NORTH DAKOTA DEPARTMENT OF HEALTH
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June 20, 2003

FILE

Ms. Dee Rothery
U.S. EPA - Region VIII
One Denver Place
999 18th Street, Suite 300
Denver, CO 80202-2466

Re: FY '02-'03 PPA, Air Quality
Media Workplan, Monitoring,
Item B (Network Review)

Dear Ms. Rothery:

An electronic copy of the referenced review was e-mailed to you June 20, 2003. Due to the uncertainty surrounding the impact of the regional haze rule and what $PM_{2.5}$ monitoring will be required after December 31, 2003, it is not practical for us to consider any major network changes based on these two issues. There is one change that was not included in the 2003 network modification plan: the new site in Lostwood Wildlife Management Refuge. All the basic equipment for the Lostwood site has been ordered and is expected to be operational by September 1, 2003. The additional site previously discussed for TRNP-SU is still in the discussion stage.

40 CFR 58, Appendix D, Section 2.8.1.4, requires North Dakota to have one $PM_{2.5}$ site for every 200,000 people. It also requires "... at least one SLAMS monitor for regional background and at least one SLAMS to monitor regional transport." When the $PM_{2.5}$ network was initially established, Grand Forks Fargo, and Bismarck were identified by Region VIII as the three sites to satisfy that requirement. None of these sites are acceptable for background or regional transport. Therefore, after reviewing the six monitoring objectives and the four sites identified in the network review to satisfy the monitoring objectives, the three sites identified to satisfy the Appendix D requirement are Fargo, Beulah, and TRNP-NU. All three of these sites have a TEOM, in addition to an FRM sampler.

Because the review is based on a calendar year, it does not include any of the network changes we have recently discussed: these changes will be addressed in the 2004 network modification plan and included in next year's network review.

If you have any questions about the review, please contact me by e-mail at dharman@state.nd.us or phone at 701-328-5188.

Sincerely,

Daniel E. Harman
Manager
Air Quality Monitoring
Division of Air Quality

DEH:saj

North Dakota Department of Health
Division of Air Quality

Ambient Air Quality Monitoring
Annual Network Review
2002

May 2002

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1.0 INTRODUCTION

The North Dakota Department of Health, Division of Air Quality, has the primary responsibility of protecting the health and welfare of North Dakotans from the detrimental effects of air pollution. Toward that end, the Division of Air Quality ensures that the ambient air quality in North Dakota is maintained in accordance with the levels established by the state and federal Ambient Air Quality Standards (AAQS) and the Prevention of Significant Deterioration of Air Quality (PSD) Rules. To carry out this responsibility, the Division of Air Quality operates and maintains a network of ambient air quality monitors and requires five major industrial pollution sources to conduct source specific ambient air quality monitoring.

To evaluate the effectiveness of the State's air quality monitoring effort, the U.S. Environmental Protection Agency (EPA) requires the Division of Air Quality to conduct an annual review of the State's ambient air quality monitoring (AAQM) network. EPA's requirements, as set forth in 40 CFR 58.20, are to (1) determine if the system meets the monitoring objectives defined in 40 CFR 58, Appendix D, and (2) identify network modifications such as termination or relocation of unnecessary sites or establishment of new sites which are necessary. 40 CFR 58.25 requires the state to annually develop and implement a schedule to modify the AAQM network to eliminate any unnecessary sites or correct any inadequacies indicated as a result of the annual review required by 40 CFR 58.20(d). This document and subsequent revisions satisfy these annual requirements.

1.1 Network Review Process

The locations of sites in a monitoring program are established to meet certain objectives. The May 10, 1979, Federal Register (40 CFR 58), "Ambient Air Quality Surveillance Regulations," as amended, has specified a minimum of six basic monitoring objectives. These objectives are as follows:

1. *To determine the highest pollutant concentrations expected to occur in an area covered by the network.*

2. *To determine representative concentrations in areas of high population density.*

3. *To determine the impact on ambient pollution levels by a significant source or class of sources.*

4. *To determine the general/background concentration levels.*

5. *To determine the impact on air quality by regional transport.*

6. *To determine Welfare-related impacts.*

The link between basic monitoring objectives and the physical location of a particular monitoring site involves the concept of spatial scale of representativeness. This spatial scale is determined by the physical dimensions of the air parcel nearest a monitoring site throughout which actual pollutant concentrations are reasonably similar. The goal in locating sites is to match the spatial scale represented by the sample of monitored air with a spatial scale most appropriate for the monitoring objective. Spatial scales of representativeness, as specified by EPA, are described as follows:

Microscale - dimensions ranging from several meters up to about 100 meters.

Middle Scale - areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 km.

Neighborhood Scale - city areas of relatively uniform land use with dimensions of 0.5 to 4.0 km.

Urban Scale - overall, city-wide dimensions on the order of 4 to 50 km. (Usually requires more than one site for definition.)

Regional Scale - rural areas of reasonably homogeneous geography covering from 50 km to hundreds of km.

The relationships between monitoring objectives and spatial scales of representativeness, as specified by EPA, are as follows:

Monitoring Objective	Appropriate Siting Scales
Highest Concentration	Micro, middle, neighborhood
Population Exposure	Neighborhood, urban
Source Impact	Micro, middle, neighborhood
General/Background	Urban, regional
Regional Transport	Urban, regional
Welfare-related Impacts	Urban, regional

Recommended scales of representativeness appropriate to the criteria pollutants monitored in North Dakota are shown below:

Criteria Pollutant	Spatial Scales
Inhalable Particulate (PM_{10})	micro, middle, neighborhood, urban, regional
Sulfur Dioxide (SO_2)	middle, neighborhood, urban, regional
Ozone (O_3)	middle, neighborhood, urban, regional
Nitrogen Dioxide (NO_2)	middle, neighborhood, urban
Carbon Monoxide (CO)	micro, middle, neighborhood

Using this physical basis to locate sites allows for an objective approach, ensures compatibility among sites, and provides a common basis for data interpretation and application. The annual review process involves an examination of existing sites to evaluate

their monitoring objectives and spatial scale with sites deleted, added, or modified accordingly. Further details on network design can be found in 40 CFR 58, Appendix D.

1.2 General Monitoring Needs

As can be gathered from the prior discussion, each air pollutant has certain characteristics which must be considered when establishing a monitoring site. These characteristics may result from 1) variations in the number and types of sources and emissions in question; 2) reactivity of a particular pollutant with other constituents in the air; 3) local site influences such as terrain and land use; and 4) climatology. The State AAQM network is designed to monitor air quality data for four basic conditions: 1) background monitoring; 2) population exposure; 3) highest concentration; and; 4) long range transport/regional haze. Industrial AAQM network sites are designed to monitor air quality data for source specific highest concentration impacts on an urban scale. Tribal network sites and data are included in this review even though there is only minimal influence on the network operation.

The primary function of the department's four required sites (see Table 1) are to satisfy the six monitoring objectives. Beulah is source impact and population exposure because of the major sources in the vicinity of Beulah. The site is a combination of a down-wind site and between the city and two major source. Fargo NW is population orientated because Fargo is a major population center with PSD sources in the Fargo-Moorhead area. The data from this site is used as input to dispersion models to evaluate permits-to-construct and permits-to-operate for projects located in or near population centers in the eastern part of the state. Dunn Center is the background site. And, TRNP-NU is the regional transport site. The remaining sites are used to support modeling and/or supplement data collected at the required sites.

Before the next network modification plan is completed in January 2004, the need for several sites/parameter combinations will be reviewed. The current list of existing sites/parameters to be reviewed are Dunn Center continuous $PM_{2.5}$ and Bismarck Residential SO_2 and NO_x. Consideration is being given to opening sites at Lostwood National Wildlife Refuge and TRNP - SU along the eastern boundary of the park. If approved, the sites will have SO_2, NO_x, O_3, continuous PM_{10} and $PM_{2.5}$, WS, WD, Temperature, Delta Temperature, and Solar Radiation.

Background sites are chosen to determine concentrations of air contaminants in areas remote from urban sources and generally are sited using the regional spatial scale. This is true for

NO_2 despite the fact that the regional spatial scale is not normally used for NO_2 monitoring. Once a specific location is selected for a site, monitoring sites are established in accordance with the specific probe siting criteria specified in 40 CFR 58, Appendix E.

Since all industrial AAQM network sites are source specific, all the pollutants at industry sites are source oriented on an urban scale. Industrial sites are initially selected using dispersion modeling results and meteorological data. If a particular location is determined not to be practical due to, for example, inaccessibility or power not reasonably available, then sites in a prevailing wind direction are considered. These sites are the most likely locations to have elevated ambient concentrations. The data collected at the industry-operated sites is included in the data summaries for comparison but not included in any discussion of the State ambient monitoring network needs or analysis. Each industry network is an entity unto itself and does not influence the placement of State operated sites.

The Fort Berthold Indian Reservation operates an ambient air quality monitoring network. Since the Department has influence on neither the operation nor maintenance of the network, the data collected are included only to indicate the presence of the sites and reflects the data sent to the Department. The data validity is not certified by inclusion.

The Fort Totten Indian Reservation is in the process of evaluating the need for an ambient air monitoring network along with what parameters and how many sites may be needed. If they establish a network with acceptable quality assurance, the data will be included in our data summaries.

