's role--confirmed by many recent requests for assistance--is to collect and interpret resource data so that others may have the information needed to make sound [land use] decisions ...[t]o help assure that decisions can be made with knowledge of the soil and climatic qualities rather than simply trading acres as economic equals. The inventory system can assist decision-makers in determining the real cost of taking any parcel of that land out of production" (Exhibit 63, pp. 195, 197).

Third, the definition of prime farmland contained in 7 C.F.R. § 657.5 (a)(1980) is used in other proceedings. It is used in the U.S. Department of the Interior's Mineland Reclamation Rules (30 C.F.R. § 716.76). Other federal agencies use the definition in other ways. For example, directives from the President's Council on Environmental Quality require federal agencies to assess impacts on prime farmland when preparing federal EISs and in their programs (Exhibit 61).

Fourth, the fact that the proposed definition is easy to interpret and administer also makes this proposed definition reasonable. 7 C.F.R. § 657 (1980) requires the SCS State Conservationist in each state to identify the soils that meet the above definition of prime farmlands. The Minnesota State Conservationist has prepared a background memo that identifies how Minnesota's prime soils will be identified and lists soils that meet the definition (Exhibit 134). The Minnesota State Conservationist updates the list of prime soils to allow consideration

of new soils discovered during county soil surveys. The list is entitled "Important Farmlands Legend"; the most recent list is dated March 15, 1981. It is included in the background memo. The list is intended for use with detailed soil surveys (Exhibit 128, p. 1), particularly the SCS-prepared county soil surveys (See Exhibits 135, 136).

For counties with modern SCS county soil surveys, qualifying soils and their locations can be clearly established early in the siting process. The definition can also be applied in counties without these surveys. Soil surveys would be required for sites in these counties. An example of a site soil survey done by the SCS for a proposed plant site in St. Louis County is shown in Exhibit 131. It is possible to determine if new soils meet the proposed definition, since the standards that define prime soils are factors that are analyzed when new soils are determined (Exhibit 133). New soils discovered during a site survey would be referred to the Minnesota State Conservationist for comment. However, this situation will be less common in the future. The SCS anticipates that the entire state will be surveyed by 1991; 62 county surveys are currently complete or underway (Exhibit 123). Further information is available to assist in selection of potential sites that would likely meet the proposed avoidance area criterion in counties without soil surveys. Local SCS personnel can provide general soils information to show the probable location of prime soils. The SCS is also publishing an "Important Farmlands" map for each county, to show where prime farmlands are concentrated (see exhibits 125 and 126). The SCS also contemplates publishing a statewide map showing general location of prime farmlands in 1981, as a further aid.

Fifth, the fact that soils must meet specified criteria makes this definition easier to understand and less subject to differing interpretation by the parties involved in the siting process.

Finally, the definition is reasonable because it is better than other possible definitions. The other options considered and rejected are discussed below.

- All farmland. Defining prime farmland as "all farmland" would not reflect a reasonable effort to identify the best productive natural resource. It would exclude many prime farmlands not now being farmed and include many not-as-productive areas that are being farmed.

- Land capability classification system. The SCS land capability classification system establishes eight categories of soils based on the limitations of the soils when used for crops, the risk of damage when they are used and the way they respond to reasonable treatment. A policy to protect Class I and II lands was considered as the proposed criterion was developed (Exhibit 79). This definition has several advantages: it is a familiar system, it was developed by the USDA experts, it is keyed to natural characteristics of the soils and, since it is used in conjunction with the county soil surveys, would be easy to administer. Unfortunately, the land capability classification system is not based on specified criteria, which makes it more

susceptible to variation in interpretation, particularly in areas without county soil surveys. The definition is also based more on management limitations than on inherent productivity of the natural resource. It should be noted that the definition of prime farmlands and the land capability classification system overlap, as would be expected. In general, all Class I soils are also prime soils. Most of Class II soils and a few Class III soils are also considered prime soils (Exhibit 134).

- Crop equivalency rating system. The crop equivalency rating system expresses the value or productivity of land in terms of the net economic return associated with a particular combination of soil, climate and management practices (Exhibit 119). The major drawbacks to this system are that it identifies economic worth and involves placement of subjective values by the person rating the land.

- Cropland resources study. Minnesota Cropland Resources, prepared by the State Planning Agency, rates the productivity potential for cropland in the state based on soil characteristics and climate factors (Exhibit 96). The state-wide coverage makes this option attractive. However, the base data and methodology are quite generalized. The report emphasizes that the maps are not intended for use in site planning (Exhibit 96, p. 23).

- Development of a new definition. The other major option concerns development of a new definition of prime lands. A precise definition that would protect the "best of the best" could theoretically be developed. This would require much more time and effort than has already been expended. It is not clear whether the benefits of such an effort would outweigh the costs of the process or whether a better definition could even be developed. There are benefits to using an already established, familiar and accepted definition. It is also quite clear that the need to protect this productive agricultural resource cannot wait upon the development of such a definition.

- Including "unique" farmlands. Extending the definition to include "unique" farmland as defined by the SCS in 7 C.F.R. 657.5 (b)(1980) has been suggested by the 1980-1981 Power Plant Siting Advisory Committee (Exhibit 28). Unique farmland is defined as having special combinations of soil quality, location, growing season and moisture supply to grow a specific crop; examples of such crops are cranberries, fruit and vegetables. The major drawback to this suggestion is the lack of specific standards to define unique farmlands, which would make application of the policy quite difficult. The definition is also not entirely based on inherent, stable, physical criteria, since nearness to market is a consideration.

b. Proposed 6 MCAR § 3.072 P. (Definition of "developed portion of plant site")

The proposed definition of "developed portion of plant site" is necessary to clearly specify which portion of the total plant site is subject to the provisions of the proposed avoidance area criterion concerning prime farmland.

The conventional power plant site consists of a power station or developed portion, in which structures, facilities and land uses necessary to plant operation are located, and a buffer area. The buffer area is land surrounding the power station that is used to minimize plant impacts, such as noise and cooling tower drift, that diminish with increased distance from the plant (Exhibit 121, p. 1-2). A proposed plant may also include a water storage reservoir or cooling pond to store water for the cooling systems or to comprise the cooling system, respectively.

By this definition, the developed portion of the plant site would consist of structures, facilities and land uses that preclude crop production. Land occupied by structures or facilities are obviously not available for crop production. The definition also includes those land uses which, practically speaking, could not be used for crop production; an example would be areas near the coal storage piles where vehicles are driven. The buffer area would not meet this definition, since agricultural uses are allowable in a buffer area (Exhibit 121, p. 1-2).

Excluding the water storage reservoir or cooling pond from the proposed definition is necessary and reasonable, because a separate policy is proposed for them in proposed 6 MCAR § 3.074 H.3.d.

The reasonableness of the proposed definition is discussed on below.

c. Proposed 6 MCAR § 3.074 H.3.d. (Avoidance area criterion concerning prime farmland)

The avoidance area criterion contained in proposed 6 MCAR § 3.074 H.3.d. proposes a maximum amount of prime farmland that can be taken for the developed portion of the plant site and a separate maximum amount for a water storage reservoir or cooling pond. The amounts are proportional to the net generating capacity of the power plant--an "acres per megawatt (MW)" approach. A range of possible values for the maximum amounts of prime farmland has been suggested for consideration during the rule hearings; the range is from 0.25-0.75 acres per megawatt of net generating capacity. The proposed limits do not apply to certain urbanizing areas. "Net generating capacity" refers to the amount of electricity produced by a power plant in excess of the amount needed to run plant equipment.

The proposed criterion applies to two parts of the plant site: the developed portion of the plant site and the water storage reservoir or cooling pond site. This is reasonable because these are the only parts of the site where crop production is indeed precluded. Land within the buffer area is not appropriately subject to the proposed criterion, since agricultural use is an allowable activity in the buffer, during plant operation (Exhibit 121, p. 1-2).

The proposed criterion proposes separate limits on use of prime farmland for the developed portion of the site and for the reservoir or cooling pond. This is reasonable because the purpose of the proposed criterion is better served by requiring that use of prime farmland be minimized as both the plant site and the reservoir site are selected. Were one number specified--or, for the proposed range, 0.5 acres to 1.5 acres per megawatt--to consider both the reservoir or cooling pond and the developed portion of the site, siting flexibility would increase, but prime farmland may not be protected sufficiently. In cases where there is either no reservoir or only a small reservoir, a large amount of prime farmland could be used for the developed portion of the plant site.

Further, the plant site and the reservoir or cooling pond may be miles apart. Water can be piped from a distant reservoir(s) directly to the plant, or, alternatively, used to augment low stream flows such that constant plant withdrawal from the river is possible. The maximum possible distance for piping depends more upon the cost premium involved than any technical constraint.

Finally, land requirements for reservoirs are much more variable than land requirements for the developed portion of the plant site, which takes somewhat less than one acre per megawatt (Table 2). Land requirements for water storage reservoirs vary from site to site, in response to storage needs and reservoir depth. Storage needs vary considerably. The water model developed by the Department of Natural Resources for the 1979 Draft Inventory of Study Areas estimated, for an 800 MW plant with low flow levels at the 90% exceedence flow, storage needs ranging from 1972 acre feet to 27,597 acre feet (Exhibit 72). The actual reservoir may be up to twice as large since it must also contain room for sediment and flood water storage and other inactive storage. Clearly, deeper reservoirs minimize land requirements. For example, 12,000 acre feet of storage is available from 600 acres, if the reservoir is 20 feet deep, or from 400 acres is the reservoir is 30 feet deep. Therefore, it is entirely possible that different values for the allowable amount of prime farmland per megawatt may be appropriate.

Land requirements for cooling ponds are more easily identified - for an area like Minnesota, the surface area needed to allow the required amount of cooling is about 1.1 acres per MW. (Exhibit 77, p. 53 and Exhibit 78, p. 128). The cooling pond can also be located away from the rest of the plant site.

The proposed criterion relates the amount of prime farmland that can be used to the size of the plant. This approach is reasonable because it addresses the issue of protection of prime farmland directly, without a bias to plant size. This is important because the Board's siting responsibility extends to all power plants 50 MW and larger (Minn. Stat. § 116C.52, subd. 4 (1980)). The proposed policy ensures that prime farmland must be conserved in each plant site, regardless of size. Likewise, larger plants are not unduly penalized because they require larger sites.

The "acres per megawatt" approach also provides an incentive for utilities to reduce the size of the site and reservoir/cooling pond, thereby encouraging thrifty use of land. Further, the "acres per megawatt" approach is also easy to understand and administer, since the allowable amount of prime farmlands is easily calculable.

This approach does not have the drawbacks of other approaches that were considered and rejected:

- Maximum acreage. The 10/2/80 draft of the proposed amendments established a maximum allowable acreage of prime farmland, regardless of plant size (Exhibit 17). In this approach, neither the developed portion of the plant nor the reservoir/cooling pond could take more than 320 acres of prime farmland. This confuses the issue of protection of prime farmland with plant size, because it produces an inherent bias towards smaller plants which can more easily meet this standard. Several reviewers were concerned about this, since it appears an inappropriate focus for an agricultural policy and one more appropriately considered by the Minnesota Energy Agency in its Certificate of Need proceedings (Exhibits 20, 21 and 26, p. 9).

  Simple arithmetic shows that this approach also could result in more total loss of prime farmland if smaller plants are built on different sites. Four -400 MW plants totalling 1600 MW could take up to 1280 acres, while two-800 MW plants would be limited to 640 acres.

  Further, the uncertainty as to how many--and what size--plants will be proposed in the future would make it very difficult to select a maximum acreage figure that would be equitable for all future sitings. The current 15-year forecast submitted by the major utilities shows only two plants in Minnesota - one 60 MW plant and one 800 MW plant that has already been sited by the Board. No sizes or locations have been specified for an additional 1183 MW of needed capacity (Exhibit 106, Exhibit G-2). However, these figures may not accurately predict future needs. For example, the Northern States Power Company has cited the uncertain availability of oil and the possibility of premature shutdown of NSP's nuclear plants as adding uncertainty to power system planning (Exhibit 66). Changes in any of the major assumptions used in the utilities' forecast could also change the number and size of plants that must be sited.

- Percent of site. Allowing a certain percentage of the site to be prime farmland has one fatal drawback: the area of a site can be expanded rather easily, so the policy could be easily circumvented. This would not serve to protect prime farmland. Nor would it encourage utilities to be thrifty in their use of land for plant sites.

It can be argued that the policy penalizes smaller plants and plants other than coal-fired plants. Table 2 shows that smaller coal-fired plants require more acres per megawatt than larger plants; sites for a 50 MW plant, 200 MW plant and 400 MW plant involve 1.6 acres per megawatt, 1.0 acres per megawatt, and 0.90 acres per megawatt, respectively. Plants fueled by wood or other bulky alternative material may require larger sites for fuel storage and waste disposal. However, the policy should not unduly penalize smaller plants. Smaller plants require fewer total acres (e.g., 80 acres for a 50 MW plant), and staff research shows it is easier to find small clusters of non-prime soils (Appendix 2). The other question is not as clear cut, since our data on site size concerns coal-fired plants. However, no wood or other fuel plants larger than 50 MW are currently proposed by the utilities for the next 15 years (Exhibit 106, Exhibit G-2).

Table 2

Site Size for Coal-fired Plants

Plant System	Plant Size (MW)			
	50	200	400	800
Boiler-Turbine (acres)	1.5	1.8	2.0	4.0
Fuel Supply (acres)	5.0	15.0	26.0	48.0
Cooling System (acres)	8.0	15.0	20.0	25.0
Water Quality (acres)	1.0	1.5	2.0	4.0
Solid Waste (20 ft. deep)	63.0	165.0	315.0	610.0
Trans. Switchyard (acres)	1.5	2.0	3.0	7.0
Total Developed Area (acres)	80.0	200.3	368.0	698.0
(Acres/MW)	1.6	1.0	0.92	0.87
Buffer Zone (acres)	35.0	90.0	160.0	326.0
Total Plant Area (acres)	115.	290.0	528.0	1024.0

From Considerations in Electric Power Plant Siting: Coal Fired Power Plants from 50 to 2,400 Megawatts. Prepared by Burns and Roe, Inc. for the Minnesota Environmental Quality Board. January, 1980. (Exhibit 77).

The proposed avoidance area criterion gives a range of values for the amount of prime farmlands that can be taken per megawatt of net generating capacity for the site and the reservoir or cooling pond site; the range includes the values from 0.25-0.75 acres per megawatt. The Board has proposed this range, in part, because the Board believes that this will aid the rulemaking process by encouraging interested persons to make affirmative presentations regarding the standard they prefer. It is the Board's belief that statements in support of a particular standard (as opposed to statements in simple opposition to a proposed standard) will provide the Board with more useful and complete data from which to select the best possible standards.

In addition, the Board has proposed the range because it believes that the adoption of any number within the range could be reasonable. In this statement and its appendices, the Board's staff has presented evidence and data that support the numbers within the proposed range. The Board encourages people to comment during the hearings on the number they prefer and the reasons for their recommendation. After consideration of these statements, Board staff intends to identify during the hearing the number(s) it proposes to recommend the Board adopt. There will be opportunity for comment following the staff recommendation.

The range itself encompasses the values most likely to be considered appropriate. The lower figure, 0.25 acres per megawat, means that only about one-fourth of the developed portion of the plant site or the cooling pond site could be prime farmlands. This would be a fairly restrictive policy, given the large concentrations of prime farmlands in certain areas, yet still offer a few siting opportunities. A lower amount would likely not be reasonable, given prime farmland's legal status as a productive natural resource and the need to maintain siting opportunities throughout the state. The upper figure, 0.75 acres per megawatt, is a reasonable upper limit to the discussion because it offers more siting opportunities, since about three-fourths of the sites could be prime farmland, and, therefore, offers less protection of prime farmland. A larger number would afford little protection. The range allows the tradeoff of siting flexibility versus protection of prime farmland to be considered by all interested people during the rulemaking process.