1.3 Monitoring Objectives

The monitoring objectives of the Department are to track those pollutants that are judged to have the potential for violating either State or Federal Ambient Air Quality Standards and to ensure that those pollutants do not cause significant deterioration of our existing air quality. To accomplish these objectives, the Department operated nine AAQM sites around the State. Seven were SLAMS sites, and two were special purpose monitoring (SPM) sites. There were three industries reporting ambient air quality data to this Department. Table 1 lists each site's type and the parameters monitored. Figure 1 shows the approximate site locations. For the industry networks, each network is represented by a single circle whether there is a single site or multiple sites.

The numbers in the Site Name/Company column in Table 1 and in the '#' column in Tables 2, 5, 7, 9, 13, and 14 correspond to the numbers on the figures. The numbers in the circles correspond to the monitoring site monitoring that pollutant and the squares correspond to the major sources for that particular pollutant.

TABLE 1

AAQM Network Description

Site Name AQS Site #	Type Station	Parameter Monitored[1]	Operating Schedule	Monitoring Objective[2]	Spatial Scale[2]	Date Site/Parameter Began
1 Beulah North 380570004	SLAMS Required	$PM_{2.5}$ SO_2, NO_2, O_3, MET NH_3 cont. $PM_{2.5}$ Air Toxics	6th Day cont. cont. cont. 6th Day	Population Exposure Population Exposure General Background[3] Population Exposure Population Exposure	Neighborhood Neighborhood Regional Neighborhood Neighborhood	12/98 04/80 11/00 10/00 04/99
2 Bismarck Residential 380150003	SLAMS	$PM_{2.5}$ $PM_{2.5}$ Speciation PM_{10}	3rd Day 6th Day 6th Day	Population Exposure	Urban	12/98 1/01 1/01
3 Dunn Center 380250003	SLAMS Required	SO_2, NO_2, O_3, MET	cont.	General Background	Regional	10/79
4 Fargo NW 380171004	SLAMS Required	SO_2, NO_2, O_3, MET cont. $PM_{2.5}$ PM_{10} $PM_{2.5}$ $PM_{2.5}$ Speciation	cont. cont. 3rd Day 3rd Day 3rd Day	Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure	Urban Urban Urban Urban Urban	05/98 7/00 05/98 12/98 7/01
5 Hannover 380650002	SLAMS	SO_2, NO_2, O_3, MET	cont.	General Background	Regional	10/84
6 Mandan Refinery - SPM 380590002	SPM	SO_2, MET	cont.	Source Impact	Neighborhood	12/95
7 Mandan Refinery NW - SPM 380590003	SPM	SO_2, MET	cont.	Source Impact	Neighborhood	09/98
8 TRNP - NU 380530002	SLAMS Required	SO_2, NO_2, O_3, MET cont. $PM_{2.5}$ PM_{10} $PM_{2.5}$ $PM_{2.5}$ Speciation	cont. cont. 6th Day 6th Day 6th Day	Long range Transport	Regional	8/01
9 TRNP - SU 380070002	SLAMS	SO_2, O_3 MET $PM_{2.5}$	cont. 6th Day	General Background	Regional	07/98 6/00
Tribal	**Site Name** AQS Site #					
10 Three Affiliated Tribes	Dragswolf 380530108	PM_{10} MET	6th Day cont.	General Background	Urban	05/90
11 Three affiliated Tribes	White Shield 380550113	SO_2 PM_{10} MET	cont. 6th Day cont.	Source Impact Source Impact	Urban Urban	07/90
Company	**Site Name** AQS Site #					
12 Amerada Hess Corporation	TIOGA #1 381050103 TIOGA #3 381050105	SO_2 SO_2	cont. cont.	Source Impact Source Impact	Urban Urban	07/87 11/87
13 Bear Paw Energy, Inc.	MGP #3 380530104 MGP #5 380530111	SO_2, MET SO_2, MET	cont. cont.	Source Impact Source Impact	Urban Urban	11/94 05/94
14 Dakota Gasification Company	DGC #12 380570102 DGC #14 380570118 DGC #16 380570123 DGC #17 380570124	SO_2, NO_2, MET SO_2 SO_2 SO_2, NO_2	cont. cont. cont. cont.	Source Impact Source Impact Source Impact Source Impact	Urban Urban Urban Urban	01/80 01/89 10/95 10/95

1. MET refers to meteorological and indicates wind speed and wind direction monitoring equipment.
2. Not applicable to MET.
3. This analyzer will serve a duel role of population exposure and general background

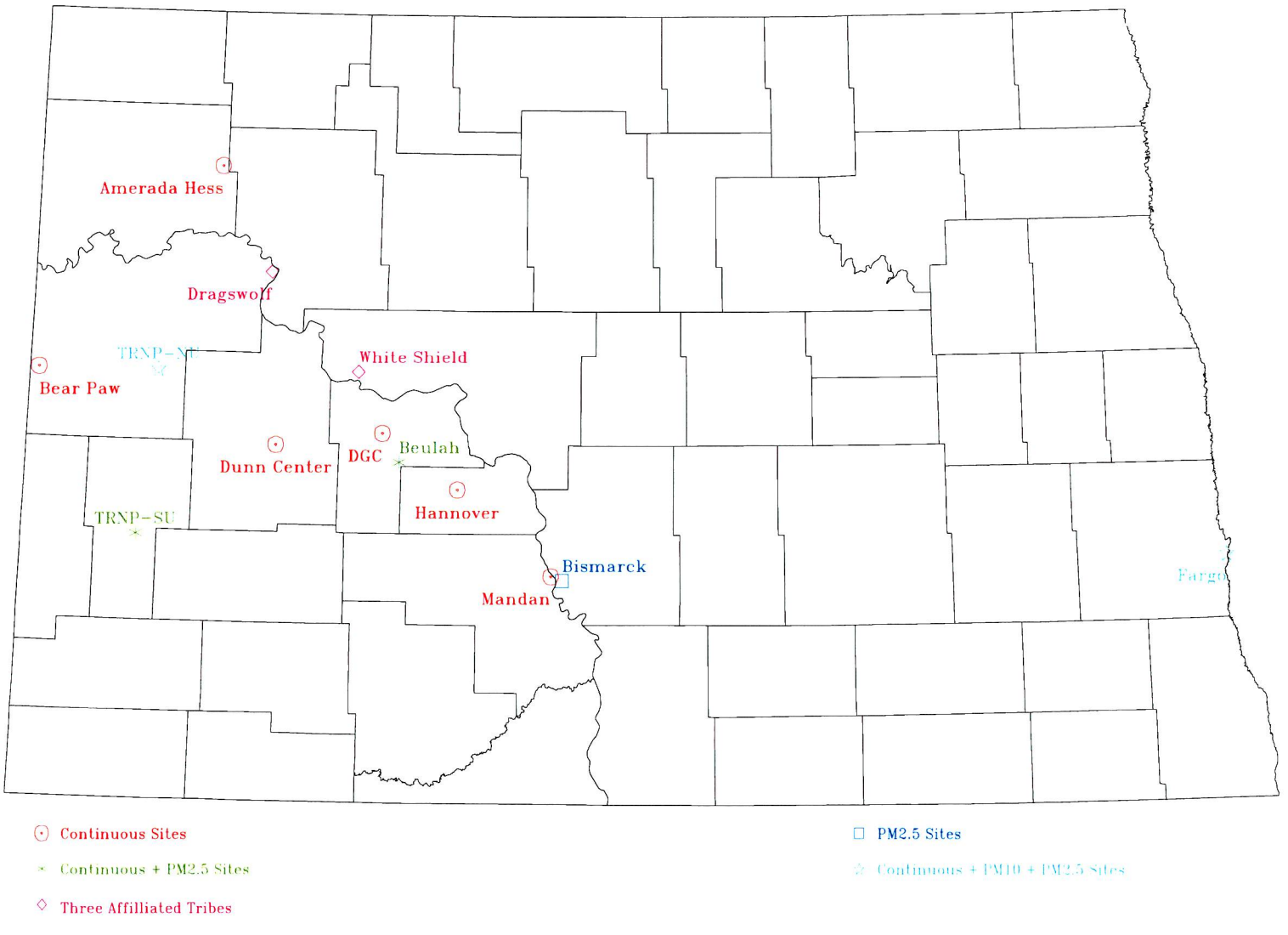

Figure 1 North Dakota Ambient Air Quality Monitoring Sites

2.0 AMBIENT AIR MONITORING NETWORK COVERAGE

The state of North Dakota is attainment for all criteria pollutants. As such, there are no "problem areas" in the general sense of the term. However, there are areas of concern where the Department has established monitoring sites to track the emissions of specific pollutants from point sources. Also, three major sources maintained monitoring networks in the vicinity of their plants (see Table 1 and Figure 1).

2.1 Sulfur Dioxide

Energy development in the west and west-central portions of North Dakota has produced a number of sources of sulfur dioxide (SO_2). These sources include coal-fired steam-powered electrical generating facilities, a coal gasification plant, natural gas processing plants, an oil refinery, and flaring at oil/gas well sites. As a result, SO_2 is one of the Department's major concerns in regard to ambient air quality monitoring.

2.1.1 Point Sources

The major SO_2 point sources (>100 TPY) are listed in Table 2 along with their emissions from the emissions inventories reported to the Department. Figure 2 shows the approximate locations of these facilities (the numbers correspond to the site and source tables). Figure 2A shows the contribution of point sources to the total SO_2 emissions.