Appendix 2 contains further information on the implications of the range for the developed portion of the site and the reservoir or cooling pond site. Three numbers are considered--0.25 acres per megawatt, 0.5 acres per megawatt and 0.75 acres per megawatt. Information on the number of siting opportunities, level of protection afforded prime farmland and measures the utility can take to meet the limits is presented for each number for both situations. This information shows that there are siting opportunities even in heavily prime areas for all three numbers.

It should be noted that the 1980-1981 Power Plant Siting Advisory Committee has recommended that the appropriate number is 0.5 acres per megawatt for the developed portion of the plant site and 0.5 acres per megawatt for the reservoir or cooling pond site (Exhibit 28).

The proposed avoidance area criterion does not apply to certain urbanizing areas. This is reasonable because it addresses the equity problem inherent in requiring the utilities and others in the siting process to avoid use of prime farmlands near urban areas only to watch the same land go to urban uses shortly thereafter.

It will also encourage location of plants near large load centers, thereby avoiding areas of concentrated agricultural use and perhaps minimizing adverse impacts on the areas due to transmission line requirements and other factors. It also increases the possibility that advantages associated with near location of power plant and urban area can be realized; examples include cogeneration possibilities, district heating systems and other economic development and other community benefits discussed under proposed 6 MCAR § 3.074 H.1.p. This is reasonable because it reflects and furthers the goals of several site selection criteria--6 MCAR § 3.074 H.1.g. and k. and proposed 6 MCAR § 3.074 H.1.p.

The exemption is limited to three cases--areas located within home rule charter or statutory cities (the two types of cities), areas located within two miles of first, second and third class home rule charter or statutory cities; and areas designated for orderly annexation under Minn. Stat. § 414.0325 (1980). This is reasonable because these areas have been officially designated as having potential for urban growth. By definition, cities are considered as having potential for urban growth.

However, growth may occur outside city boundaries. Therefore, it is reasonable to include two other types of areas The first type is areas designated for orderly annexation. These areas have been formally identified by the annexing city and the surrounding township(s) as being areas of future growth for the city; the purpose of orderly annexation is to provide areas of growth for the city so that unregulated sprawl into agricultural or other important areas can be avoided. The Minnesota Municipal Board must review these agreements; about 50 agreements have been made (Exhibit 92). It should be noted that only areas designated specifically as orderly annexation areas are subject to this exemption.

Areas within two miles of first, second and third class cities are also exempt from the proposed avoidance area criterion. This is reasonable because, otherwise, significant areas of potential urban growth are omitted. Most cities have not adopted orderly annexation agreements that identify areas of anticipated urban growth. This is also reasonable becaue it is compatible with a legislative presumption that areas within two miles of cities are subject to urban growth. Minn. Stat. §§ 462.357, subd. 1 and 462.358, subd. 1a (1980) allow cities to extend their zoning and subdivision review authority to areas within two miles of the city boundaries.

The exemption applies only to areas within two miles of first, second and third class cities--those with at least 10,000 inhabitants. The 1980 Census indicates that 65 cities have at least 10,000 inhabitants

(Exhibit 91). This limitation is reasonable because an unacceptable amount of land would be exempted if the almost 800 fourth class cities were added to the exemption, as suggested by the 1980-1981 PPSAC (Exhibit 28). If each fourth class city were one square mile, nearly 9½ million acres would be exempted from the protection of the Avoidance Area criterion--nearly 20% of the state. In fact, this estimate likely underestimates the impact, since many fourth class cities are likely to be larger than one square mile. While this would greatly increase siting opportunities, it would also exempt an unacceptable amount of prime farmland from protection, particularly in southern Minnesota where there are many cities (Exhibit 83). Further, cities with populations of at least 10,000 are more likely to be considered as large load centers and more likely able to take advantage of the benefits of near location of power plants.

Areas subject to the proposed exemptions are easily identifiable which should minimize problems associated with the administration of the policy.

It might be argued that lands zoned for urban uses by the local units of government should be used to define the areas of potential urban growth. This is not a reasonable approach, for two reasons. First, zoning ordinances can be changed easily by the local unit of government; this fact could be used by the local unit to profoundly influence plant siting in Minnesota, which contradicts the legislative directive that "...(t)o assure the paramount and controlling effect of the provisions herein...(s)uch certificate (of site compatibility) shall supersede and preempt all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local and special purpose government" (Minn. Stat. § 116C.61, subd. 1 (1980)). Second, given the great variation in zoning ordinances throughout the state, it would be difficult to define these areas in a comprehensive, consistent fashion.

The exemption of these specific urbanizing areas is not inconsistent with the intent of the proposed avoidance area criterion to protect prime farmlands. First, the exemptions recognize and seek to remedy an inequity in the siting process. Second, the list of exemptions has been limited to those areas most clearly shown to be "urbanizing"; the land affected by the policy is small. And, third, it is clearly better to encourage plant location in areas that will likely be lost anyway than to allow plant location in stable agricultural areas.

In general, the proposed criterion is reasonable because it establishes policy that will protect Minnesota's prime farmland without unreasonably restricting siting opportunities throughout the state. It does this in a way that is clear and easy to administer.

There was substantial comment on the possible impact of the proposed Avoidance Area criterion during review of the various drafts of the proposed Rules. On the one hand, the utilities were concerned that the proposed policy would unduly restrict siting opportunities, particularly in areas with major concentrations of prime farmland (Exhibits 20, 21 and 22). On the other hand, the 1980-81 PPSAC and interested citizens

were concerned that the proposed policy did not provide sufficient protection of prime farmland, and recommended that, in addition to an "acres per megawatt" limitation, an absolute maximum acreage or "cap" be placed on the amount of prime farmland that can be taken for each plant site and for each reservoir/cooling pond (Exhibits 24, 28 and 39).

The avoidance area criterion is reasonable as proposed, since it allows siting opportunities even in heavily prime areas. As explained in Appendix 2, staff research shows that the policy allows sufficient flexibility to permit siting of plants of various sizes throughout the state. The research shows, as expected, that there are more locations at the upper end of the range (0.5 - 0.75 acres per megawatt) than there are at the lower end of the range. Although some of these potential sites may not be good plant sites because of slope problems or other constraints, many other potential sites remain in each search area.

Further, the proposed criterion does allow use of a certain amount of prime farmland. Techniques are available to reduce site size which can expand siting opportunities in heavily prime areas. It may be possible to reduce site size by using more efficient site layouts. It is also possible to have deeper waste storage ponds; these ponds are the largest part of the developed portion of the site. There are also various ways to reduce the area of the water storage reservoir. The site can be aligned to follow non-prime soils. Plants can be sited within the urbanizing areas exempt from this proposed criterion. Finally, if there are really no feasible and prudent alternatives, the site could be used.

Addition of a maximum acreage or "cap" to the proposed criterion is not appropriate. While this would offer a higher level of protection to prime farmland, there are major drawbacks. First, there is an obvious bias against larger plants. While some may argue that this is desirable, determination of appropriate plant site is a major issue in and of itself and should not be confused with a policy that is designed to protect prime farmland. The size issue is considered by the Minnesota Energy Agency during its Certificate of Need process. Second, it is not clear on what basis, other than limiting plant size, a "cap" could be selected. Third, a "cap" may make siting in the heavily prime areas of southern and western Minnesota much more restrictive than in other areas of the state. This may prevent siting of a plant near an agricultural industry that is a potential cogenerator or supplemental fuel source. Also, it should be recognized that electrical demand growth, while slackening, is still above state average in the agricultural areas and, if need for new transmission lines is to be minimized, the option to site near load centers should be maintained. Finally, the "cap" approach brings up the problem of how to handle site expansion; it would not be fair, and would be extremely restrictive, to limit the total site development to that maximum amount.

III. PROPOSED AMENDMENTS RELATING TO THE INVENTORY OF LARGE ELECTRIC POWER GENERATING PLANT STUDY AREAS

The PPSA directs the Board to adopt an Inventory of Power Plant Study Areas (Minn. Stat. § 116C.55 (1980)). The Inventory of Power Plant Study Areas (Inventory) is intended to be an advance planning guide useful in identifying appropriate areas for power plant location. A study area is a large land area which meets certain criteria and standards and in which one or more plant sites will likely be found after further study.

Proposed 6 MCAR § 3.083 establishes the criteria and standards and administrative procedures to be used by the Board in identifying study areas and adopting an Inventory of Power Plant Study Areas. Proposed 6 MCAR § 3.072 H. and Q. contain two definitions used in proposed 6 MCAR § 3.083.

The proposed Inventory criteria and standards address the four factors which best identify large land areas where plants might be located: water availability (for plants using evaporative cooling), transportation access (for coal-fired plants), acceptable air quality impacts and areas where siting is prohibited by statute. Since technical assumptions (i.e., water, fuel and land requirements for a given plant size) needed to apply the criteria and standards will change often as new data becomes available, the proposed rules specify the process by which the Board will develop such assumptions. That process includes consultation with MEQB agencies, utilities and other parties with pertinent information.

Since plant capacity, fuel type and design have major impacts on resource needs, each study area will be identified for a plant of a particular capacity, fuel type and design using appropriate criteria, standards, and technical assumptions. The Inventory will identify study areas only for plant capacities, fuel types and designs that may be sited by the Board in the near future.

Under the PPSA (Minn. Stat. § 116C.55, subd. 3 (1980)), the Board is required to update the Inventory as needed and to publish an Inventory report; therefore, the proposed amendments do not repeat these statutory requirements.

After the Board has adopted the Inventory, the PPSA and the existing rules direct the utilities to specify the reasons for proposing any site not included in the Inventory and evaluate the proposed site based on Inventory criteria and standards (Minn. Stat. § 116C.57, subd. 1 (1980), 6 MCAR § 3.074 A.). This means that the Inventory criteria and standards, while compatible with the rules governing site selection, are valid only as general guides for identifying specific sites.

As originally enacted in the PPSA (Minn. Stat. § 116C.55, subd. 2, 3 (1973)), the Board was required to prepare an Inventory of Power Plant Sites. An inventory of sites was attempted in 1974-1975. Since it was not possible to sufficiently study a state as large as Minnesota (over

50 million acres) to identify all the relatively small power plant sites (2,000 acres or less), the final document identified candidate areas rather than actual sites (Exhibit 82). The Inventory was never adopted by the Board. As the Minnesota Supreme Court has noted, the PPSA was amended in 1977 "in recognition of the awkward and unnecessary processes[.]" (Floodwood-Fine Lakes et al. v. MEQB, 287 N.W. 2d 390, 396 (Minn. 1979). The PPSA now requires the Board to adopt an inventory of study areas rather than of plant sites.

The PPSA also requires the Board to use a "public planning process where all interested persons can participate in developing the criteria and standards to be used by the Board in preparing an inventory of large electric power generating plant study areas[.]" (Minn. Stat. § 116C.55, subd. 2 (1980)). As directed, there was wide citizen participation in the development of the proposed Inventory criteria and standards. The following is a brief summary of the process:

- The 1978-1979 Power Plant Siting Advisory Committee (PPSAC) was charged with providing the Board and its staff with advice on ways to involve interested citizens and on the issues and criteria that might be included in the Inventory. This committee met about twenty times in 1978 and 1979 to discuss the Inventory. The PPSAC was made up of private citizens interested in various aspects of power plant siting who were appointed by the Board pursuant to Minn. Stat. § 116C.59, subd. 1 (1980).

- During the fall of 1978, nearly 300 citizens participated in eleven discussion meetings held around the state to elicit suggestions for the Inventory. The issues of most interest to the people of Minnesota were identified, which helped in the development of the proposed criteria and standards (Exhibit 14).

- During 1979, the Board's staff prepared a report called Information Meeting Draft--1979 Inventory of Power Plant Study Areas (1979 Draft Inventory). This report contained a draft list of Inventory criteria and standards, illustrative maps of resulting study areas using various technical information, and background information (Exhibit 85). Numerous drafts of this report were reviewed by the 1978-1979 PPSAC, Board member agencies, utilities and interested persons. This input helped to crystallize the proposals.

- In January and February, 1980, the 1979 Draft Inventory of the Inventory was presented at eleven discussion meetings around the state. Over 500 people attended these meetings. The presentation elicited public comments on the proposed issues, criteria and standards (Exhibit 15).

- The Board published a Notice of Intent to Solicit Outside Opinion in the May 19, 1980 issue of the State Register (4 S.R. 1832-1833) (Exhibit 12). No response to this Notice was received.

- In late 1980 and early 1981, three draft sets of proposed amendments were circulated to Board member agencies, 1979-80 and 1980-81 PPSAC members, utilities and other interested agencies and persons, for review and comment. (Exhibits 17, 33, 45). Over 50 meetings were also held with these reviewers during this period (Exhibits 30, 42, 48).

A. Need and Reasonableness of Proposed Amendments Relating to the Inventory

The proposed amendments relating to the Inventory are needed so that the Board can fulfill two legislative directives--first, to adopt an Inventory of Study Areas and, second, to follow the rulemaking provisions of Minn. Stat. ch. 15 in adopting the criteria and standards to be used in preparing the Inventory (Minn. Stat. § 116C.55 (1980). The proposed amendments contain criteria and standards necessary to the identification of study areas; they also contain necessary administrative procedures. The proposed amendments, and the Inventory adopted pursuant to them, will provide guidance to the Board, utilties and interested persons in finding appropriate areas for power plant sites.

The proposed amendments are reasonable, because they establish a process that is equitable and clear. Further, the proposed amendments will result in an Inventory that is a realistic guide. The criteria and standards are limited to the major factors that define large areas as appropriate for plant locations and for which reasonable technical assumptions can be made. Study areas will be specific as to plant size, type and design, and will be identified only for plants anticipated in the near future.

Further comments on the need and reasonableness of specific provisions of the proposed amendments follow.

1. Proposed Amendment of 6 MCAR § 3.072 H (Definition of "study area")

The proposed amendment is necessary and reasonable because it updates the definition of "study area" to reflect the establishment of criteria and standards to be used to identify study areas in proposed 6 MCAR § 3.083. The amended definition of "study area" clearly specifies that study areas are those land areas that meet Inventory criteria and standards.

The amended definition also stipulates that study areas will be specific to plant capacity, fuel type and design. This is necessary and reasonable because the resource requirements and impacts of a plant vary considerably depending upon these factors. For example, a 200 MW coal-fired plant using wet cooling towers consumes about 3.75 cubic feet of water per second at full load, while an 800 MW plant of similar fuel type and design consumes about 15 cubic feet of water per second at full load. A combination wet-dry cooling tower can be designed to consume any amount of water below the needs of the 100% wet tower. Clearly, the areas with adequate water for these example plant sizes and designs are likely to be different.

The specification of study areas by plant capacity, fuel type and design is also appropriate because it provides a clear framework for identifying technical assumptions needed to apply the criteria and standards and it clearly indicates which study area should be used to guide location of a proposed plant.

2. Proposed 6 MCAR § 3.072 Q. (Definition of "technical assumptions")

The amendment gives meaning to the term "technical assumptions" used in proposed 6 MCAR § 3.083, which establishes Inventory criteria, standards and procedures. The definition explains what types of assumptions are needed to apply the Inventory criteria and standards to identify land areas that meet the Inventory criteria and standards.

Each Inventory criterion and standard addresses a resource needed for plant operation. Assumptions must be made to estimate resource requirements of the power plant (e.g., water needs) and resource availability (e.g., amount of water that is available for plant use from a particular river segment). Table 3 lists the specific areas in which technical assumptions will likely be needed to apply each Inventory criteria and standard. The table reflects the experience gained in preparing the 1979 Draft Inventory (Exhibit 85).

The ability to change the technical assumptions is necessary and reasonable to allow updating and revision of the Inventory of Power Plant Study Areas, as required by the PPSA (Minn. Stat. § 116C.55(1980)). This also ensures that the Inventory is a strategic planning tool as intended by the Legislature. The Inventory criteria and standards are adopted rules. However, land areas that meet these criteria and standards will change over time, in response to changes in resource availability (e.g., railroad abandonment will diminish the existing transportation system, while improving air quality may open new areas) and resource requirements of plants (e.g., new water conservation measures may reduce water needs, and use of fluidized bed combustion can minimize SO2 emissions). Regulatory standards that affect resource requirements and resource availability (e.g., establishment of protected flow levels by DNR will affect water availability) will also change over

time. Likewise, our ability to assess resource needs and resource availability will change over time, as more and better data becomes available.

Since the technical assumptions are an important factor in identifying study areas, an open process by which the Board will develop the technical assumptions is established in proposed 6 MCAR § 3.,083 B. This process is discussed later with proposed 6 MCAR § 3.083 B.

Table 3
Inventory Technical Assumptions

This is a preliminary list of the areas in which technical assumptions must be developed before maps of Inventory study areas can be made.

Criteria/Standard	Technical Assumptions
1. Exclusion areas	
o No exclusion areas	o Current list of exclusion areas o Which exclusion areas to be included
2. Air quality	
o No violations for SO_2 or particulates	o Which standards - federal or state, 24 hour or 3 hour - the ones most likely to be violated o Available PSD increment: - Baseline ambient levels updated - Handling of non-attainment areas and offsets o "Footprint" of emissions: - Coal characteristics - Control technology required - Choice of model to generate footprint o Methodology for assessing impact
3. Coal accessibility	
o Within 12 miles o Existing transportation systems	o Which transportation systems are options for particular plant sizes o Current list of existing systems o Which parts of existing systems can be upgraded
4. Water availability	
o Rivers, lakes o Within 25 miles o Adequate water (direct withdrawal or supplemental water storage)	o Which lakes to be considered for evaluation, based on size, location o Which rivers to be considered for evaluation, based on: - Size, location - Sufficiency of daily streamflow records - based on low flow for the area - If insufficient record, whether and how artificial records would be developed o Water demand for plant, based on plant size, cooling system technology, water intake pipe size, plant capacity factor o Methodology to evaluate water adequacy, based on historic stream flows, cooling water system technology and the environmental, economic and engineering constraints of reservoir design related to size: - Historic low flows/low elevations - Methodology to estimate supplemental storage needs - Likelihood of finding reasonable locations for supplemental storage

3. Proposed 6 MCAR § 3.083 A. (Inventory Criteria and Standards)

This proposed amendment establishes the Inventory criteria and standards to be used to identify study areas and also to evaluate proposed plant sites which are not included within the appropriate study area. It is necessary to clearly specify the basis by which study areas are identified and, thus, satisfy the requirements of Minn. Stat. § 116C.55 (1980).

Although the criteria and standards apply to all plant capacities, fuel types and designs, unless otherwise specified, they are clearly appropriate with respect to coal-fired plants, the only type of plant over 50 MW proposed to be sited in Minnesota by the utilities in the next 15 years (Exhibit 106, Exhibit G-2).

The proposed amendment limits the criteria and standards to the four major resources for which data is available that define large areas as being appropriate potential areas for plant location, which is reasonable because it makes the Inventory a more useful guide for plant siting. Several additional criteria and standards were proposed in earlier drafts of the proposed amendments, particularly the 1979 Draft Inventory (Exhibit 81). These were eliminated because they were too site-specific in nature to be useful in identifying large land areas or because there is no available statewide data with which to interpret them.

The need and reasonableness of each criterion and standard is discussed below. For background information on the areas in which technical assumptions will likely be made for each criterion and standard, refer to Table 3.

a. Proposed 6 MCAR 3.083 A.1. (Exclusion areas)

This provision establishes an Inventory criterion and standard that would exclude Board-designated exclusion areas from being part of a study area.

Certain lands have been identified in the existing rules as being such significant natural resources that they cannot be used for plant sites, except for water intake structures and water pipelines (6 MCAR 3.074 H.2.b.). These lands include national parks; national historic sites and landmarks; national historic districts; national wildlife refuges; national monuments; national wild, scenic and recreational riverways; state wild, scenic and recreational rivers and their land use districts; state parks; nature conservancy preserves; state scientific and natural areas; and state and national wilderness areas.

It is necessary and reasonable that the Inventory criteria and standards are made compatible with existing rules relating to site selection. The existing rules provide that certain areas of the state are not available for plant location (6 MCAR § 3.072 H.2.b.). The proposal also is necessary to emphasize the importance of these natural areas to the state and the commitment of the Board to direct plant location away from these environmentally significant areas.

The proposed criterion and standard are reasonable because they follow existing Rules adopted after careful consideration and a public hearing process. Additionally, since the Exclusion Areas are defined on maps, they can be easily incorporated into the Inventory data base.

An example map showing the application of this criterion and standard, using certain possible technical assumptions, is shown in Figure 1. This map was developed for the 1979 Draft Inventory (Exhibit 85, pp. 38-39).

b. Proposed 6 MCAR § 3.083 A. 2 (Air quality)

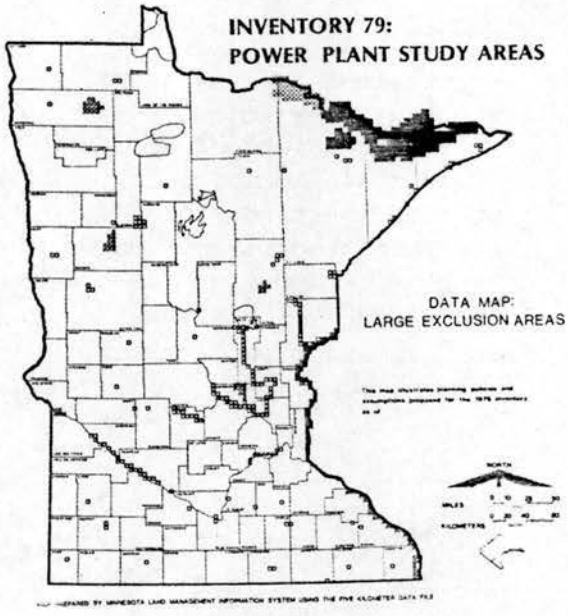
This proposed amendment establishes an Inventory criterion and standard concerning air quality.

The proposed criterion and standard address a major consideration in siting a power plant--whether federal and state air quality standards can likely be met. Minn. Stat. § 116C.57, subd. 4 (14)(1980) mandates that "[n]o site or route shall be designated which violates state agency rules" and 6 MCAR § 3.074 H.2.a. states that a plant cannot be sited "in violation of any federal or state statute or law, rule or regulation". Since plants cannot be sited in violation of air quality standards, it is necessary and reasonable that the search for suitable areas for plant location be directed away from likely problem areas. This amendment is also necessary to make the Inventory criterion and standard compatible with existing statutes and rules relating to power plant siting.

The proposal is reasonable because it has been carefully designed to accomplish the difficult task of assessing air quality for an entire state. The standard specifices only two "index" pollutants to be used in identifying study areas. Sulfur dioxide and particulate matter were selected as the "index" pollutants by the Minnesota Pollution Control Agency (MPCA) during work on the 1979 Draft Inventory, because they are the major pollutants most likely to be subject to violation of standards. This efficiently concentrates Board efforts. The standard also specifies two types of air quality standards -- the primary and secondary (ambient) standards and the prevention of significant deterioration (PSD) increments (the amount that net ambient pollution levels can increase). This is reasonable because these standards most affect which areas are open to plant siting as explained in Table 4. Table 4 shows the relationship between ambient standards and PSD increments and explains how the two types of standards are useful in identfying areas with air quality constraints.

FIGURE 1

MINNESOTA ENVIRONMENTAL QUALITY BOARD



KEY

TYPE OF EXCLUSION AREA:	PERCENTAGE OF CELLS:
NATIONAL PARKS	0.6
NATIONAL WILDLIFE REFUGES	1.0
NATIONAL WILD. SCENIC. AND RECREATIONAL RIVERS	0.3
NATIONAL WILDERNESS AREAS	2.6
STATE PARKS	0.9
STATE WILD. SCENIC. AND RECREATIONAL RIVERS	0.9
MORE THAN ONE TYPE OF EXCLUSION AREA	0.2

FIGURE III-1

DISCUSSION:

Figure III-1, "Data Map: Large Exclusion Areas," shows the location of the Large Exclusion Areas - those types of Exclusion Areas that are large enough to be significant at the five-kilometer cell scale. Nearly 7% of the cells contain large Exclusion Areas. This is one of the maps used to produce Figure III-4, "Policy Map: Exclusion Areas and Avoidance Area Concentrations."

Assumptions

All cells containing these large Exclusion Areas are shown. Some cells may only be partly filled with Exclusion Areas, so a small buffer is created around these important resources.

Data Sources

Each administering agency was consulted for the most recent data and maps. All areas designated through August 31, 1978 are included in this Inventory:

Area	Contact Agency
National Parks	National Park Service
National Wildlife Refuges	U.S. Fish & Wildlife Service
National Wild/Scenic Recreational Waterways	MN Dept. of Natural Resources
State Wild/Scenic/Recreational Waterways/Land Use Districts	MN Dept. of Natural Resources
State Parks	MN Dept. of Natural Resources
State and National Wilderness Areas	MN Dept. of Natural Resources and National Park Service

Table 4

Allowable Increments - Clean Air Act, As Amended (1977)

Area	PSD Increment*	Comments
Nonattainment Areas	No increase allowed	Nonattainment areas (NAA) are those with existing or anticipated violations of ambient standards. No major new sources in or near the NAA are permitted without corresponding decreases in other emissions in the area.
Attainment Areas:		Attainment Areas have no existing or anticipated violations of ambient standards; there are two types of Attainment Areas in Minnesota: Class I and Class II areas.
	Maximum Increase:	
Class I	24 hour SO_2: 5 ug/m^3; 24 hour particulates: 10 ug/m^3	Class I areas have significant natural resources and very good ambient air quality. The BWCA and Voyageurs National Park are the only Class I areas in Minnesota. The low allowable increment would probably prevent plant location inside and near a Class I area.
Class II	24 hour SO_2: 91 ug/m^3; 24 hour particulates: 37 ug/m^3. In no case can pollutants exceed ambient standards, so existing ambient levels help determine actual increment.	Except for designated nonattainment areas, Class I areas and areas with insufficient data, the state is a designed Class II area. Multiunit power plants using best available technology can be accomodated in most of Class II areas, except for those areas with ambient levels very near the maximum permissable level.

*The permissible amount that net ambient pollution levels can increase. There are also PSD increments for the 3 hour and annual SO_2 standards and the annual particulate standard.

It is reasonable that both federal and state requirements are referenced, since both must be met. Air quality is regulated by the U.S. Environmental Protection Agency (EPA) under 42 U.S.C. §§ 7401-7642 (1980), the Clean Air Act, and by the MPCA under Minn. Stat. § 116.07 (1980). Minn. Rule APC 1 contains the state primary and secondary (ambient) air standards. Note that the EPA and MPCA primary and secondary (ambient) air standards for SO_2 currently are different, as shown in Table 5; MPCA is now in rulemaking to consider whether to change its standards (Office of Administrative Hearings File No. PCA-81-003-HK). Clearly, if the standards differ, the more restrictive standard would be used to identify study areas.

Table 5

Primary and Secondary (Ambient) Standards
For Sulfur Dioxide and Particulate Matter*

Pollutant	Time Period	Federal		State	
		Primary	Secondary	Primary	Secondary
Sulfur dioxide	3 hr.	-	1300	655	655
	24 hr.	365	-	260	260
	annual	80	-	60	60
Particulate Matter	24 hr.	260	150	260	150
	annual	75	60	75	60

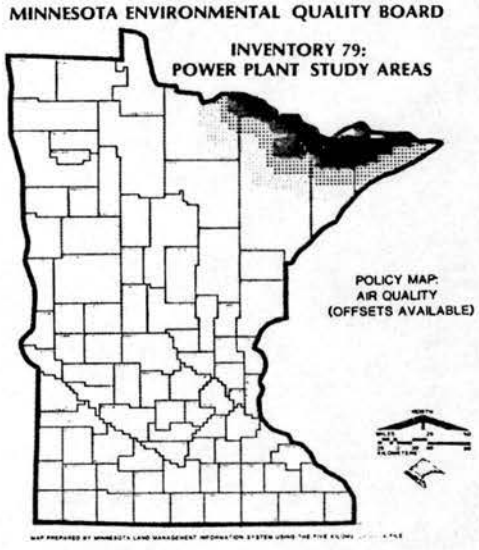
* Units are micrograms per cubic meter

Note that the Rule specifies "likely" violation. This is reasonable because it reflects the "screening" nature of the analysis done to determine study areas. It would be impossible to analyze the entire state in sufficient detail to actually determine whether study areas are indeed licensable. As written, the proposed standard allows use of technical assumptions to best incorporate available information to determine study areas.

Specifying the federal and state requirements does not constitute a delegation of authority to the MPCA or the EPA, as the Board has no authority to set air quality standards. Indeed, as stated earlier, the PPSA and the existing rules require sites to meet both federal and state standards.

An example map showing the application of this criterion and standard, using certain possible technical assumptions, is shown in Figure 2. This map was developed for the 1979 Draft Inventory (Exhibit 85, pp. 96-97).

FIGURE 2



KEY

AIR QUALITY	PERCENTAGE OF CELLS
NO AIR QUALITY CONSTRAINTS FOR UP TO 50 MW PLANT	0.0
NO AIR QUALITY CONSTRAINTS FOR UP TO 200 MW PLANT	3.6
NO AIR QUALITY CONSTRAINTS FOR UP TO 400 MW PLANT	0.5
NO AIR QUALITY CONSTRAINTS FOR UP TO 800 MW PLANT	0.1
NO AIR QUALITY CONSTRAINTS FOR UP TO 1600 MW PLANT	3.0
NO AIR QUALITY CONSTRAINTS FOR UP TO 2400 MW PLANT	2.9
NO AIR QUALITY CONSTRAINTS	89.6

DISCUSSION:

Figure V-12, "Policy Map: Air Quality (Offsets Available)," shows those areas of the state where air quality regulations can likely be met by new coal fired power plants assuming that emission offsets are available in all the non-attainment areas. This map only considers the secondary standards for twenty-four hour concentrations of sulfur dioxide (SO_2) and particulates. These standards are the most severe regarding coal fired power plants. Under the proposed criteria and planning policies, and using the assumptions listed below, power plant siting would likely be unconstrained by air quality regulations in 100% of the state for plants under 50 megawatt capacity. For larger plants, with their increased air pollution emissions, the unconstrained area naturally shrinks. For example, according to this map about 90% of the state would likely be unconstrained by air quality regulations for a 2400 megawatt plant.

Note that this map is not meant to be a substitute for the detailed air quality investigations that are necessary to estimate the air quality impacts of specific new power plants.

Assumptions

The assumptions used for Figures V-7 and V-8 that were used to estimate the ambient air quality also apply to this map. In addition, the following assumptions apply:

Power Plant emissions were calculated assuming compliance with the September 19, 1978 new source performance standards and have not yet been updated for the final standards - in some situations, this may have caused a slight underestimate of the impacts and these will be updated as soon as possible;

Fugitive dust from the associated coal handling and stockpiles was not included in the particulate modeling;

It was assumed that other sources of pollution could be cleaned up enough in the non-attainment areas to allow the siting of plants within these areas. Obviously, a utility would have to obtain the necessary offsets to locate a new plant in a non-attainment area (see the text of this chapter for more detail). Figure V-II assumes that no offsets are available.