2.1.2 Other Sources

The western part of the State has a number of potential SO_2 sources associated with the development of oil and gas. These sources include individual oil/gas wells, oil storage facilities, and compressor stations. Emissions from such sources can create two problems. First, these sources may directly emit significant amounts of hydrogen sulfide (H_2S) to the ambient air (see Section 2.7). Second, flaring the H_2S from these sources can create significant concentrations of SO_2 in the ambient air. The primary counties for these sources in western North Dakota are outlined in green on Figure 2. Figure 2A shows the contribution of "Other Point Sources" that consists of DGC, refineries, gas processing plants, and agriculture processing plants.

TABLE 2

Major SO_2 Sources

(>100 TPY)

2002

#	Company	Source	County	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Basin Electric Power Cooperative	Leland Olds Station	Mercer	47399	30.29%	3805700001
2	Minnkota Power Cooperative, Inc.	M R Young Station	Oliver	28565	18.25%	3806500001
3	Great River Energy	Coal Creek Station	McLean	24428	15.61%	3805500017
4	Otter Tail Power Company	Coyote	Mercer	14073	8.99%	3805700012
5	Basin Electric Power Cooperative	Antelope Valley Station	Mercer	13863	8.86%	3805700011
6	Great River Energy	Stanton Station	Mercer	9648	6.17%	3805700004
7	Dakota Gasification Co.	Plant	Mercer	6264	4.00%	3805700013
8	Tesoro Refining and Marketing Company	Refinery	Morton	4592	2.93%	3805900003
9	Montana Dakota Utilities Co.	RM Heskett Station	Morton	2811	1.80%	3805900001
10	Amerada Hess Corporation	Tioga Gas Plant	Williams	1605	1.03%	3810500004
11	University of North Dakota	Heating Plant & Incinerator (HMIWI)	Grand Forks	641	0.41%	3803500003
12	American Crystal Sugar	Drayton Plant	Pembina	503	0.32%	3806700003
13	American Crystal Sugar	Hillsboro Plant	Traill	479	0.31%	3809700019
14	Bear Paw Energy,LLC	Lignite Gas Plant	Burke	426	0.27%	3801300071
15	North Dakota State University	Heating Plant	Cass	338	0.22%	3801700005
16	Petro-Hunt, LLC	Little Knife Gas Plant	Billings	283	0.18%	3800700002
17	ADM Corn Processing - Walhalla	Ethanol Plant	Pembina	220	0.14%	3806700004
18	Bear Paw Energy,LLC	Grasslands Plant	McKenzie	199	0.13%	3805300023
19	Minn-Dak Farmers Cooperative	Wahpeton Plant	Richland	149	0.10%	3807700026

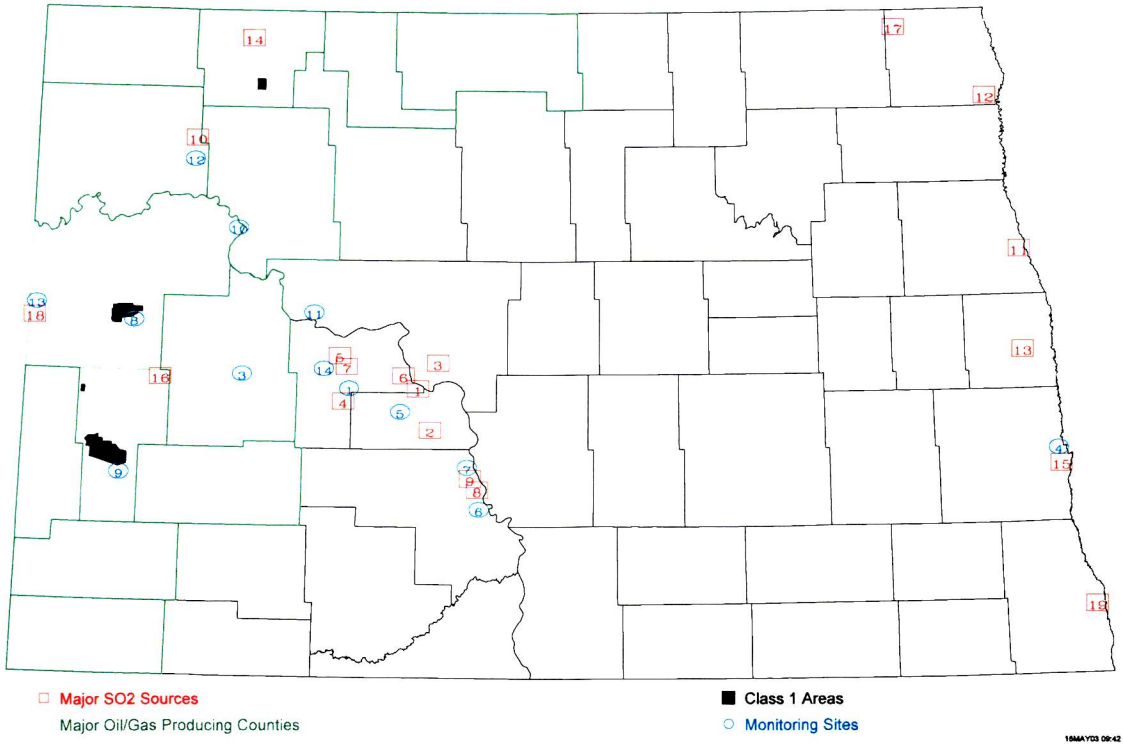

Figure 2 Major Sulfur Dioxide Sources

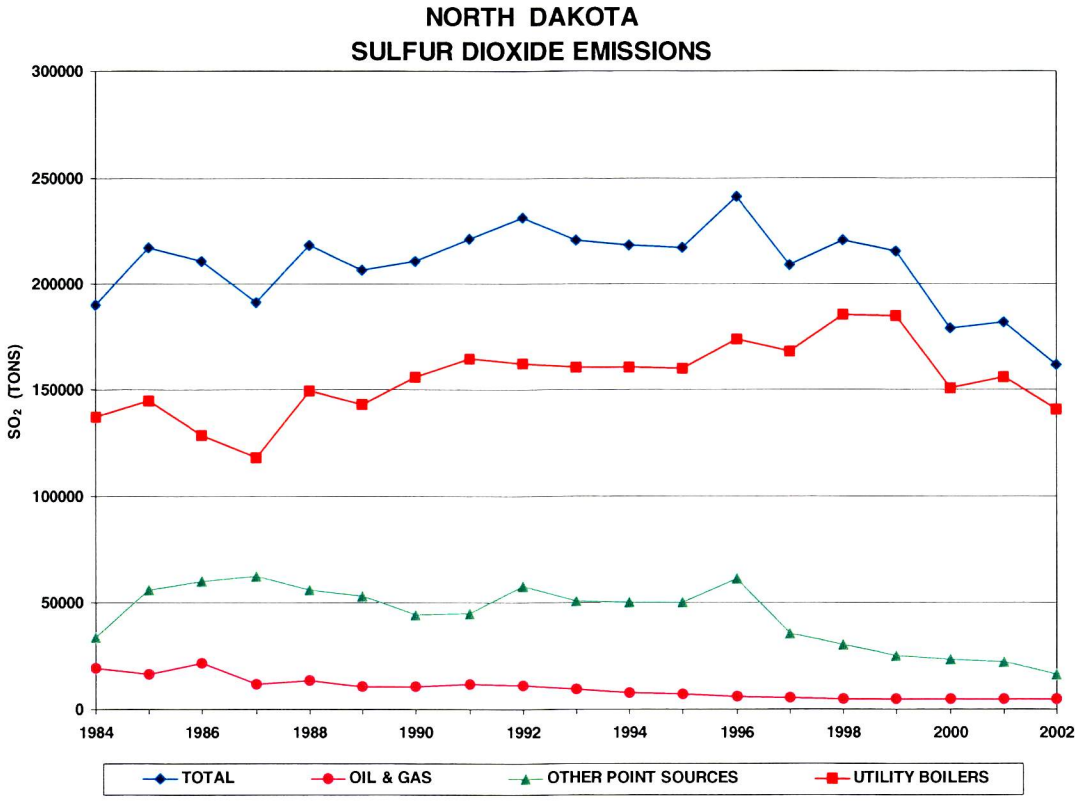

Figure 2A Annual Sulfur Dioxide Emissions

2.1.3 Monitoring Network

The SO_2 monitoring sites are shown on Figure 2. As can be seen, these monitoring sites are concentrated in the vicinity of the oil and gas development in the west and the coal-fired steam electrical generating plants in the central part of the State. Table 3 shows the 2002 annual SO_2 data summaries; Table 4 shows the 5-minute data summary. There were no exceedances of either state or federal SO_2 standards.

2.1.4 Network Analysis

The nine largest SO_2 sources in the state are within 45 miles of both the Beulah and Hannover sites. This makes these two sites very important in tracking the impact of these ten sources on the ambient air. One would expect that as the large sources came on line, beginning in 1980, a noticeable change would be seen on the ambient air quality. This has not been the case. There have been possible short term influences, but no significant long term impact by these ten sources combined. Figures 3, 4, 5, and 6, present a 23-year view of the percentage of data greater than the minimum detectable value (MDV), 1-hour maximums, 3-hour maximums, and 24-hour maximums, for the state operated sites. Because the industry sites are sited specifically for maximum expected concentrations (primarily as predicted by dispersion models and secondarily in a downwind direction), the industry sites are not reviewed for particular long term trends.

The best long term indicator of any change in the amount of SO_2 in the ambient air is seen by reviewing the percentages of data points greater than the MDV. Figure 3 presents this data for the active state sites from 1980 through 2001. To calculate valid annual statistics, at least 75% of the data must be greater than the MDV. Therefore, the annual mean is not a valid indicator and, consequently, not addressed.

TABLE 3

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Sulfur Dioxide (PPB)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMA 1-HOUR 1ST MM/DD:HH	MAXIMA 1-HOUR 2ND MM/DD:HH	MAXIMA 3-HOUR 1ST MM/DD:HH	MAXIMA 3-HOUR 2ND MM/DD:HH	MAXIMA 24-HOUR 1ST MM/DD	MAXIMA 24-HOUR 2ND MM/DD	ARITH MEAN	1HR #>273	24HR #>99	% >MDV
Amerada Hess - Tioga #1	2002	JAN-DEC	8652	140 10/24:02	134 10/25:03	85 10/24:02	72 10/24:05	47 10/24	15 10/23	1.7			11.4
Amerada Hess - Tioga #3	2002	JAN-DEC	8510	118 10/22:06	115 12/18:12	82 10/29:17	73 12/18:14	20 12/18	19 01/13	2.9			18.8
Bear Paw - MGP #3	2002	JAN-DEC	8463	100 04/04:13	54 06/29:17	42 04/04:14	26 06/29:17	7 04/04	6 09/24	1.2			4.6
Bear Paw - MGP #5	2002	JAN-DEC	8686	77 05/17:08	66 06/27:09	27 05/17:08	25 06/22:14	7 06/27	5 06/22	1.2			7.7
Beulah - North	2002	JAN-DEC	8702	131 06/18:14	101 06/18:15	52 06/18:14	44 02/20:20	16 02/20	14 02/14	1.7			17.6
DGC #12	2002	JAN-DEC	8678	76 02/12:06	51 02/20:17	38 02/12:08	31 02/20:20	13 02/20	8 02/12	1.9			22.9
DGC #14	2002	JAN-DEC	8659	68 02/13:09	63 06/20:10	31 01/08:11	28 01/08:05	13 01/08	11 02/13	1.7			14.9
DGC #16	2002	JAN-DEC	8688	62 05/21:04	60 06/17:09	48 05/21:05	40 06/17:11	18 05/21	12 02/20	1.9			16.6
DGC #17	2002	JAN-DEC	8651	110 06/17:10	86 06/22:01	70 06/21:11	54 06/17:11	18 06/21	10 06/17	1.9			24.6
Dunn Center	2002	JAN-DEC	8695	23 01/26:11	21 01/28:11	12 01/26:11	11 04/05:11	3 01/26	3 01/28	1.2			8.1
Fargo NW	2002	JAN-DEC	8479	6 06/16:23	6 12/25:03	6 12/25:05	4 03/10:20	3 12/25	2 02/01	1.0			2.7
Hannover	2002	JAN-DEC	8693	77 07/24:16	67 07/30:08	49 07/24:14	47 07/24:17	14 07/24	10 07/30	1.9			20.3
Mandan - SPM	2002	JAN-DEC	8704	133 02/25:23	125 09/19:05	96 05/03:20	94 01/11:23	33 04/02	32 02/26	4.8			36.1
Mandan NW - SPM	2002	JAN-DEC	8361	100 05/20:21	91 05/20:22	73 05/20:23	63 04/06:02	19 05/20	14 04/06	3.1			34.7
TRNP - NU	2002	JAN-DEC	8700	13 03/14:11	12 03/07:01	9 03/14:11	9 03/14:14	3 03/07	3 03/14	1.1			5.4
TRNP - SU (Painted Canyon)	2002	JAN-DEC	8703	26 10/10:14	15 01/26:16	10 01/26:17	9 10/10:14	5 09/05	3 01/26	1.2			9.8
White Shield	2002	JAN-DEC	8693	37 06/17:13	32 05/07:09	20 06/17:14	19 02/20:17	6 03/11	5 02/20	1.3			10.2

The maximum 1-hour concentration is 140 ppb at Amerada Hess - Tioga #1 on 10/24:02
The maximum 3-hour concentration is 96 ppb at Mandan - SPM on 05/03:20
The maximum 24-hour concentration is 47 ppb at Amerada Hess - Tioga #1 on 10/24

* The air quality standards are:
STATE Standards -
1) 273 ppb maximum 1-hour average concentration.
2) 99 ppb maximum 24-hour average concentration.
3) 23 ppb maximum annual arithmetic mean concentration.

FEDERAL Standards -
1) 500 ppb maximum 3-hour concentration not to be exceeded more than once per year.
2) 140 ppb maximum 24-hour concentration not to be exceeded more than once per year.
3) 30 ppb annual arithmetic mean.

TABLE 4

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : SO_2 5-Minute Averages (ppb)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	5-MINUTE MAXIMA 1ST	DATE MM/DD:HH	2ND	DATE MM/DD:HH	3RD	DATE MM/DD:HH	# HOURS >600	% >MDV
Amerada Hess - Tioga #1	2002	JAN-DEC	8652	301	10/24:00	273	10/25:01	249	10/24:02	0	16.9
Amerada Hess - Tioga #3	2002	JAN-DEC	8510	302	10/22:11	280	10/22:06	271	10/29:17	0	31.1
Bear Paw - MGP #3	2002	JAN-DEC	8463	284	03/29:17	227	03/29:12	221	06/23:12	0	11.3
Bear Paw - MGP #5	2002	JAN-DEC	8686	360	06/27:08	283	05/17:08	255	06/27:09	0	16.6
Beulah - North	2002	JAN-DEC	8702	274	06/18:14	221	06/18:15	152	02/14:13	0	26.9
Dunn Center	2002	JAN-DEC	8697	41	01/26:11	35	01/26:12	25	10/21:15	0	15.3
Fargo NW	2002	JAN-DEC	8479	17	02/11:16	12	06/16:23	10	03/26:08	0	6.3
Hannover	2002	JAN-DEC	8693	137	07/18:09	123	07/30:07	105	02/08:22	0	31.3
Mandan - SPM	2002	JAN-DEC	8704	207	09/19:05	191	09/19:04	185	05/03:19	0	47.2
Mandan NW - SPM	2002	JAN-DEC	8361	208	02/17:09	168	06/17:08	164	08/25:09	0	48.2
TRNP - NU	2002	JAN-DEC	8700	18	03/14:11	17	03/07:01	15	10/29:10	0	9.5
TRNP - SU (Painted Canyon)	2002	JAN-DEC	8703	53	10/10:14	32	10/10:15	25	10/09:09	0	16.4

The maximum 5-minute concentration is 360 ppb at Bear Paw - MGP #5 on 06/27:08

* No Standard is currently in effect:

Beginning in 1980, major events are easily traceable. In 1980, the oil industry was expanding. In 1981, MDU's Coyote Power Station began operation. In 1982 the oil industry in western North Dakota hit its peak activity. 1983, 1984, and 1985 were startup years for Basin Electric's Antelope Valley Unit #1, the synthetic natural gas plant (aka, Dakota Gasification Company), and Antelope Valley Unit #2, respectively. From 1987 through 1993, for the Beulah and Hannover sites, there was a steady increasing trend in the percentage of data greater than the MDV. However, Hannover showed a decrease from 1993 to 1997 while Beulah continued to increase until 1997. The Beulah - N site began operation in 1998 and has shown a decreasing trend in percentage detectable.

The same patterns seen in Figure 3 are discernable in the 1-hour, 3-hour, and 24-hour maximum concentration graphs (see Figures 4, 5, and 6, respectively). As can be seen from the graphs, in 1998, the Mandan Refinery - SPM site exceeded the state and nearly the Federal 24-hour standard (see Figure 6): The 24-hour average was 143 ppb.

Because the newer sites (Fargo NW, Mandan Refinery - SPM, Mandan Refinery NW - SPM, and TRNP - SU) have a limited amount of data, no attempt is made to evaluate the results.