Data Source

The Minnesota Pollution Control Agency, Division of Air Quality, provided the air pollution modeling for various sized power plants based on model plant data provided by a consultant to the Minnesota Environmental Quality Board; "Guidelines on Air Quality Models" by the EPA; meteorological data from Minneapolis/St. Paul, St. Cloud, and International Falls; and proposed EPA New Source Performance Standards (September 19, 1978). In addition, the data sources for Figures V-2, V-3, V-7 and V-8 also apply to this map.

c. Proposed 6 MCAR § 3.083A.3. (Transportation)

This proposed amendment establishes an Inventory criterion and standard concerning access to transportation, which would apply only to study areas for coal-fired plants.

The proposal is necessary and reasonable because it addresses a major siting issue for coal-fired plants -- the plant type most likely to be sited in the near future. Coal-fired power plants require access to transportation systems capable of delivering the amount of coal required for operation. Coal can be transported by railroad, barge, truck and coal-slurry pipeline. Table 6 shows coal requirements and resulting transportation requirements for several plant sizes. This information indicates that railroad and barges are the most likely mode of transport for large plants. Truck delivery may be feasible for small plants. There are no existing or proposed coal-slurry pipelines in Minnesota.

Table 6

Transportation Needs of Coal-fired Plants

Plants size	Coal (tons/week)[a]	Water Transport (barges/week)[b]	Rail Transport (unit trains/week)[c]	Truck Transport (trucks/week)[d]
50MW	3,800	4.3	0.4	127
100MW	7,400	8.4	0.7	247
200MW	13,800	15.5	1.4	460
400MW	26,400	29.7	2.6	880

a Western coal; 8,300 Btu/pound; at 65% plant capacity factor.

b 1 bargeload = 1,400 tons of coal. Based on a 33 week shipping season.

c 1 unit train = 10,000 tons of coal, or 100-100 ton cars. Plants smaller than 150 MW would most likely receive rail shipments by individual carloads rather than unit trains.

d 1 truck load = 30 tons.

Sources:

Considerations in Electric Power Plant Siting: Coal-fired Plants from 50-2400 Megawatts. Prepared by Burns and Roe, Inc. for the Minnesota Environmental Quality Board. January, 1980 (Exhibit 77).

Minnesota Coal Transport. Prepared by Earth Science Associates for the Minnesota Environmental Quality Board. January, 1979 (Exhibit 84).

The proposal limits the criterion and standard to coal-fired plants. This is reasonable because coal-fired plants are the only plants proposed in the future. Further, transportation access does not constrain location of other plant types to the same degree, so transportation access would not be useful in defining large areas where location of these other plant types might be appropriate.

Specifying that the study area must have reasonable access to an existing transportation system is reasonable because it recognizes the tremendous environmental and economic cost involved in constructing new systems--for example, by deepening new stream segments to handle barge traffic or constructing a major new railroad; upgrading is generally much less damaging to the environment (Exhibit 84, pp. II-29-30). It also makes the proposed criterion and standard compatible with existing rules 6 MCAR § 3.074 H.1. d., g., m. and p.

The proposed standard defines "reasonable access" as being no more than 12 miles from the existing transportation system. Twelve miles is a reasonable maximum distance for constructing a link between plant and transportation system, given the substantial environmental and social impact and the economic costs of new construction.

The likely links between plant and transportation system would be built above ground and thus would involve land use disruptions, loss of productivity in the right of way and creation of a linear barrier. In many parts of the state, there are roads every section; a new 12-mile linear barrier could disrupt 10-12 roads. A 12-mile linear barrier could also disrupt up to twelve sections of land. The average size of a farm in Minnesota is 291 acres (Exhibit 70, p. 3). If the transportation link were routed on property boundaries and the farms were square, an average of three farms would be affected per mile in farm areas, or a total of 36 farms for the 12-mile segment. The minimum right of way width for a rail spur is 50 feet; the 12-mile segment would require the removal of about 6.1 acres/mile from other uses (Exhibit 84, p. II-20). The cost of such construction is substantial. For example, the capital costs of a 12-mile rail spur could range up to $18 million (Exhibit 84, p. II-21).

An example map showing the application of this criterion and standard, using certain possible technical assumptions, is shown in Figure 3. This map was developed for the 1979 Draft Inventory (Exhibit 85, pp. 116-117).

d. Proposed Rule 6 MCAR § 3.083 A.4. (Water)

This proposed amendment establishes a criterion and three standards that relate to water availability for plants using evaporative cooling systems.

FIGURE 3

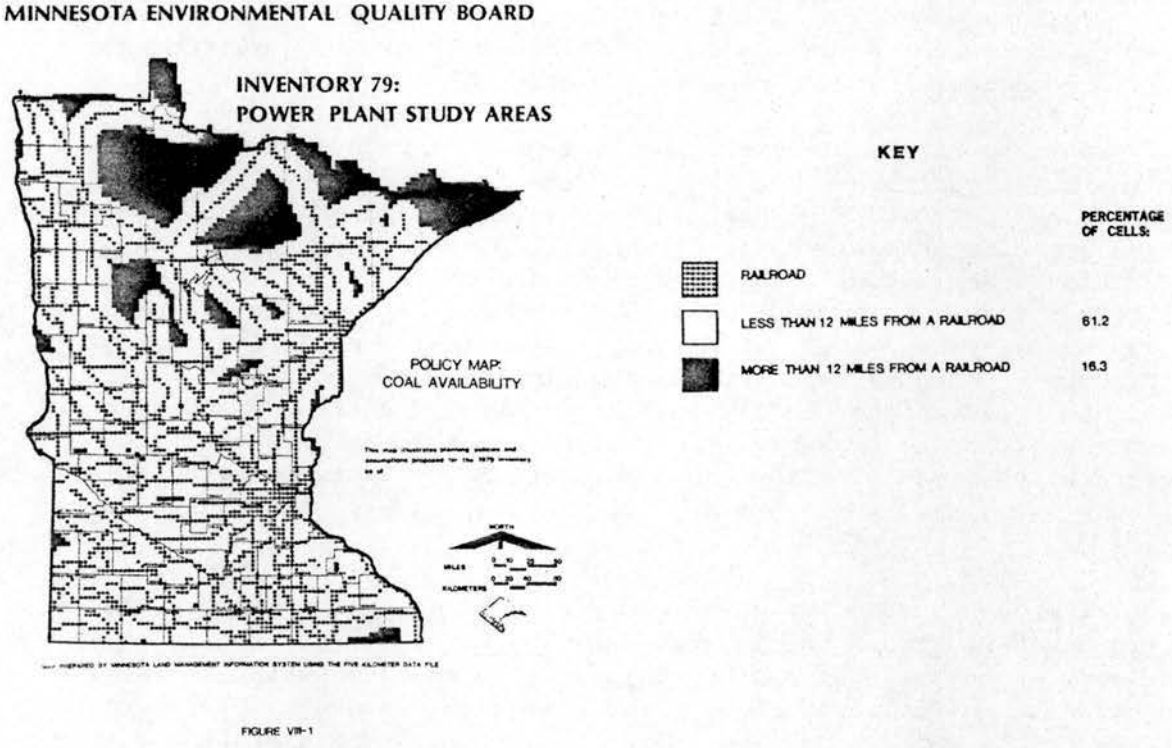


FIGURE VII-1

DISCUSSION:

Figure VII-1, "Policy Map: Coal Availability," shows those areas of the state that are within twelve miles of existing railroad rights of way. Note that only 16.3 percent of the state is not within this distance of existing railroad rights of way. Although existing waterways were not included in this map, railroad rights of way tend to follow these waterways so no significant change in the map would result in their exclusion. This map does not consider the environmental and social effects of coal transportation and is not meant to take the place of the detailed studies needed for specific power plant siting applications.

Assumptions

The major assumption made in developing this map is that all railroad rights of way are either now capable of handling coal unit trains or can be upgraded to allow the use of unit trains.

Data Sources

The information for this map was obtained from:

Railroad Map of Minnesota, by Burlington Northern (1974); and
Reuse of Abandoned Railroad Rights of Way, Report to the Legislature, by the Minnesota Planning Agency (1978).

The proposed criterion and standards are needed to recognize the importance of access to an adequate water supply for power plants with evaporative cooling systems and incorporate that fact in identifying study areas for those power plants. They are also necessary to make the Inventory criterion and standards compatible with existing statutory and regulatory constraints with respect to water supply.

Power plants require cooling systems to remove waste heat (heat rejected from the steam cycle). Dry cooling systems are "air cooled", so water requirements for cooling purposes are minimal. Evaporative cooling systems use substantial amounts of water to provide cooling by evaporation. For example, a 200 MW plant and an 800 MW plant with wet cooling systems would consume about 3.75 cubic feet of water per second and 15 cubic feet of water per second, respectively, at full capacity. Evaporative cooling systems include mechnical and natural draft wet cooling towers, cooling ponds, combination wet/dry cooling systems and once-through cooling systems. Power plants must be able to generate electricity year-round. Therefore, power plants with evaporative cooling systems need access to a constant water supply, even during dry periods.

Potential water sources for major water withdrawal include rivers, lakes and groundwater. There are several existing statutory and regulatory contraints on these water sources that must be considered in identifying study areas. The existing power plant siting rules establish criteria with respect to water supply for power plants. Under the exclusion criterion in 6 MCAR § 3.074 H. 2.c, the plant site must have reasonable access to a proven water supply sufficient for plant operation and mining of groundwater is prohibited. Avoidance area criterion 6 MCAR § 3.074 H.3.c. states that use of groundwater for high consumption purposes like cooling should be avoided if there are better surface water alternatives; the use of groundwater to supplement surface water is permissable. The Department of Natural Resources (DNR) regulates water appropriations for power plants and other uses through a permit system (6 MCAR §§ 1.5050-1.5058); the DNR can restrict appropriation during periods of low stream flow or low lake elevations, to provide for instream or inlake needs. State law prohibits withdrawal from lakes in excess of one-half foot annually per acre of lake surface (Minn. Stat. § 105.417, subd. 3 (a) (1980)). River pools and river reservoirs, like Lake Pepin and Lac Qui Parle, are considered lakes and are subject to the withdrawal limitation.

The proposed criterion and standards limit consideration of water adequacy to plants with evaporative cooling systems. This is reasonable because plants with dry cooling systems do not require major amounts of water, so access to water is not a useful factor in identifying study areas for them.

The proposed criterion and standards are reasonable because they address a complicated subject in a sound manner. Surveying an entire state to determine water adequacy is a difficult undertaking. There are no precise standards that indicate adequacy, as there are MPCA/EPA standards

for air quality. There are many potential water sources, with continually increasing amounts of data on them. The ability to successfully analyze this data is also evolving as DNR gains experience with its recently promulgated water appropriation rules and as DNR completes studies on related issues. The proposed criterion and standards allow use of technical assumptions to incorporate the most recent informatiom and analytic capability into the identification of study areas.

The first standard appropriately identifies lakes and rivers as potential water sources. Rivers currently provide water for most power plants in Minnesota. Lakes are also considered as a potential water source in identifying study areas, since a few large lakes, particularly Lake Superior and major river pool reservoirs like Lac Qui Parle and Lake Pepin, may be able to supply sufficient water for certain plant sizes and designs. It should be stressed that this standard is not encouraging use of lakes as a primary water source; it simply recognizes that some of the larger lakes may be capable of supplying adequate water. Groundwater is not included as a potential water source in identifying study areas in light of the existing limitations on ground water in 6 MCAR § 3.074 H 2.c. and 6 MCAR § 3.074 H 3.c. and the current lack of specific groundwater aquifer data on a statewide basis.

The second standard states that study areas should be within 25 miles of an adequate water source. It is reasonable that plants can be located away from the water source. Siting at a distance from the water supply allows consideration of new areas and increases the likelihood that suitable sites will be located within the study areas. Moreover, from a technical viewpoint, water can be pumped any distance by including enough pumping stations. There is, however, a practical limit to the total distance between the source and the plant. It is estimated that a distance of 20-25 miles represents a practical limit beyond which pumping water is not economical (Exhibit 77, p. 75). The 1975 Inventory of Candidate Areas described areas within 15 miles of a water source as desirable and areas over 30 miles as undesirable (Exhibit 82, p. II-C56). The use of 25 miles is selected as maximum reasonable distance for use in the proposed standard.

Allowing a longer distance for access to water than access to rail acknowledges the less adverse environmental impact of water pipelines as compared to that of new transporation links. Water pipelines are below grade, so, once constructed, they do not interfere with surface activities or land uses and there is little potential for air pollution.

The third standard concerns the determination of the adequacy of water sources; it states that the water source is considered adequate if it appears likely to allow LEPGP operation during periods of low flow (rivers) or low elevations (lakes), either by direct withdrawal or by using supplemental stored water, and lists the three factors to be considered in the evaluation. This standard recognizes that plants need a continuous source of water, even during periods of low flows or low elevations when appropriation may be restricted by the DNR. Plant water supplies are typically designed to enable plant operation during such low water conditions.

The third standard also appropriately recognizes that supplemental stored water is a reasonable option to constant withdrawal in providing a constant water supply. Unless storage can be used to supplement that available from the lake or stream, siting of large plants will be confined to the lower reaches of a few large rivers in the state and the largest lakes, forcing a few areas of the state to bear all of the adverse environmental and social impacts of power plants. State law encourages appropriation and use of water from streams during periods of high flows (Minn. Stat. § 105.41 subd.1a) (1980)). Thus, consideration of alternatives involving stored water is also consistent with that policy.

The third standard lists the three factors to be used in evaluating whether water sources will likely be adequate. These include historic stream flows, cooling water system technology and the environmental, economic and engineering constraints of reservoir design related to size. The use of "likely" reflects the fact that the evaluation is a screening device based on certain technical assumptions and is not a statement on licensability. These three factors are based on the factors considered by the DNR when granting water appropriation permits and also on the factors that must be considered by the Board in selecting reasonable reservoir sites, if storage is needed--6 MCAR 3.074 H.1. d,g,h and p. Therefore, the evaluation will, through the judicious selection of technical assumptions, use the best available information on resource availability and regulatory experience to identify water sources likely to be considered as adequate for planning purposes by DNR and the Board. This is reasonable because the plant must be licensable by DNR and must meet Board concerns.

An example map showing the application of the criterion and standards, using certain possible technical assumptions, is shown in Figure 4. This map was developed for the 1979 Draft Inventory (Exhibit 85, pp. 64-65).

4. Proposed 6 MCAR § 3.083B. (Application of Inventory criteria and standards)

This proposed amendment concerns the application of the Inventory criteria and standards. It outlines the procedures to be followed by the Board in adopting the Inventory of Power Plant Study Areas and also specifies Inventory content.

This amendment is necessary to clearly state the manner in which the Board will fulfill its statutory responsibility to adopt an Inventory based on the criteria and standards. The amendment is reasonable because it explicitly states the procedures and Inventory content for ease of understanding, ensures that major issues are addressed in the Inventory and allows for necessary updating of the Inventory.