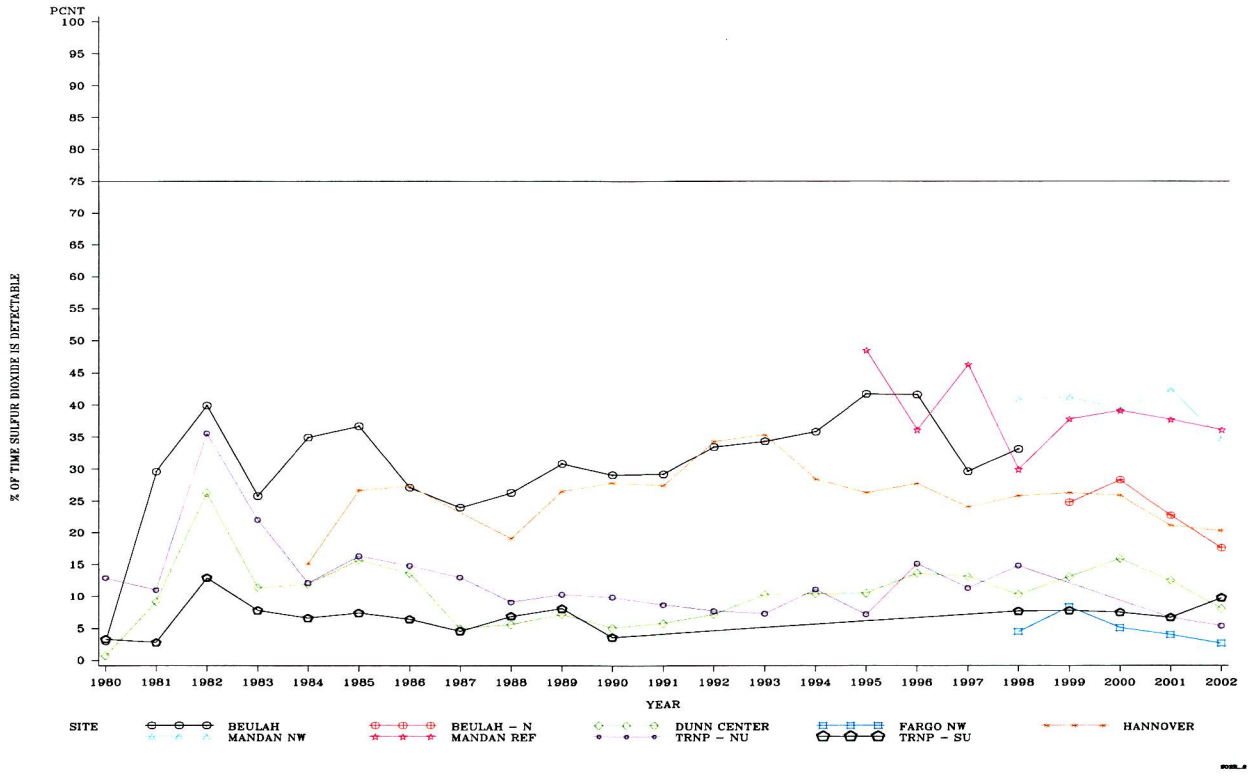

Figure 3 Percentage of Time SO_2 Detectable

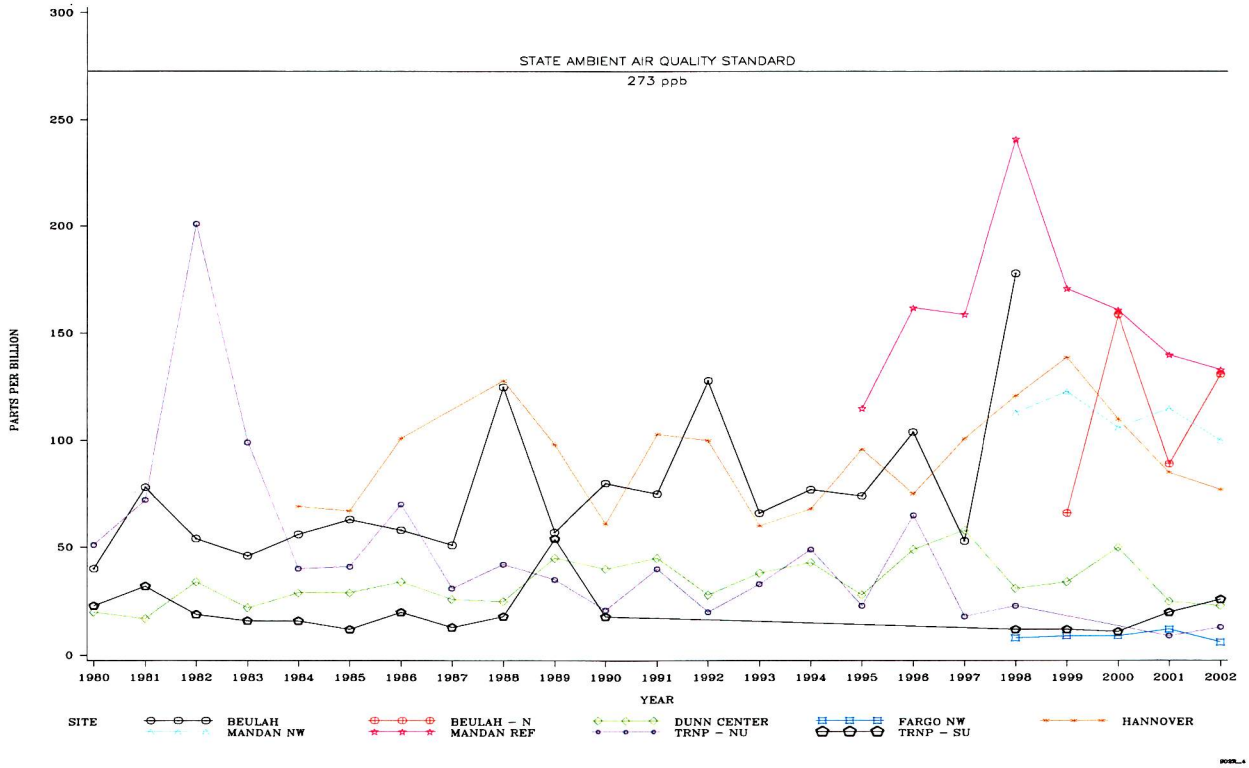

Figure 4 SO_2 Maximum 1-Hour Concentrations

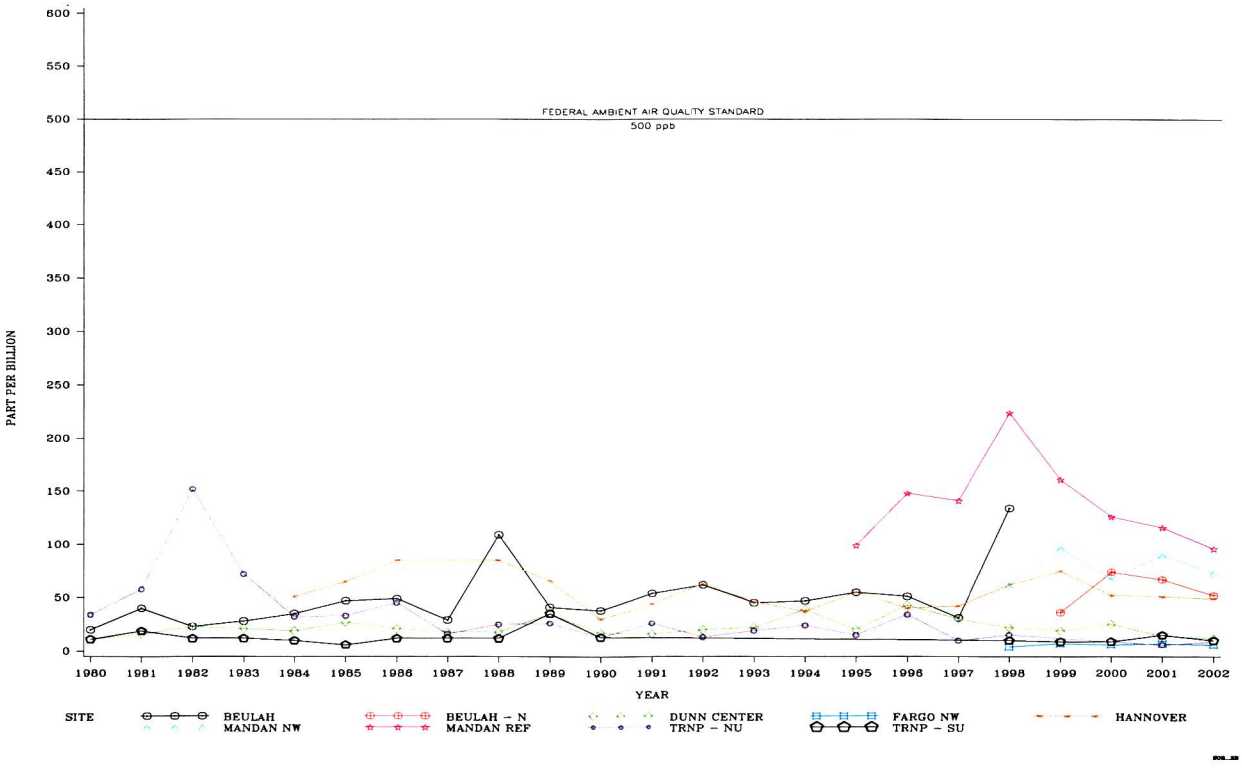

Figure 5 SO_2 Maximum 3-Hour Concentrations

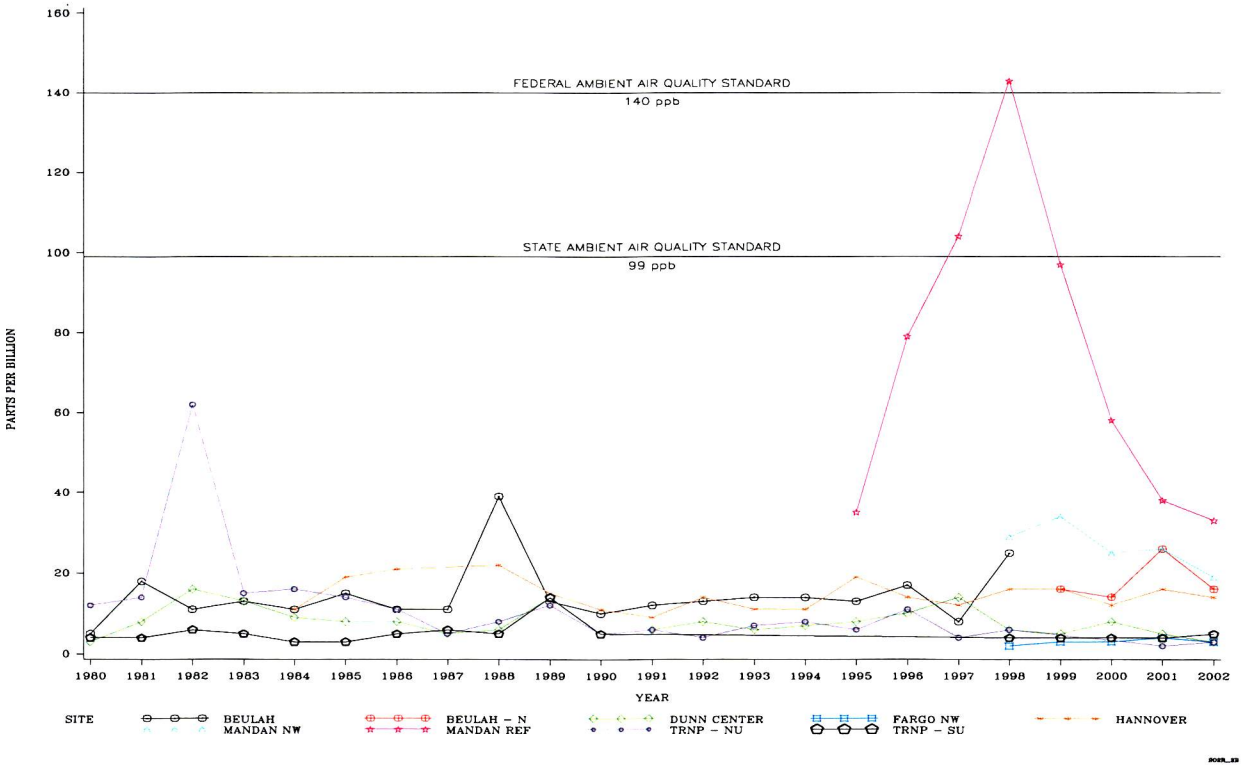

Figure 6 SO_2 Maximum 24-Hour Concentrations

2.2 Oxides of Nitrogen

Oxides of Nitrogen (NO_x) is the term used to represent both nitric oxide (NO) and nitrogen dioxide (NO_2). NO_2 is formed when NO is oxidized in the ambient air. There are no ambient air quality standards for NO.

2.2.1 Point Sources

The major NO_x stationary point sources (>100 TPY) are listed in Table 5 along with their emissions as calculated from the most recent emission inventories reported to the department. Figure 7 shows the approximate locations of these facilities (the numbers correspond to the site and source tables). The larger NO_x point sources in North Dakota are associated with coal-fired steam-powered electrical generating plants in the west-central portion of the State and large internal combustion compressor engines in the natural gas fields in the western part of the State. Figure 7A shows the contribution of point sources to the total NO_2 emissions. The "Point Sources"category consists of Utility Boilers (power plant boilers) and oil and gas wells.

2.2.2 Area Sources

Another source of NO_X is automobile emissions. North Dakota has no significant urbanized areas with regard to oxides of nitrogen; the entire population of the State is less than the 1,000,000 population figure that EPA specifies in the NO_2 requirement for NAMS monitoring. Figure 7A shows the contribution of "Other Point Sources" and "Utility Boilers." The "Other Point Sources" category consists of DGC, refineries, gas processing plants, and agriculture processing plants.

2.2.3 Monitoring Network

The Department currently operates five $NO/NO_2/NO_x$ analyzers. These are located at Beulah, Dunn Center, Fargo, Hannover, and TRNP - NU. The Dakota Gasification Company (DGC) network also operates analyzers at sites DGC #12 and DGC #17. Table 6 shows the 2002 NO_2 data summaries. The measured NO_2 values are quite low, particularly the annual means. From Figure 7 it can be seen that $NO/NO_2/NO_x$ analyzers, except for Dunn Center and TRNP - NU, are well placed with respect to the major NO_x sources: Dunn Center and TRNP - NU are defined as a background site and long range transport/regional haze, respectively.

TABLE 5

Major NO_x Sources
(> 100 TPY)

2002

#	Company	Source	County	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Minnkota Power Cooperative, Inc.	M R Young Station	Oliver	22738	26.68%	3806500020
2	Basin Electric Power Cooperative	Leland Olds Station	Mercer	13647	16.01%	3805700001
3	Otter Tail Power Company	Coyote	Mercer	13041	15.30%	3805700012
4	Basin Electric Power Cooperative	Antelope Valley Station	Mercer	11627	13.64%	3805700011
5	Great River Energy	Coal Creek Station	McLean	10147	11.91%	3805500017
6	Dakota Gasification Co.	Plant	Mercer	3523	4.13%	3805700013
7	Great River Energy	Stanton Station	Mercer	3101	3.64%	3805700004
8	Amerada Hess Corporation	Tioga Gas Plant	Williams	2316	2.72%	3810500004
9	Montana Dakota Utilities Co.	RM Heskett Station	Morton	1068	1.25%	3805900001
10	Tesoro Refining and Marketing Co.	Refinery	Morton	864	1.01%	3805900003
11	American Crystal Sugar	Hillsboro Plant	Traill	460	0.54%	3809700019
12	American Crystal Sugar	Drayton Plant	Pembina	435	0.51%	3806700003
13	Minn-Dak Farmers Cooperative	Wahpeton Plant	Richland	390	0.46%	3807700026
14	University of North Dakota	Heating Plant & Incinerator (HMIWI)	Grand Forks	229	0.27%	3803500003
15	Cavalier AFS	Power Plant	Pembina	196	0.23%	3806700005
16	Bear Paw Energy,LLC	Lignite Gas Plant	Burke	181	0.21%	3801300071
17	Williston Basin Interstate Pipeline Co.	Dickinson Compressor	Stark	180	0.21%	3808900004
18	Northern Border Pipeline Co.	Station #4	McKenzie	172	0.20%	3805300014
19	Amerada Hess Corporation	Antelope Plant No. 2	McKenzie	168	0.20%	3805300045
20	Bear Paw Energy,LLC	Alexander	McKenzie	165	0.19%	3805300024
21	North Dakota State University	Heating Plant	Cass	142	0.17%	3801700005
22	ADM Corn Processing	Ethanol Plant	Pembina	128	0.15%	3806700004
23	Northern Border Pipeline Co.	Station #8	McIntosh	105	0.12%	3805100001
24	Northern Border Pipeline Co.	Station #6	Morton	101	0.12%	3805900007
25	Northern Border Pipeline Co.	Station #5	Dunn	100	0.12%	3802500014