FIGURE 4

MINNESOTA ENVIRONMENTAL QUALITY BOARD

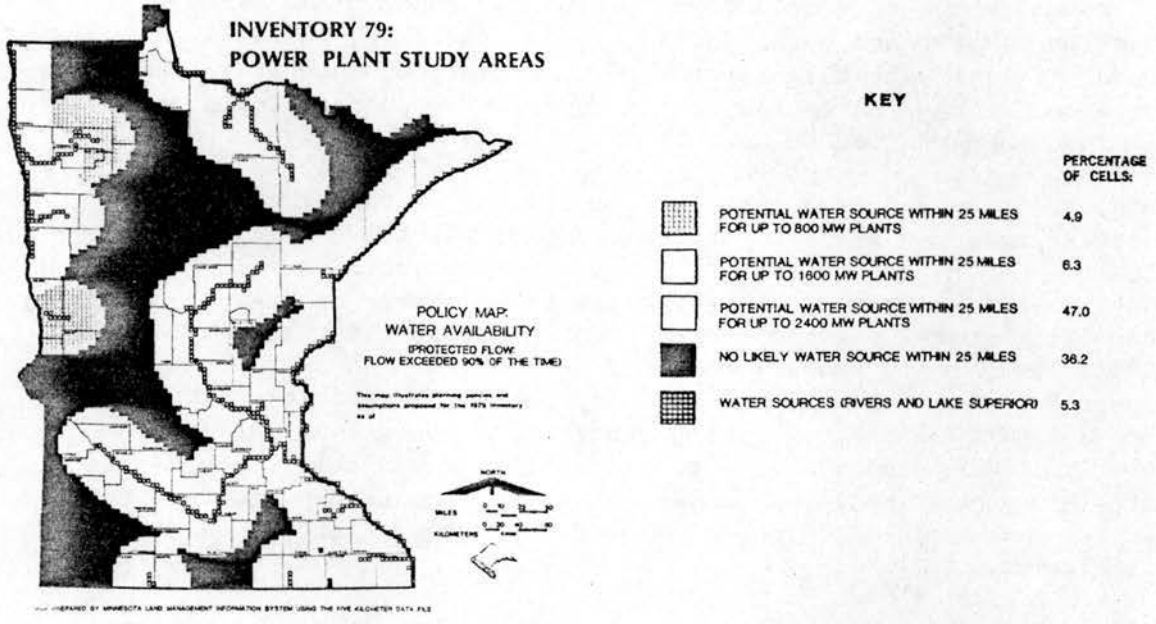


FIGURE IV-4

DISCUSSION:

Figure IV-4, "Policy Map: Water Availability (Protected Flow: Flow Exceeded 90% of the time)," shows those areas of the state that are within twenty-five miles of water sources likely to be available and adequate for coal fired power plants. Note that this map assumes a protected flow level equal to the flow exceeded 90% of the time. Potential water availability for other protected flow levels are shown on Figures IV-5 and IV-6.

Note that under the proposed criteria and planning policies (for the stated protected flow), power plant siting would likely be unconstrained by water availability in over 58% of the state for 800 megawatt plants. For larger plants, with their larger water consumption, the unconstrained area shrinks. For example, according to this map only 47% of the state would likely be unconstrained by water availability for a 2400 megawatt plant. Note that this map is not meant to be a substitute for the detailed water availability studies needed for specific power plant applications.

Assumptions

The following primary assumptions were used in developing this policy map:

An annual plant capacity factor of 65% was used in determining plant water needs;
One hundred percent wet cooling was used in determining plant water needs for plants of greater than 200 MW capacity;
Lake water (except Lake Superior) and ground water were not considered primary or secondary water supplies;
The maximum reasonable reservoir size would provide 30,000 acre feet of useable water storage;
A protected flow level equal to the flow exceeded 90% of the time was used.

Data Sources

Power plant water needs were obtained from a study done by Burns and Roe, Incorporated, for the Minnesota Environmental Quality Board (This study is available from the Board). Stream flow data was obtained from United States Geological Survey daily stream records.

There are four elements to this proposed amendment.

First, the proposed amendment indicates that the Inventory will include study areas for specific plant capacities, fuel types and designs. This is in accord with the proposed definition of "study areas" (see discussion of proposed amendment to 6 MCAR § 3.072 H. supra). As discussed earlier, this limitation is reasonable because it reflects the importance of these three factors in determining whether Inventory criteria and standards can be met.

Second, the proposed amendment establishes that study areas will be identified only for plant capacities, fuel types and designs reasonably anticipated to be subject to application for a Certificate of Site Compatibility in the near future. This is necessary and reasonable because it requires identification of plant capacities, fuel types and designs likely to be subject to Board action and thus appropriately focusses Board efforts. There are many potential capacities, fuel types and designs for plants. Defining study areas for all of them would require too much needless effort. It is also reasonable because it eliminates the unproductive controversy that results from proposing study areas for controversial plant sizes and fuel types that are not proposed for the future.

Specifying the "near future" is reasonable because it recognizes the uncertainty inherent in forecasting future plant needs. The accuracy of any forecast generally decreases the farther the forecast looks to the future. The revisions in the later years of the utilities' 15-year advance forecasts from 1974-1980, shown earlier in Table 1, demonstrate this. The proposed amendment allows the Board to concentrate on those plants that most likely will be subject to Board action. The Board can review the 15-year advance forecasts submitted by the utilities, the biennial reports of the Minnesota Energy Agency and other available information to determine which plant capacities, fuel types and designs should be included in the Inventory.

Third, the proposed amendment establishes Inventory content. The proposed amendment is necessary to specify the content of the Inventory and to differentiate the Inventory from the Inventory report that the Board must also prepare. The Inventory report will be a lengthier document that provides additional background information, similar to the 1979 Draft Inventory (Exhibit 85). The Inventory content is clearly limited to study area maps and a brief discussion of the underlying assumptions. This is reasonable because it makes the Inventory easier to update and requires that underlying assumptions be clearly stated for easier review. The Inventory is intended to be a working, evolving document which will clearly provide information useful to utilities and other interested parties in identifying and evaluating possible sites. An outdated document would not provide such assistance.

Fourth, the proposed amendment commits the Board to consultation with Board member agencies, utilities and other persons with pertinent information as it develops the technical assumptions needed to apply the

Inventory criteria and standards and define study areas. This open process is necessary and reasonable in light of the legislative directive that there be a public participation process in developing Inventory criteria and standards (Minn. Stat. § 116C.55, subd. 2 (1980)).

This amendment is also necessary to specify the process by which the Board will determine technical assumptions, which will be extremely important in identifying study areas. The proposed amendment is reasonable because it provides for outside participation from those with expertise, so that the final products will be as accurate as possible. It is also reasonable because it centers the response on the technical aspects rather than inviting a broad opinion poll about such technical topics.

B. Inventory Preparation

The following process would be used by the Board to prepare the Inventory:

1. After reviewing the latest biennial report of the Minnesota Energy Agency, the latest 15-year utility advance forecast from the utilities, and other pertinent information, the Board will designate plant capacities, fuel types and designs for which study areas are to be determined.

2. Board staff will direct development of the data base and technical assumptions, in consultation with utilities, Board member agencies and other parties likely to have technical data.

3. The Board will designate the technical assumptions to be used in developing study area maps.

4. Study area maps will be prepared for the designated plants with the designated technical assumptions.

5. The Board will adopt the Inventory.

6. Annually, or as appropriate, the Board will review the Inventory and determine if revisions are needed to reflect:

    - o changes in forecasts on which plant fuel types and capacities are likely to come before the Board for site selection.

    - o major advances in plant design.

    - o changes in technical assumptions, because of new or improved data, changing regulations, etc.

It should be noted that study areas will only be developed for plants for which the Board has siting authority--those 50 MW or larger. It is possible that smaller plants may be considered as reasonable alternatives; however, they would not be subject to a Certificate of Site Compatibility.

IV. CONCLUSION

The evidence and arguments justifying both the need and reasonableness of the Board's proposed amendments to the Rules Relating to Siting Large Electric Power Generating Plants, 6 MCAR § 3.071 et seq., are summarized in this document and its attachments, Appendix 1 (the Statement of Evidence containing the exhibit list and the summary of expert testimony to be elicited) and Appendix 2 (Report on Proposed Range for Limits to Use of Prime Farmland for Plant Sites). This document and its attachments constitute the Board's Statement of Need and Reasonableness for the hearing on the proposed amendments.

Environmental Quality Board

Arthur E. Sidner

Arthur E. Sidner, Chairman
June 25, 1981

APPENDIX 1

STATE OF MINNESOTA
COUNTY OF RAMSEY

MINNESOTA ENVIRONMENTAL QUALITY BOARD

In the Matter of the Proposed Adoption of Amendments to Rules Relating to Siting Large Electric Power Generating Plants

No. EQB-81-005-AK

STATEMENT OF EVIDENCE

I. List of Exhibits

Jurisdictional Documents

1. Order for Hearing (May 22, 1981).

2. Certificate of Board's Authorizing Resolution (March 19, 1981).

3. Notice of Hearing as Signed (May 28, 1981).

4. Notice of Hearing as Mailed on June 15, 1981.

5. June 15, 1981 State Register containing the Notice of Hearing and the Proposed Amendments at pages 1995-2000.

6. Mailing List Certificate (June 15, 1981).

7. Order of the Chief Hearing Examiner approving incorporation by reference.

8. Affidavit of Mailing (June 16, 1981).

9. Affidavits of Additional Notice of Mailing.

   9a. June 16, 1981.
   9b. June 25, 1981.

10. June 22, 1981 EQB Monitor containing a notice of the hearings on the Proposed Amendments.

11. Statement of Need and Reasonableness.

12. May 19, 1980 State Register containing Notice of Intent to Solicit Outside Opinion Regarding Revision of Rules Relating to Power Plant Siting at pages 1832-1833 .

13. All written materials or telephone messages received in response to the Notice of Intent published in the State Register on May 19, 1980 at pages 1832-1833. Record open to June 9, 1980. None was received.

Response During Rule Development

14. Summary of 1978 Information Meetings

15. Summary of 1980 Information Meetings on 1979 Draft Inventory

16. Presentation to Minn./Wisc. Power Suppliers Group, September 10, 1980

17. 10/2/80 Draft Rules and Attachment

18. October 24, 1980 letter from Chris Sandberg, Minnesota Public Utilities Commission

19. October 27, 1980 letter from Cecelia Lewis, 1979-80 PPSAC member

20. October 29, 1980 letter from A.W. Benkusky, NSP

21. November 3, 1980 letter from K.A. Carlson, Chairman, Minnesota/Wisconsin Power Suppliers Environmental Committee

22. November 4, 1980 letter from David Martin, Owatonna Public Utilities

23. November 6, 1980 letter from Ray Diedrick, SCS

24. November 7, 1980 letter from Charles Dayton, attorney representing Concerned Citizens for the Preservation of the Environment and Circuit Breakers

25. November 13, 1980 memo from Tom Balcom, Environmental Review Coordinator, DNR

26. Paper entitled "Power Plant Siting and Agricultural Land: Commentary on Proposed Regulation" by John Waelti, presented at December 5, 1980 PPSAC meeting

27. Paper entitled "Observations on Minnesota Land Use Trends and on Definition of Prime Farmland-Draft Copy," presented by Joe Stinchfield at December 6, 1980 PPSAC meeting

28. December 6, 1980 Recommendation of 1980-1981 Power Plant Siting Advisory Committee (PPSAC) concerning prime farmlands policy

29. Summary of telephone comments on 10/2/80 Draft Rules by Cliff Swedenburg, Public Utilities Commission, October 20, 1980; Rex Sala, 1980-81 PPSAC member, October 20, 1980; Richard Skarie, Agricultural Extension Service, University of Minnesota, October 27, 1980; and Bill Marshall, Public Service Department.

30. List of Meetings Held by Staff on 10/2/80 Draft

31. List of Persons Receiving 10/2/80 Draft

32. Cover letters to Persons Receiving 10/2/80 Draft (example memo to EQB Technical Representatives; memo to 1979-80, 1980-81 Power Plant Siting Advisory Committee members; letter to Minnesota-Wisconsin Power Suppliers Environemtal Committee, staff and frequent attendees from other utilities and list of recipients; letters to persons Involved with Specific Rules; and letters to other agencies).

33. 12/17/80 Draft Rules and attachment

34. January 5, 1981 letter from Cecelia Lewis, 1979-80 Power Plant Siting Advisory Committee Member

35. January 12, 1981 letter from Lowell Hanson, Extension Soils Scientist, Agricultural Extension Service, University of Minnesota

36. January 14, 1981 memo from Tom Balcom, Environmental Review Coordinator, DNR

37. January 21, 1981 letter from David M. Martin, Owatonna Public Utilities

38. January 22, 1981 letter from Ray Diedrick, SCS

39. February 26, 1981 letter from Charles Dayton, attorney representing Concerned Citizens for the Preservation of the Environment and Circuit Breaks

40. January, 1981 note from Ann Bateson, Office of the Revision of Statutes

41. Summary of Telephone Comments on 12/17/80 Draft Rules by Mark Lahtinen, Water Quality Division, PCA, January 8, 1981; Terry Merritt, MN Municipal Board, January 13, 1981; and Diane Vosick, MN Audubon Society.

42. List of Meetings Held by Staff on 12/17/80 Draft

43. List of Persons Receiving 12/17/80 Draft

44. Cover letters Requesting Review of 12/17/80 Draft (memo to persons receiving the 10/2/80 Draft; representative letter to agricultural, environmental and citizen Groups and list of recipients; letter to Paul Ims, Echo; letter to State Rep. Gaylen Den Ouden; letter to Brian Higgins, HDR; and letter to Merlin Lokensgard, Minnesota Farm Bureau Federation.

45. 3/5/81 Draft Rules and Cover Memo

46. March 13, 1981 letter from Keith Wietecki, NSP

47. March 18, 1981 letter from Vern Ingvalson, Minnesota Farm Bureau Federation

48. List of Meetings Held by Staff on 3/5/81 Draft and List of Persons Receiving 3/5/81 Draft

49. Staff Materials Prepared for March 19, 1981 MEQB meeting (copy of Notice of Meeting published in the State Register on March 9, 1981 at pages 1409-1410; staff report dated 3/12/81; March 16, 1981 staff response to March 13, 1981 letter from Keith Wietecki, NSP; March 16, 1981 Staff Memo about staff proposed amendments to 3/5/81 draft; March 17, 1981 Staff Memo about staff proposed amendments to 3/5/81 draft; March 18, 1981 draft of Rules incorporating staff proposed amendments to 3/5/81 draft; and March 19, 1981 proposed MEQB resolution authorizing rulemaking).

50. March 30, 1981 staff memo concerning status of proposed amendments; (sent to all persons receiving the 3/5/81 draft)

51. March 20, 1981 letter from Mary Williams, Minnesota Project

52. March 31, 1981 letter from Ray Diedrick, SCS

53. May 7, 1981 memo from Ann Bateson, Office of the Revisor of Statutes

54. June 12, 1981 letter to Soil Conservation Service field officers concerning prime farmland materials and mailing list

55. June 12, 1981 letter to Executive Directors of the Regional Development Commissions concerning prime farmland materials and mailing list

56. Materials sent in June 15, 1981 mailing of Notice of Hearing

Documentary Evidence

57. American Land Forum. Land and Food: The Preservation of U.S. Farmland--Report Number 1. Washington, D.C. 1979.

58. Bloomfield, Roger B. "What you should know before converting to waste fuels." Power. April, 1981. Pp. 69-71.

59. Brown, Lester R. Worldwatch Paper 24--The Worldwide Loss of Cropland. Worldwatch Institute, Washington, D.C. October, 1978.

60. California Energy Commission. Municipal Waste Water as a Source of Cooling Water for California Electric Power Plants. Sacramento, California. May, 1980.

61. Council on Environmental Quality. "Publishing of Three Memoranda for Heads of Agencies." (The first two memoranda concern prime farmlands.) Federal Register. September 8, 1980. Pp. 59189-92.

62. Craig, William J. What is Happening to Farmland in Minnesota? Center for Urban and Regional Affairs Publication No. CURA 81-4. Minneapolis, Minnesota. 1981.

63. Dideriksen, Ray and Sampson, R. Neil. "Important farmlands: A national view". Journal of Soil and Water Conservation. September-October, 1976. Pp. 195-197.