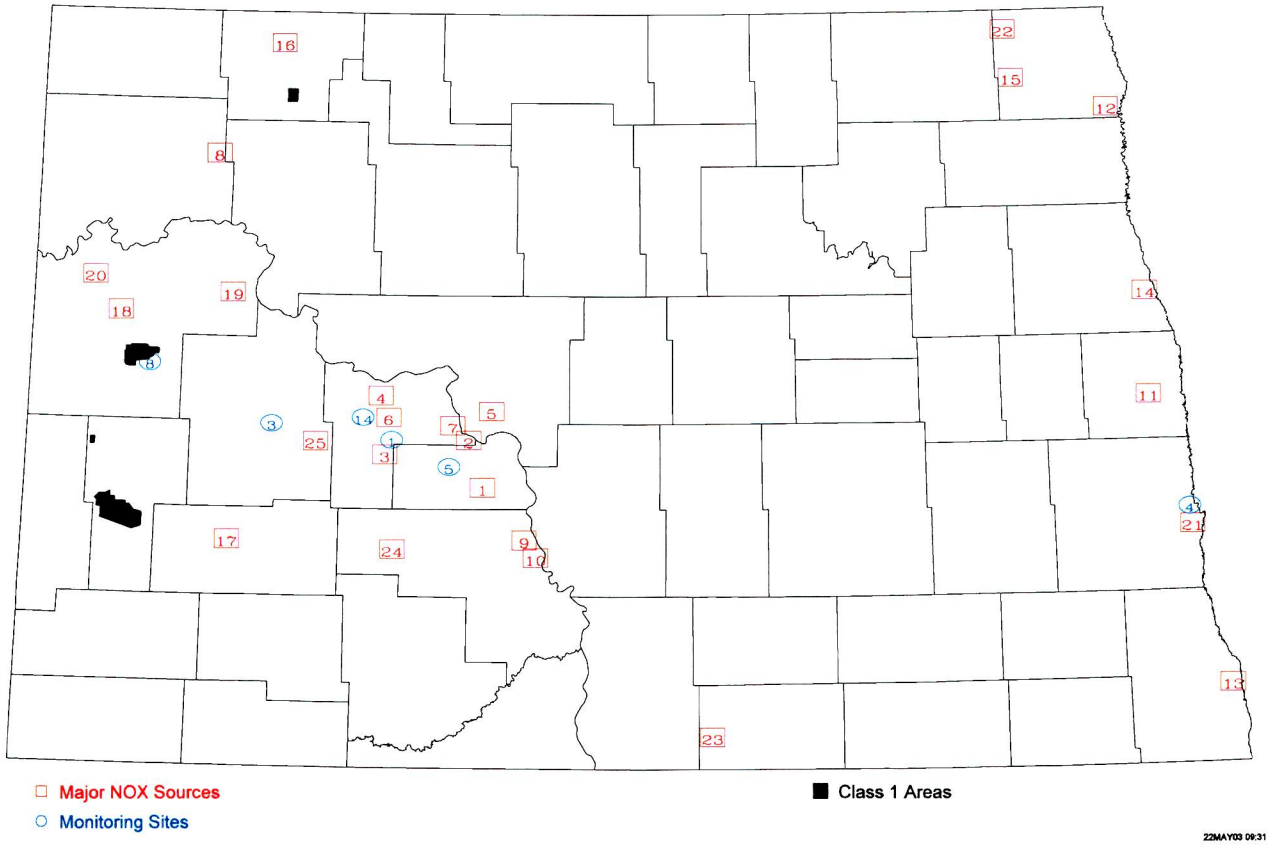

Figure 7 Major Nitrogen Dioxide Sources

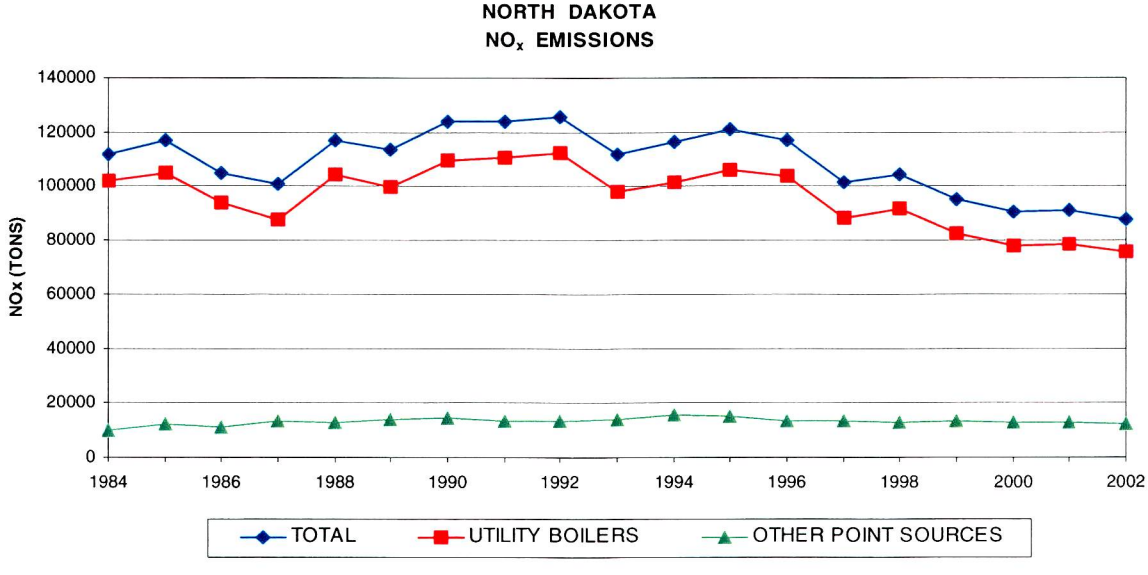

Figure 7A Annual Nitrogen Dioxide Emissions

TABLE 6

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Nitrogen Dioxide (PPB)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMA 1 - HOUR 1ST MM/DD:HH	MAXIMA 1 - HOUR 2ND MM/DD:HH	ARITH MEAN	% >MDV
Beulah - North	2002	JAN-DEC	8478	34 01/31:22	34 02/20:17	3.0	72.5
DGC #12	2002	JAN-DEC	8504	30 01/31:20	30 01/31:21	2.8	64.5
DGC #17	2002	JAN-DEC	8607	29 08/05:22	28 02/03:17	2.3	53.5
Dunn Center	2002	JAN-DEC	8674	18 06/18:12	12 06/28:21	1.7	36.8
Fargo NW	2002	JAN-DEC	8439	37 09/26:18	36 02/01:19	5.6	82.4
Hannover	2002	JAN-DEC	7980	27 12/24:03	26 06/20:22	2.3	52.9
TRNP - NU	2002	JAN-DEC	8679	9 03/14:13	8 03/07:04	1.3	18.8

The maximum 1-hour concentration is 37 ppb at Fargo NW on 09/26:18

* The air quality standards are:
STATE - 53 ppb maximum annual arithmetic mean.

FEDERAL - 53 ppb annual arithmetic mean.

2.2.4 Network Analysis

Nine of the ten largest NO_2 sources in the state are within 45 miles of the Beulah and Hannover monitoring sites. Figures 8 and 9 show the trends for the state operated sites for 1980 - 2002. Since the industry operated sites are placed for maximum concentrations, trends are not considered.

With the exception of Beulah in 1981, the percentage of data greater than the MDV, shown in Figure 8, was reasonably stable until 1993. The significant increase in the percentage of detectable concentrations is contrary to the quantity of NO_2 emitted. In Figure 7A show an increasing, but slow, trend in NO2 emissions from 1980 until 1993. From 1994 until present, there has been a decreasing trend in NO2 emissions. A possible explanation for Hannover is the analyzer was changed in March 1992 from a Meloy 8101C to a TECO 42. However, the analyzer change did not produce a discreet jump: the increase was seen at both the Beulah and Hannover sites. A possible conclusion is the increase in detectable NO_2 concentrations is real and not the result of equipment changes. Another possibility, and more likely, is a change in the wind flow patterns. In 2000, Hannover was the only site that had a decrease in the number of hourly averages less than the minimum detectable value. Fargo NW is the only State site with more then 75% of the possible values greater then the MDV.

If the 1-hour maximum concentrations had followed a pattern similar to the one shown in Figure 8, the equipment change could have accounted for the increase in the percentage of data greater than the MDV. However, the 1-hour maximums, shown in Figure 9, have shown an overall decrease. Since Beulah - N, TRNP-NU, and Dunn Center are relatively new sites, no valid trending is possible.