64. EPRI Journal. "Energy from Biomass." December, 1980. Pp. 30-32.

65. Governor's Council on Rural Development. Letter from Mark Seetin, Vice-Chair, to Nancy Onkka, Power Plant Siting Program, Minnesota Environmental Quality Board. May 7, 1981.

66. Haik, Ray. Letter to Chief Justice Sheran. September 22, 1980.

67. Heartland Project. Strangers and Guests--Toward Community in the Heartland, A Regional Catholic Bishops' Statement on Land Issues. Sioux Falls, South Dakota. May 1, 1980.

68. Janssen, Kent. "Why Dry Scrubbers Are Better." Public Power. July-August, 1980. Pp. 26-29.

69. Minnesota Conservation Needs Committee, U.S.D.A. Soil Conservation Service, Chairman. Minnesota Soil and Water Conservation Needs Inventory. St. Paul, Minnesota. August, 1971.

70. Minnesota Crop and Livestock Reporting Service, et al. Minnesota Agricultural Statistics--1979. St. Paul, Minnesota. June, 1979.

71. Minnesota Department of Agriculture. The Thirty-First Biennial Report: July 1, 1978-June 30, 1980. St. Paul, Minnesota. 1980.

72. Minnesota Department of Natural Resources, Office of Planning and Research, Methodology for Calculation of Reservoir Size, Appendix to Water Consumption by Future Power Plants in Minnesota--A Framework for Planning (Preliminary Draft). St. Paul, Minnesota. January, 1978.

73. Minnesota Department of Transportation. 1979 State Rail Plan. St. Paul, Minnesota. December 31, 1979.

74. Minnesota Energy Agency. 1980 Energy Policy and Conservation Biennial Report (Draft). St. Paul, Minnesota. 1980.

75. Minnesota Environmental Quality Board. Regional Copper-Nickel Study. Volume 3-Chapter 4--Water Resources. St. Paul, Minnesota. December, 1979.

76. ----------. Power Plant Siting Program. Assessment of Cogeneration Potential in Minnesota--Draft Final Report (prepared by Synergic Resources Corporation, Bala-Cynwyd, Pennsylvania). St. Paul, Minnesota. April, 1981.

77. ----------. Considerations in Electric Power Plant Siting: Coal-Fired Power Plants from 50 to 2400 Megawatts (prepared by Burns and Roe, Inc., Ordell, New Jersey). St. Paul, Minnesota. January, 1980.

78. ----------. Considerations in Electric Power Plant Siting: Considerations in the Identification and Evaluation of Potential Reservoir Sites for Coal-Fired Power Plants (prepared by Woodward-Clyde Consultants, San Francisco, California). St. Paul, Minnesota. July, 1980.

79. ----------. Considerations in Electric Power Plant Siting: Cropland Preservation. St. Paul, Minnesota. January, 1980.

80. ----------. Economic Feasibility of Power Plant Conversion to District Heating Operation--Addendum to Considerations in Electric Power Plant Siting--Coal-Fired Plants from 50 to 2400 Megawatts (prepared by Burns and Roe, Inc., Oradell, New Jersey). St. Paul, Minnesota. March, 1981.

81. ----------. Information Meeting Draft, 1979 Inventory of Power Plant Study Areas, Issue Summary, October, 1979. St. Paul, Minnesota. Mimeo.

82. ----------. Inventory 1975: Candidate Areas for Large Electric Power Generating Plants (prepared by EDAW, Inc. and the Power Plant Siting Advisory Committee). St. Paul, Minnesota. 1975.

83. ----------. Maps showing approximate two-mile radius around all cities in two locations in Minnesota. N.d.

84. ----------. Minnesota Coal Transport Evaluations (prepared by Earth Science Associates, Palo Alto, California). St. Paul, Minnesota. January, 1979.

85. ----------. 1979 Inventory: Information Meeting Draft. St. Paul, Minnesota. October, 1979.

86. ----------. Potential Joint-Use of Waste Disposal and Electric Power Generating Facilities--Phase 1 Draft Report (prepared by Sanders and Thomas, Inc.). St. Paul, Minnesota. November 14, 1980.

87. ----------. A Review of Site Compatibility--The Floodwood-Fine Lakes Large Electric Generating Plant Site (Draft) (prepared by Woodward-Clyde Consultants). St. Paul, Minnesota. December, 1977.

88. ----------. A series of maps showing research on proposed range for limits to use of prime farmland for plant sites.

88a. Prime Farmland Policy Test Sites--Blue Earth County Search Area
88b. Prime Farmland Policy Test Sites--Goodhue County Search Area
88c. Prime Farmland Policy Test Sites--Olmsted County Search Area
88d. Prime Farmland Policy Test Sites--St. Louis County Search Area
88e. Prime Farmland Policy Test Sites--Wabasha County Search Area
88f. Prime Farmland Policy Test Sites--Yellow Medicine County Search Area
88g. Possible Constraints to Test Sites--Blue Earth County Search Area
88h. Possible Constraints to Test Sites--Goodhue County Search Area
88i. Possible Constraints to Test Sites--Olmsted County Search Area
88j. Possible Constraints to Test Sites--St. Louis County Search Area
88k. Possible Constraints to Test Sites--Wabasha County Search Area
88l. Possible Constraints to Test Sites--Yellow Medicine County Search Area

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II. Expert Witnesses Who May or May Not Be Called To Testify On Proposed Amendments

- Robert Gray, former Executive Director of the National Agricultural Lands Study (NALS), and now associated with the American Farmland Trust. Mr. Gray will discuss (1) the program of study, conclusions and recommendations of the NALS and (2) the national implications of loss of prime farmland at the July 20 hearing beginning at 7:00 p.m.

- Raymond Diedrick, State Soil Scientist with the Minnesota Office of the U.S.D.A. Soil Conservation Service (SCS). Mr. Diedrick will discuss the definition of prime farmland contained in 7 C.F.R. 657.5 (a), development of the state list of soils that meet that definition, the Important Farmlands Inventory of the SCS, soil survey procedures and definitions, the SCS Land capability classification system and related items. SCS area field officers will answer questions on these topics at hearings where Mr. Diedrick is not present; SCS area field officers Paul Nyberg and Carroll Carlson are tentatively scheduled for the July 27 and July 29 hearings.

- Dr. Matt Walton, director of the Minnesota Geological Survey. Dr. Walton will discuss potential construction limitations to building power plants in the five prime farmland policy search areas and identify engineering techniques to overcome limitations (if any) at the July 22 hearing beginning at 7:00 p.m.

III. Agency Personnel Who Will Represent the Minnesota Environmental Quality Board at the Hearings

The agency representatives will include Lee Alnes, Larry Hartman, John Hynes, Sheldon Mains, Nancy Onkka, and Special Assistant Attorney General Christie Eller.

Appendix 2

STATE OF MINNESOTA
COUNTY OF RAMSEY

MINNESOTA ENVIRONMENTAL QUALITY BOARD

In the Matter of the Proposed Adoption of Amendments to Rules Relating to Siting Large Electric Power Generating Plants

No. EQB-81-005-AK

REPORT ON PROPOSED RANGE FOR LIMITS TO USE OF PRIME FARMLAND FOR PLANT SITES

The Minnesota Environmental Quality Board (Board) has proposed amendments to its rules which would strengthen protection of prime farmland during selection of power plant sites. Soils that meet the standards listed in 7 C.F.R. 657.5(a)(1980) are considered as prime farmlands; these standards were developed by the USDA Soil Conservation Service.

The proposed amendments contain an avoidance area criterion that limits the amount of prime farmland in the developed portion of the plant site and in an associated water storage reservoir or cooling pond site to a certain amount based on the net generating capacity of the plant. The policy would not apply to certain urbanizing areas. Since this is an avoidance area criterion, the limits would apply unless there are no feasible and prudent alternatives. The Statement of Need and Reasonableness contains more information on the proposed criterion.

The criterion as proposed contains a range of figures from 0.25-0.75 acres per megawatt for the allowable amount of prime farmland that can be taken. The rule as adopted will contain one number for the developed portion of the plant site and one number for the reservoir or cooling pond.

Interested persons are encouraged to present testimony on any figure they believe is the appropriate limit. The Board believes that such testimony is essential to provide complete and useful data from which to select the best possible limits. The Board's goal is to select limits that provide sufficient protection of prime farmland without unreasonably restricting siting opportunities throughout the state, in accord with legislative directives in Minn. Stat. ch. 116B, ch. 116C and 116D (1980).

This appendix provides background information useful in assessing the impact of various numbers within the range--0.25 acres per megawatt, 0.5 acres per megawatt and 0.75 acres per megawatt. It summarizes data on test sites in six search areas (Figure 1). These search areas were selected because they contain high concentrations of prime farmland, thereby testing the proposed limits in the most restrictive area, and importantly, because these search areas were likely to contain realistic sites, since they had been identified as plant site search areas in recent utility siting studies (Exhibits 121 and 141). This appendix also discusses the implications of these three numbers in terms of protection of prime farmland versus siting opportunities and, in Attachment 2, identifies the ways in which utilities can reduce land requirements

PRIME FARMLAND POLICY

SEARCH AREAS

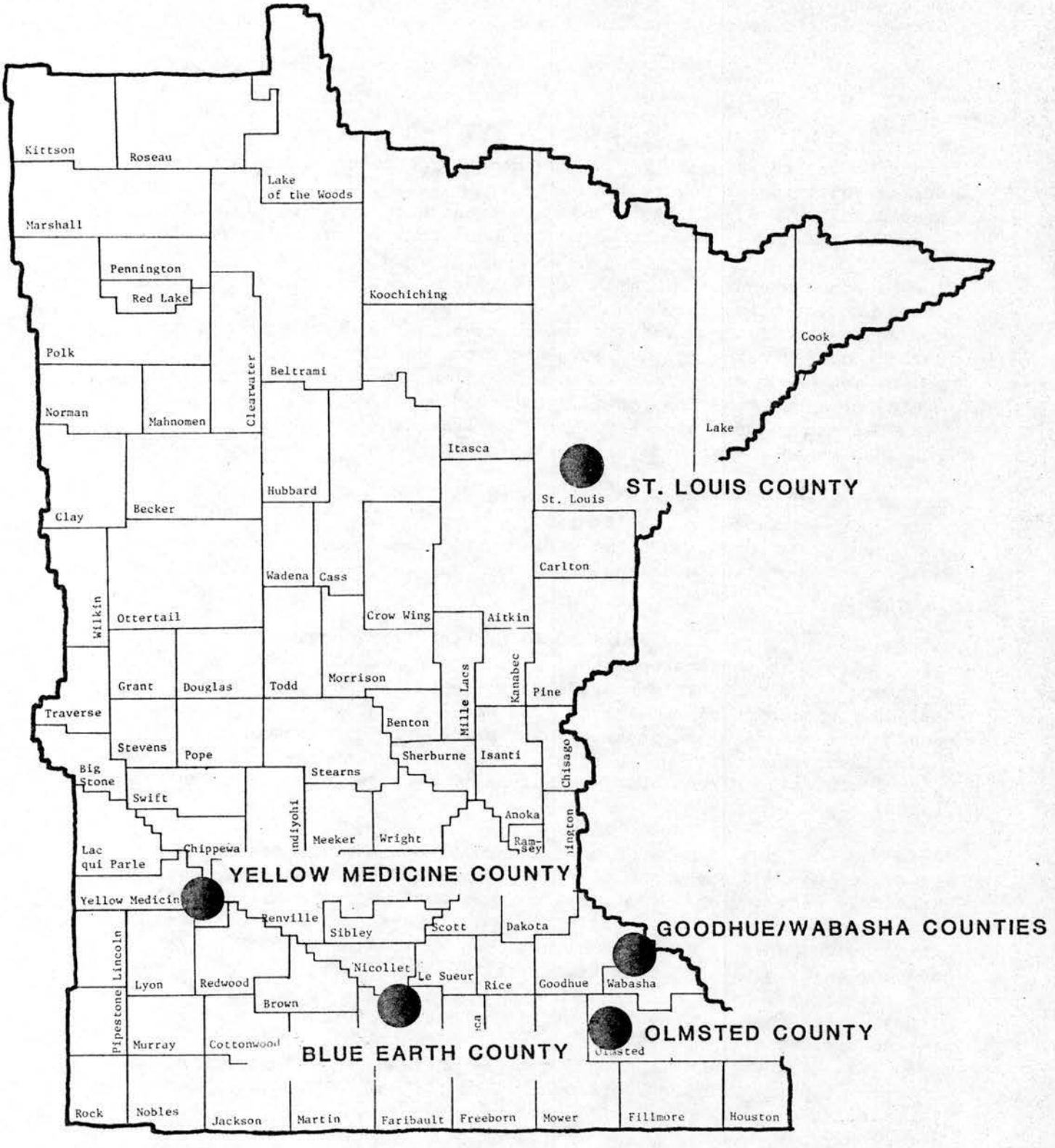

FIGURE 1

for the plant or reservoir site to meet the proposed limit. Attachment 1 contains more information on all test sites, so that interested persons can consider the impact of other possible limits.

Developed Portion of the Plant Site

Land requirements for power plants vary according to the size of the plant. As shown in Table 1, larger plants take less land per megawatt (MW) than smaller plants. Plants with capacities of 1600 MW, 800 MW, and 400 MW would use 0.84, 0.87 and 0.92 acres of land per megawatt, respectively.

These three plant sizes were considered in the research done on the six search areas to test the impact of the three possible limits.

A policy level of 0.75 acres of prime farmland per megawatt would allow:

1200 acres of prime farmland (or 89%) on a 1600 MW site
600 acres of prime farmland (or 86%) on a 800 MW site
300 acres of prime farmland (or 81%) on a 400 MW site

A limit of 0.50 acres of prime farmland per megawatt would allow:

800 acres of prime farmland (or 59%) on a 1600 MW site
400 acres of prime farmland (or 57%) on a 800 MW site
200 acres of prime farmland (or 54%) on a 400 MW site

A policy level of 0.25 acres of prime farmland per megawatt would allow:

400 acres of prime farmland (or 29%) on a 1600 MW site
200 acres of prime farmland (or 28%) on a 800 MW site
100 acres of prime farmland (or 27%) on a 400 MW site

Table 2 shows the number of the 185 test sites within the six search areas that meet each of the three limits. As expected, there are more sites that meet the upper limit than meet the lower limit. All sites meet the upper limit, while only 30 meet the lower limit. This indicates that siting opportunities in heavily prime areas are reduced as the policy becomes more restrictive. However, with one exception, there is at least one site for each plant size in each search area that meets or is close to the lower limit.

These results likely underestimate the number of sites that meet the three limits. Square test sites were used in the calculations. In reality, site layout is flexible. Had the square site layout been altered slightly, the calculated acres of prime farmland per megawatt could have been reduced. Six more sites would meet the 0.25 acres per megawatt limit and 12 more sites the 0.5 acres per megawatt limit, if the layout were adjusted slightly. Further, many more test sites could have been selected, particularly those at the upper end of the range. Time constraints prevented this.

TABLE 1 MODEL PLANT AND LAND USE (Acres)

PLANT SYSTEM	NET GENERATING CAPACITY (MW)		
	400	800	1600
Boiler-Turbine	2	4	7
Fuel Supply	26	48	95
Cooling System	20	25	41
Water Quality	2	4	7
Solid Wastes	315	610	1197
Transportation	3	7	13
Total Acres	368	698	1360
Acres/MW	0.92	0.87	0.85

Interpreted from: Considerations in Electric Power Plant Siting: Coal fired Power Plants from 50-2400 MW. Prepared by Burns and Roe, Inc.

TABLE 2

Search Area	Total # of Test Sites	# of Test Sites that Meet 0.25 acres/MW	# of Test Sites that Meet 0.50 acres/MW	# of Test Sites that Meet 0.75 acres/MW
BLUE EARTH				
400 MW	29	5	19	29
800 MW	20	2	11	20
1600 MW	11	1	7	11
GOODHUE				
400 MW	4	2	4	4
800 MW	2	2	2	2
1600 MW	-	-	-	-
OLMSTED				
400 MW	34	4	29	34
800 MW	17	2	16	17
1600 MW	6	1	6	6
ST. LOUIS				
400 MW	8	1	6	8
800 MW	8	1	7	8
1600 MW	8	1	5	8
WABASHA				
400 MW	2	2	2	2
800 MW	2	2	2	2
1600 MW	1	1	1	1
YELLOW MEDICINE				
400 MW	14	2	2	14
800 MW	14	2	2	14
1600 MW	5	-	2	5
TOTAL	185	31	123	185

It is likely that certain test sites would not make suitable plant sites as only one criterion has been applied. A reasonable plant site requires certain characteristics, like access to water. However, even if some are not suitable, given the number of test sites identified, many others would remain. These test sites were located within general search areas identified by the utilities. It must also be recognized that there are some problems with almost any possible plant site that must be worked around. (See Exhibits 87, 121, and 140.) Attachment 1 contains the results of research concerning major potential constraints for each test site.

There are a number of ways available to permit plant location in certain areas and still meet a prime farmland limit. These include aligning the site to follow non-prime soils, reducing site size by installing higher dikes on the waste ponds (these are the largest part of the site) or by reducing other system acreages and using dry scrubbers for SO_2 removal so the waste can be deposited in a landfill rather than stored on-site. Attachment 2 discusses these and other options.

Water Storage Reservoir or Cooling Pond Site

It is more difficult to develop general estimates of land requirements for reservoir sites. Land requirements for water storage reservoirs vary from site to site, in response to storage needs and reservoir depth. Reservoirs are generally sized to allow plant operation during the record period of low flows, when water cannot be withdrawn from the river. Storage needs vary considerably. For example, the water model developed by the Department of Natural Resources for the 1979 Draft Inventory of Study Areas estimated, for an 800 MW plant with low flow levels at the 90% exceedence flow, storage needs ranging from 1972 acre feet to 27,597 acre feet (Exhibit 72). The actual reservoir may be up to twice as large since it must also contain room for sediment and flood water storage and other inactive storage. Table 5 shows the relationship between depth of reservoir and land requirements for several storage volumes.

Table 3

Relation of Storage Capacity to Reservoir Depth and Land Area*

	Depth of Reservoir		
Land Area	10 Feet	20 Feet	30 Feet
200 acres	2,000*	4,000	6,000
400 acres	4,000	8,000	12,000
800 acres	6,000	12,000	18,000
1000 acres	10,000	20,000	30,000

*Storage in acre feet.

Land requirements for cooling ponds are more easily identified--for an area like Minnesota, the surface area needed to allow the required amount of cooling is about 1.1 acres per MW. (Exhibit 77, page 53; Exhibit 78, p. 128). No cooling ponds have been proposed in recent plant siting studies (Exhibits 121, 140 and 141).

There are many types of reservoirs--diked lakes, diked marshes, natural depressions, in-stream reservoirs, or diked reservoirs. The reservoir can provide water directly to the plant or be used to augment low stream flows so that water withdrawal from the river at the plant can remain constant.

Reservoir sites were identified for the search areas in Blue Earth, Olmsted, and Yellow Medicine Counties, since these areas would likely be required to supplement direct withdrawal from a water source during dry periods. The other three search areas were considered to have sufficient water through constant withdrawal (Goodhue and Wabasha County Search Areas, Stone and Webster Co. evaluation Exhibit 21) or stream flow augmentation by utility reservoirs (St. Louis County, Minnesota Power Company reservoirs).

Four types of reservoirs were considered: a dammed tributary for stream flow augmentation during periods of low flow, diked natural lakes, diked natural depressions, and a watershed dam. Since reservoir shape and size depends on local topography and adequacy of the primary water supply, a standard size could not be used for research purposes.

Two potential reservoirs were identified in the Yellow Medicine County search area. Five potential reservoirs were identified near the Blue Earth County search area and one potential reservoir was identified in the Olmsted County search area. Five of the eight reservoir sites had been proposed in siting study for the Minnesota/Wisconsin Power Suppliers (Exhibit 121). The three additional sites were proposed by Board staff. Storage capacity data and when possible the acres of prime farmland per megawatt were calculated. The results are shown in Table 4.

Ten of the twelve reservoirs proposed in the siting study for the Minnesota/Wisconsin Power Suppliers (Exhibit 121) meet the proposed policy range. Most of them are less than 0.50 acres/megawatt (Table 5). All of the sites found by the EQB staff would also meet the proposed policy range.

Identifying reservoir sites that fall within the Board's suggested policy range is somewhat easier than identifying plant sites. Where slope and soil mosture content are possible constraints for plant siting, they can be a benefit in reservoir siting. Natural depressions, watershed valleys, dry lakebeds and marshes are generally non-prime, making them possible areas for diked reservoirs that meet the policy range.

Existing lakes also provide opportunity for siting fully diked reservoirs that meet the policy range. Since the majority of the reservoir area would already be waterless prime farmland is likely to be used. The Stone and Webster Siting Study identified four reservoir possibilities that used existing lakes. Minnesota has more than 15,000 lakes, some of which may be suitable for reservoirs.

Reservoir land requirements can be significantly reduced by constructing high dikes. Dikes as high as forty to fifty feet are feasible in many areas. Diked reservoirs can be designed to conform to local conditions so as to minimize use of prime farmland.

TABLE 4 Reservoir Test Sites

Site Name	Surface Area (Acres)	Storage Capacity (Acrefeet)	Acres of Prime Farmland	Acres Prime/MW		
				400 MW	800 MW	1600 MW
Hadley Valley	600	28,440	NA	(1.5)	(0.75)	(0.37)
Wood Lake	1470	20,000	786	1.96	0.98	0.49
High Bank Lake	1540	24,100	832	2.08	1.04	0.52
Wita Lake	770	7,400	47	0.11	0.05	0.02
Eagle Lake	1461	48,825	302	0.75	0.37	0.18
Kasota	820	17,500	228	0.57	0.28	0.14
Solberg Lake	1423	45,740	498	1.24	0.62	0.31
Little Cottonwood River	1140	55,000	NA	(2.85)	(1.42)	(0.71)

NOTES:

NA - Data not available.
Figures shown in brackets assume 100% prime farmland on site.
All reservoirs (except Wita Lake) could support plants larger than 1600 MW.

Source: Research Results on Proposed Range for Limits to Use of Prime Farmland for Plant Sites. Minnesota Environmental Quality Board, St. Paul, Minnesota. June, 1980. (Exhibit 90).

TABLE 5

Reservoirs Proposed In MN/WI Power Suppliers Group Siting Study

Reservoir Name	Reservoir Type	Maximum Capacity (MW)	Reservoir Depth (Feet)	Surface Area (Acres)	Acres/MW*
Minn. River at Watson	On Stream	1200	7	2700	2.25
Hawk Creek	Dammed Tributary	3100	110	1180	0.38
Wood Lake	Diked Lake	1300	29	1470	1.13
High Bank Lakes	Diked Lakes	1700	35	1540	0.90
Delhi	Fully Diked	1600	40	625	0.39
Morton	Fully Diked	1600	40	625	0.39
Rice Lake	Diked Depression	1800	13	1590	0.88
Goldsmith Lakes	Diked Lake	2200	40	780	0.35
Goldsmith Reservoir	Watershed Dam	700	70	200	0.28
Kasota Reservoir	Watershed Dam	2200	70	820	0.37
Wita Lake	Diked Lake	900	12	770	0.86
Little Cottonwood River	Dammed Tributary	4400	110	1140	0.26

* Assuming the entire site is prime; calculations are based on the maximum capacity shown.

Source: Minnesota Power Suppliers Siting Study Stage II Report. Stone and Webster Engineering Corporation. May 1, 1978. (Exhibit 121).

In addition to the actual reservoir sites identified, the plant sites that meet the range could theoretically be diked to provide water storage for a nearby site. The 1600 MW site would hold about 64,000 acre feet if ringed by forty foot dikes. The 800 MW site would hold about 32,000 acre feet and the 400 MW site would hold about 16,000 acre feet if diked to forty feet.

Attachment 2 discusses other ways of reducing land requirements so that a reservoir can be sited within the prime farmland limits. These include distant reservoirs in non-prime areas and reducing storage requirements by use of supplemental water, cooling technologies like wet-dry or dry cooling that consumes less water than traditional wet cooling systems, or sewage effluent as a cooling water source.

Statewide Implications of Proposed Limits

The USDA Soil Conservation Service estimates that nearly 19.5 million acres in Minnesota would be considered prime farmland (Exhbit 129).

The six search areas were selected because they illustrate the impact of the proposed limits in areas with much prime farmland. Table 6 shows the estimated amount of prime farmland in several counties that might meet basic criteria for water and rail access, air quality impacts and available land. Staff research indicates that test sites can be found even in heavily prime areas. Clearly, if appropriate sites can be found in these areas, then there exist many more opportunities in counties that do not contain as much prime farmland.

TABLE 6

County	Percent Prime Farmland: Conservative Needs Inventory	Percent Prime Farmland: Important Farmlands Maps
Aitkin	31	-
Brown	73	-
Carlton	-	31
Carver	-	48
Chippewa	74	-
Dodge	-	74
Douglas	-	41
Freeborn	-	66
Goodhue	-	48
Grant	-	68
Houston	22	-
Le Sueur	62	-
Marshall	25	-
Morrison	24	-
Mower	78	91
Nicollet	73	61
Norman	-	69
Olmsted	-	55
Polk	48	-
Pope	-	40
Redwood	79	-
Renville	84	-
Rice	-	54
St. Louis	13	-
Scott	-	34
Sherburne	-	4
Sibley	81	-
Stearns	41	-
Steele	-	65
Stevens	-	77
Wabasha	-	34
Winona	36	34
Yellow Medicine	81	-

Sources: Minnesota Soil and Water Conservation Needs Inventory. Conservation Needs Committee, USDA Soil Conservattion Service, Chairman, St. Paul, Minnesota. August, 1971. (Exhibit 69).

Important Farmlands Maps prepared by the USDA Soil Conservation Service, St. Paul, Minnesota.

Attachment 1

RESEARCH ON PROPOSED RANGE FOR LIMITS TO USE OF PRIME FARMLAND FOR PLANT SITES

This attachment contains the data collected by the Power Plant Siting Staff of the Environmental Quality Board (Board) for the proposed avoidance area criterion limiting use of prime farmland for power plant sites. The purpose of the research described here was to determine the effect of an "acres of prime farmland per megawatt" approach to limiting the use of prime farmland for LEPGP sites and sites of associated water storage reservoirs or cooling pond.

To determine the statewide implication of the policy, six search areas were chosen to test the range (0.25-0.75 acres of prime farmland per megawatt) proposed for public discussion by the EQB. The search areas were selected because they are within areas proposed by utilities in previous power plant siting studies and because the areas contain high concentrations of prime farmlands. Highly prime areas would be most limited by any policy that limits use of prime farmland.

Five search areas are located in Blue Earth, Goodhue, Olmsted, Wabasha and Yellow Medicine counties. These counties range from about 40% prime to more than 80% prime. Only those areas within reasonable distance to adequate water supply were tested. The Soil Conservation Service has completed detailed county soil surveys for these counties.

The sixth search area, located along the St. Louis River between Floodwood and Brookston in southern St. Louis County, has a detailed SCS soil survey in progress. A general soils map, accurate to about 40 acres, was completed in 1976. The general soils map was deemed appropriate for our purposes after consultation with SCS personnel in Virginia, Minnesota. A detailed soil survey for an area just north of Brookston was done for Minnesota Power Company in 1977 when it was considering a power plant for the area (Exhibit 131).

Identification of Power Plant Test Sites

In order to locate test sites for the policy several pieces of information had to be collected. Foremost was the identification of prime soils on the soil maps. Prime soils are those that meet the specifications of 7 C.F.R. 657.5(a)(1980); the SCS has prepared a list of state soils that meet this definition (Exhibit 134). Soils identified on this list were marked on the soils maps for each search area (Exhibits 88a-88f).

Test sites for three plant sizes were then identified within these search areas. The plant sizes were 400 MW, 800 MW and 1600 MW, which take 368 acres, 698 acres and 1360 acres for the developed portion of the plant site, respectively (Exhibit 77). Square site layouts were used in this study, although site layouts are generally designed to conform to local conditions.

The test sites were located in such a manner as to minimize the amount of prime farmland within the square site. In an actual siting of a power plant the amount of prime farmland on site could be reduced simply by using a flexible site rather than a square site.

After locating the test sites on the pockets of non-prime land, a grid overlay technique was used to calculate the acreage of prime farmland within each site. This method was found to be as accurate, and less time consuming than using a planimeter or electronic digitizing equipment.

The results of the research are contained in Exhibit 90.

The test sites were transferred to 1:24,000 scale U.S.G.S. Topographic maps to identify potential constraints to plant construction or land use conflicts (Exhibits 88g-l).

BLUE EARTH COUNTY SEARCH AREA

The Blue Earth County search area is located in the northern third of the county along the Minnesota River. This area was chosen to test the prime farmland policy for three reasons: 1) the Minnesota River is a good source for cooling water, 2) the Minnesota/Wisconsin Power Suppliers Group, in a recent siting study (Exhibit 121), expressed interest in the area near Mankato, and 3) to illustrate siting opportunities in a highly prime county. Blue Earth County is about 70 percent prime. (Exhibit 69, Table 4).

Sixty test sites at twenty-six locations were identified. Five water storage reservoirs near the sites were also identified. Three of the reservoirs were previously proposed by the Minnesota/Wisconsin Power Suppliers Group (Exhibit 121).

Most of the search area is nearly level to gently undulating with the exception of abrupt gorges near the main drainage channels (Blue Earth, LeSeuer and Minnesota Rivers). These areas have a series of terraces.

Elevation in the search area ranges from about 1,000 feet to 1,060 feet above sea level. The elevation of the bluffs along the Minnesota River valley is about 975 feet and the river level at Mankato is 756 feet. Relief is usually a few feet to twenty or thirty feet in most of the search area.

There are few potential siting constraints in this search area. The square test sites along the river may include part of the bluff, however, this could be avoided with a flexible site. Some of the test sites east of Mankato include seasonal wetlands or permanent marshes.

Prime farmland data and comments on the test sites are included below.

Power Plant Test Sites

SITE	ACRES PRIME	ACRES/MW	COMMENTS
400-1	0	0.00	NSP Mankato Site
400-2	21	0.06	
400-3	144	0.36	Little Cottonwood River on site, Hilly
400-4	126	0.32	Hilly
400-5	39	0.10	
400-6	61	0.15	Near Minnesota River & Minneopa State Park
400-7	137	0.34	
400-8	176	0.44	
400-9	154	0.39	
400-10	157	0.39	
400-11	209	0.52	Highway 60 on site
400-12	265	0.66	
400-13	249	0.62	
400-14	268	0.67	
400-15	244	0.61	
400-16	185	0.46	

400-17	223	0.56	
400-18	128	0.32	Near Minnesota River
400-19	257	0.64	
400-20	192	0.48	80 acre marsh on site
400-21	224	0.56	60 acre marsh on site, 20 acre lake on site
400-22	222	0.55	60 acre marsh on site
400-23	184	0.46	
400-24	153	0.38	Hilly
400-25	242	0.61	
400-26	94	0.23	
400-27	157	0.39	
400-28	146	0.36	
400-29	190	0.48	
800-1	25	0.03	NSP Mankato Site
800-2	142	0.18	
800-3	220	0.28	Little Cottonwood River on site, Hilly
800-4	346	0.43	
800-5	372	0.47	
800-6	453	0.57	
800-7	439	0.55	
800-8	488	0.61	
800-9	484	0.61	
800-10	538	0.67	Highway 60 on site
800-11	418	0.52	80 acre marsh on site
800-12	426	0.53	60 acre marsh on site, 20 acre lake on site
800-13	464	0.58	60 acre marsh on site
800-14	378	0.47	
800-15	357	0.45	Hilly
800-16	394	0.49	
800-17	258	0.32	
800-18	376	0.47	
800-19	378	0.47	
800-20	427	0.53	
1600-1	92	0.05	NSP Mankato site
1600-2	555	0.35	
1600-3	704	0.44	
1600-4	964	0.60	
1600-5	878	0.55	
1600-6	904	0.57	
1600-7	1015	0.63	
1600-8	742	0.46	Highway 60 on site
1600-9	623	0.39	
1600-10	458	0.29	
1600-11	485	0.30	

Reservoir Test Sites

Site Name	Surface Area (Acres)	Storage Capacity (Acrefeet)	Acres of Prime Farmland	Acres Prime/MW		
				400 MW	800 MW	1600 MW
Wita Lake	770	7,400	47	0.11	0.05	0.02
Eagle Lake	1461	48,825	302	0.75	0.37	0.18
Kasota	820	17,500	228	0.57	0.28	0.14
Solberg Lake	1423	45,740	498	1.24	0.62	0.31
Little Cottonwood River	1140	55,000	NA	(2.85)	(1.42)	(0.71)

NOTES:

NA - Data not available.
Figures shown in brackets assume 100% prime farmland on site.
All reservoirs (except Wita Lake) could support plants larger than 1600 MW.

GOODHUE COUNTY SEARCH AREA

The Goodhue County search area is located in Florence Township near Lake Pepin on the Mississippi River. This area was chosen to test the prime farmland policy for three reasons: 1) the Mississippi River has sufficient flow to supply cooling water without a storage reservoir, 2) the Minnesota/Wisconsin Power Suppliers Group, in a recent siting study (Exhibit 121), expressed interest in the area along the lower Mississippi, and 3) to illustrate siting opportunities in a highly prime county. Goodhue County is about 49 percent prime (Exhibit 69, Table 4).

Six test sites at four locations were identified in this search area. The test sites are located northwest of Lake City near Frontenac.

The search area is dissected by an intricate pattern of tributaries leading to the Mississippi River. Most of the area is naturally drained. Topography ranges from very steep in the numerous stream valleys to gently sloping and nearly level on the broad upland areas. Most of the valleys along the Mississippi River have a difference of 350 to 450 feet in elevation. The flood plain along the river has an elevation of about 680 feet above sea level.

The rapid changes in topography are the primary constraint to siting power plants in this area. The square test sites frequently include landforms which could be avoided in an actual siting exercise.

Prime farmland data and comments on the test sites are included below.

Power Plant Test Sites

SITE	ACRES PRIME	ACRES/MW	COMMENTS
400-1	0	0.00	Near Frontenac State Park
400-2	5	0.01	Hilly, Near Frontenac State Park
400-3	128	0.32	
400-4	129	0.32	
800-1	36	0.05	Near Frontenac State Park
800-2	21	0.03	Hilly, Near Frontenac State Park

OLMSTED COUNTY SEARCH AREA

The Olmsted County Search Area is located near Rochester in the western half of the county. This area was chosen to test the prime farmland policy because the Southern Minnesota Municipal Power Agency expressed interest in the area in a recent siting study (Exhibit 141). The area was also chosen to illustrate siting opportunities in a highly prime county. Olmsted County is more than fifty percent prime farmland (Exhibit 69, Table 4).

Fifty-seven test sites at twenty-nine locations were identified. One reservoir site was also identified. Most of the test sites are west-northwest of Rochester. Some sites are within two miles of Rochester.

The search area is characterized by a mature landscape that is dissected by numerous streams that flow into the Zumbro, Root and Whitewater Rivers. The stream valleys are usually about 100 feet deep.

Potential siting constraints in this search area include the rapidly changing terrain and the possibility that much of the area is underlain by Karst topography. Availability of cooling water may be a constraint for larger plants.

Prime farmland data and comments on the sites are included below.

Power Plant Test Sites

SITE	ACRES PRIME	ACRES/MW	COMMENTS
400-1	165	0.41	Hilly
400-2	169	0.42	Hilly
400-3	207	0.52	Hilly
400-4	135	0.34	Hilly
400-5	194	0.49	Hilly
400-6	209	0.52	Hilly
400-7	160	0.40	Hilly
400-8	180	0.45	Hilly
400-9	196	0.49	Hilly
400-10	163	0.41	Hilly
400-11	205	0.51	
400-12	188	0.47	
400-13	149	0.37	
400-14	109	0.27	Hilly
400-15	144	0.36	
400-16	172	0.43	Hilly
400-17	84	0.21	
400-18	120	0.30	
400-19	103	0.26	
400-20	84	0.21	
400-21	175	0.44	Hilly
400-22	62	0.16	
400-23	185	0.46	
400-24	126	0.32	

400-25	171	0.43	Hilly
400-26	127	0.32	Hilly
400-27	223	0.56	
400-28	160	0.40	Proposed trail on site
400-29	157	0.39	Hilly
400-30	130	0.33	Hilly
400-31	164	0.41	Hilly
400-32	99	0.25	Hilly
400-33	203	0.51	Hilly
400-34	118	0.30	Hilly
800-1	279	0.35	
800-2	260	0.33	Hilly
800-3	313	0.39	Hilly
800-4	344	0.43	Hilly
800-5	475	0.59	Hilly
800-6	330	0.41	Hilly
800-7	400	0.50	Hilly
800-8	166	0.21	
800-9	280	0.40	
800-10	265	0.33	Hilly
800-11	186	0.23	
800-12	311	0.39	Hilly
800-13	271	0.34	Hilly
800-14	315	0.39	Hilly
800-15	289	0.36	Hilly
800-16	348	0.44	Hilly
800-17	231	0.29	Hilly
1600-1	648	0.40	Hilly
1600-2	651	0.41	
1600-3	635	0.40	Hilly
1600-4	669	0.42	Hilly
1600-5	701	0.44	Hilly
1600-6	302	0.19	

Reservoir Test Sites

Site Name	Surface Area (Acres)	Storage Capacity (Acrefeet)	Acres of Prime Farmland	Acres Prime/MW		
				400 MW	800 MW	1600 MW
Hadley Valley	600	28,440	NA	(1.5)	(0.75)	(0.37)

NOTES:

NA - Data not available.
Figures shown in brackets assume 100% prime farmland on site.

ST. LOUIS COUNTY SEARCH AREA

The St. Louis county search area is located in the southwestern corner of the county between floodwood and Brookston. This area was chosen to test the prime farmland policy because Minnesota Power Co. had proposed a plant for the area in the late 1970's (Exhibit 140).

Twenty-four sites at eight locations were identified in this search area. The sites are located along the St. Louis river which has adequate flow for power plant cooling water supply.

The search area is gently rolling with numerous marshes and peat deposits. The St. Louis river into a 100 foot valley through the search area. Most of the search area is forested.

The major siting constraints in this area are the large swamps and peat deposits.

Prime farmland data and comments on the sites are included below.

Power Plant Test Sites

SITE	ACRES PRIME	ACRES/MW	COMMENTS
1600-1	966	0.60	½ of site is bog
1600-2	602	0.38	½ of site is bog
1600-3	710	0.44	
1600-4	973	0.61	
1600-5	0	0.00	Hilly, marsh on site
1600-6	528	0.33	3/4 of site is swamp
1600-7	560	0.35	3/4 of site is swamp
1600-8	806	0.50	1/4 of site is swamp, across river from rail
800-1	386	0.48	½ of site is bog
800-2	331	0.41	½ of site is bog
800-3	386	0.48	
800-4	400	0.50	
800-5	0	0.00	Hilly, marsh on site
800-6	386	0.48	3/4 of site is swamp
800-7	266	0.33	3/4 of site is swamp
800-8	442	0.55	1/4 of site is swamp, across river from rail
400-1	202	0.50	½ of site is bog
400-2	193	0.48	½ of site is bog
400-3	189	0.47	
400-4	235	0.59	
400-5	0	0.00	Hilly, marsh on site
400-6	225	0.56	3/4 of site is swamp
400-7	147	0.37	3/4 of site is swamp
400-8	248	0.62	1/4 of site is swamp, across river from rail

WABASHA COUNTY SEARCH AREA

The Wabasha county search area is located in the northeastern corner of the county near the town of Kellogg. This area was chosen to test the prime farmland policy for three reasons: 1) the Mississippi River has suffficient flow to supply a power plant cooling system without a storage reservoir, 2) the Minnesota/Wisconsin Power Suppliers Group, in recent siting study (Exhibit 121), expressed interest in the area along the lower Mississippi, and 3) to illustrate siting opportunities in a highly prime county. Wabasha county is about forty percent prime (Exhibit 69, Table 4). Five test sites at two locations near the river were identified in the search area.

The search area is part of a dissected plateau ranging from 1100 to 1200 feet above sea level. The plateau is about 500 feet above the Mississippi river valley floor. The Zumbro river valley cuts west to east through the search area.

Rapid changes in topography are the major siting constraint in this area, however some of the stream valleys and upland areas are large enough for smaller plants. Data and comments on the sites are included below.

Power Plant Test Sites

SITE	ACRES PRIME	ACRES/MW	COMMENTS
400-1	0	0.00	NSP Kellogg site, near wildlife refuge
400-1	11	0.03	
800-1	0	0.00	NSP Kellogg site, near wildlife refuge
800-2	42	0.05	
1600-1	0	0.00	NSP Kellogg site, near wildlife refuge

YELLOW MEDICINE COUNTY SEARCH AREA

The Yellow Medicine county search area is located in the northeastern part of the county. This area was chosen to test the prime, farmland policy for three reasons: 1) the Minnesota river is a good source for cooling water, 2) the Minnesota/Wisconsin Power Suppliers Group expressed interest in this area in a recent siting study (Exhibit 121), and 3) to illustrate siting opportunities in a highly prime county. Yellow Medicine county is more than eighty percent prime (Exhibit 69, Table 4). Thirty-three sites at fourteen locations were identified in this search area. Two reservoir sites were also identified.

Most of the search area is flat. Relief ranges from ten to twenty feet in some places. The Yellow Medicine river cuts west to east across the search area. The valley is fifty feet deep in places. The bluffs along the Minnesota river are typically 150 feet high.

The major siting constraints in this area are the bluffs along the Minnesota and Yellow Medicine Rivers.

Prime farmland data and comments on the sites are included below.

Power Plant Test Sites

SITE	ACRES PRIME	ACRES/MW	COMMENTS
400-1	13	0.03	Marsh on site
400-2	43	0.11	
400-3	298	0.74	
400-4	280	0.70	
400-5	206	0.51	
400-6	274	0.68	60 acre marsh on site
400-7	292	0.73	
400-8	301	0.75	Creek valley on site
400-9	261	0.64	
400-10	281	0.70	50 acre marsh on site
400-11	293	0.73	10 acre marsh on site
400-12	287	0.71	
400-13	297	0.74	
400-14	227	0.66	
800-1	81	0.10	Marsh on site
800-2	112	0.14	
800-3	599	0.74	
800-4	586	0.73	
800-5	473	0.59	
800-6	517	0.64	60 acre marsh on site
800-7	585	0.73	
800-8	589	0.73	Creek valley on site
800-9	516	0.64	
800-10	540	0.67	50 acre marsh on site
800-11	549	0.68	10 acre marsh on site

800-12	560	0.70	
800-13	588	0.73	
800-14	544	0.68	
1600-1	477	0.30	Marsh on site, Hilly
1600-2	490	0.31	Small lakes on site
1600-3	1057	0.66	
1600-4	1125	0.70	60 acre marsh on site
1600-5	1182	0.73	

Reservoir Test Sites

Site Name	Surface Area (Acres)	Storage Capacity (Acrefeet)	Acres of Prime Farmland	Acres Prime/MW		
				400 MW	800 MW	1600 MW
Wood Lake	1470	20,000	786	1.96	0.98	0.49
High Bank Lake	1540	24,100	832	2.08	1.04	0.52

Notes: These reservoirs could support plants larger than 1600 MW.

Attachment 2: Prime Farmland Policy Siting Alternatives

There are many alternatives that help reduce the use of prime farmland when siting power plants and reservoirs in highly prime areas. This attachment lists some ways to reduce use of prime farmlands.

1. Conform the site to the local soil patterns so as to use prime farmland for the buffer zone. Site layout is very flexible as is shown in Exhibits 121, 87 and 140.

2. Split the developed portion of the site to make use of nearby pockets of non-prime land. The Kellogg site in Exhibit 121 (page 5.1-6B) has the fuel supply at a separate location to minimize rail access problems. This technique and others like it could be used to reduce use of prime farmlands.

3. Increase the waste storage pond dike to use less land area. The waste storage pond is the largest use of land on the developed portion of the site. Dikes as high as 54 feet are proposed in Exhibit 95, page 4.81. The developed site size in Exhibit 77 (as shown in Table 1 of this Appendix) assumes only 20 feet of depth for the waste storage pond.

4. Reduce the size of the coal storage area and transportation system. By piling the coal higher and designing the rail loop as efficiently as possible, less land area is required for the plant site. Figure 3.2-26A in Exhibit 121 is one example of efficient site layout. Figure 4.1-11A in Exhibit 121 shows extra land inside the rail loop being used for the recycle water pond. Reducing the total amount of land needed for the plant site will reduce the need to use prime farmland for the developed portion of the site.

5. Use alternate disposal techniques for solid waste material. The use of dry scrubber systems as described in Exhibits 95 (page 3-44), 68, 139 and 77 (page 120) results in a waste product containing no moisture. Because the waste has less volume and less weight, it is easier to handle and transport to disposal sites on non-prime farmland.

6. Use areas exempted from the prime farmland policy for power plant sites. The proposed prime farmland policy does not apply to urbanized areas (within 2 miles of cities of the first, second and third class) because these lands are likely to be used for other development. Although sites in these areas may use some prime farmland, they provide incentive for cogeneration or colocation of other industry.

7. Reduce reservoir area by reducing water storage needs. Power plant water demand can be reduced to allow use of smaller storage reservoirs that would use less prime farmland. There are numerous techniques available to reduce water demand. Exhibit 77 section IV describes combination wet and dry cooling systems and dry cooling systems that reduce cooling water needs. Exhibit 60 describes use of sewage water for cooling. District heating and cogeneration systems as described in Exhibit 77 section IX can also reduce the need for cooling water. Use of groundwater and multiple sources of water for cooling is another method to reduce water storage needs.

8. Reduce reservoir area by increasing reservoir depth. Higher reservoir dikes allow equal storage capacity while using less land. Exhibit 121, Table 4.1-2 shows dikes as high as 40 feet for some reservoirs.

9. Locate the reservoir away from the plant site to make use of non-prime farmland. This could result in a longer distance to pipe the water, or streamflow augmentation could be employed (Exhibits 121, 78).

10. Use of multiple reservoirs. Exhibit 121 shows two site proposals that use multiple reservoirs located a few miles apart. Use of multiple reservoirs may help avoid prime farmland in some cases.

11. Use of existing lakes for diked reservoirs. By incorporating existing lakes into reservoirs (Exhibit 121), less prime farmland is likely to be taken.

12. Use of sites that don't require water storage reservoirs. By choosing plant sites near rivers with sufficient flow to supply cooling water, the need for reservoirs is eliminated.