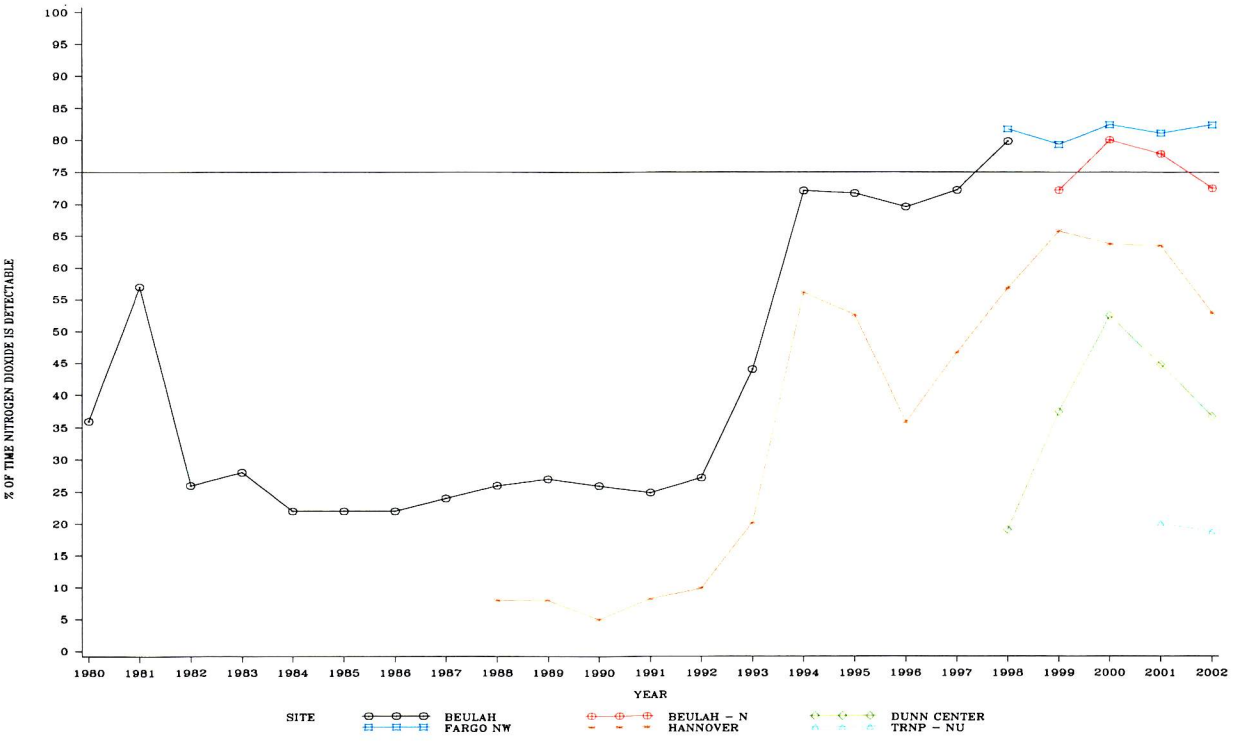

Figure 8 Percentage of Time NO_2 Detectable

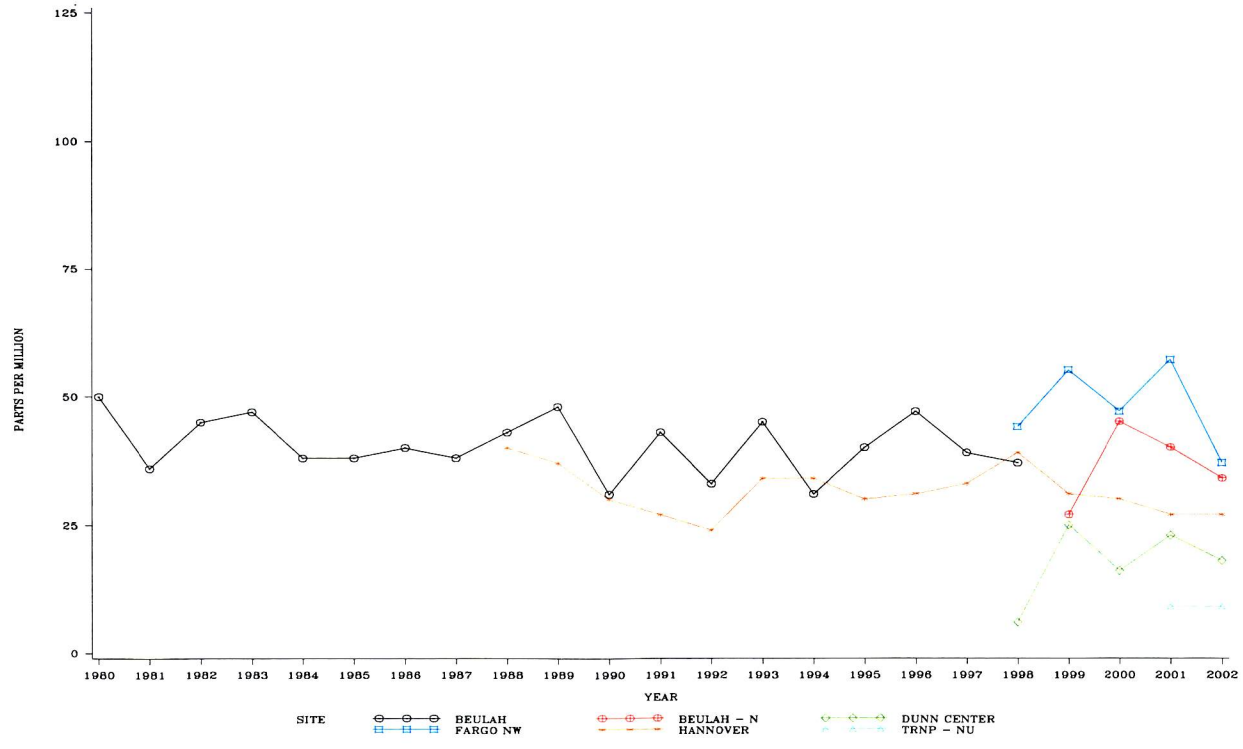

Figure 9 NO_2 Maximum 1-Hour Concentrations

2.3 Ozone

Unlike most other pollutants, ozone (O_3) is not emitted directly into the atmosphere but results from a complex photochemical reaction between volatile organic compounds (VOC), oxides of nitrogen (NO_x), and solar radiation. Both VOC and NO_x are emitted directly into the atmosphere from sources within the State. Since solar radiation is a major factor in O_3 production, O_3 concentrations are known to peak in summer months. 40 CFR 58 defines the O_3 monitoring season for North Dakota as May 1 through September 30. However, O_3 analyzers at all sites collect data year round for use in dispersion modeling.

2.3.1 Point Sources

The major stationary point sources (> 100 TPY) of VOC, as calculated from the most recent emission inventories reported to the Department, are listed in Table 7. Figure 10 shows the approximate locations of these facilities.

2.3.2 Area Sources

Point sources contribute only part of the total VOC and NO_x emissions. The remaining emissions are attributed to mobile sources in urban areas. The EPA has specified a design criteria for selecting NAMS locations for O_3 as any urbanized area having a population of more than 200,000. North Dakota has no urbanized areas large enough to warrant population-oriented monitoring.

TABLE 7

Major VOC Sources
(> 100 TPY)

2002

#	Company	Source	County	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Northern Sun (Division of ADM)	Oil Seed Processing	Ransom	298	16.37%	3807300001
2	Dakota Gasification Co.	Plant	Mercer	295	16.21%	3805700013
3	Minnkota Power Cooperative, Inc.	M R Young Station	Oliver	241	13.24%	3806500020
4	Kaneb Pipe Line Operating Partnership, L.P.	Jamestown Products Terminal	Stutsman	185	10.16%	3809300037
5	Tesoro Refining and Marketing Company	Refinery	Morton	161	8.85%	3805900003
6	Great River Energy	Coal Creek Station	McLean	153	8.41%	3805500017
7	Otter Tail Power Company	Coyote	Mercer	139	7.64%	3805700012
8	ADM Corn Processing	Ethanol Plant	Pembina	130	7.14%	3806700004
9	Basin Electric Power Cooperative	Leland Olds Station	Mercer	111	6.10%	3805700001
10	Basin Electric Power Cooperative	Antelope Valley Station	Mercer	107	5.88%	3805700011

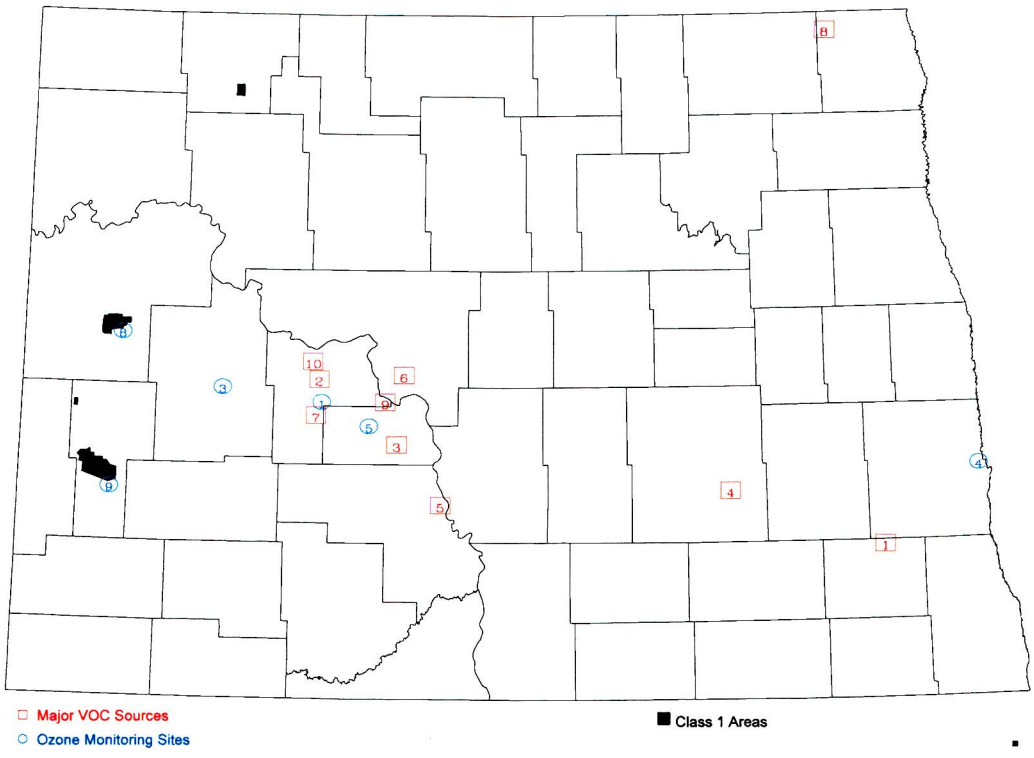

Figure 10 Major VOC Sources

TABLE 8

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Ozone (PPB)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMA 1 - HOUR 1ST MM/DD:HH	MAXIMA 1 - HOUR 2ND MM/DD:HH	MAXIMA 8 - HOUR 1ST MM/DD:HH	MAXIMA 8 - HOUR 2ND MM/DD:HH	MAXIMA 8 - HOUR 3RD MM/DD:HH	MAXIMA 8 - HOUR 4TH MM/DD:HH	1HR #>120	8HR #>80
Beulah - North	2002	JAN-DEC	8709	76 06/28:15	75 06/29:14	68 06/28:10	68 06/29:09	65 05/31:10	65 06/01:09		
Dunn Center	2002	JAN-DEC	8715	70 07/04:15	65 06/01:11	62 06/01:08	61 05/31:08	60 05/21:13	58 04/01:10		
Fargo NW	2002	JAN-DEC	7814	71 06/29:14	67 05/27:14	67 06/29:12	64 05/27:10	62 06/28:11	62 09/01:09		
Hannover	2002	JAN-DEC	8700	69 06/28:14	68 06/26:12	61 06/28:09	61 06/29:09	59 08/07:09	58 05/31:10		
TRNP - NU	2002	JAN-DEC	8706	71 07/04:14	68 06/29:12	63 07/04:11	63 07/19:10	62 06/01:09	60 05/31:09		
TRNP - SU (Painted Canyon)	2002	JAN-DEC	8711	72 06/28:17	70 07/01:13	67 06/28:11	66 07/04:11	63 07/19:09	62 06/29:09		

The maximum 1-hour concentration is 76 ppb at Beulah - North on 06/28:15
The 4th highest 8-hour concentration is 65 ppb at Beulah - North on 06/01:09

* The air quality standards for ozone are:
STATE - 120 ppb not to be exceeded more than once per year.

FEDERAL Standards -
1) 120 ppb maximum 1-hour concentration with no more than one expected exceedance per year.
2) Fourth highest daily maximum 8-hour averages for a 3-year period not to exceed 80 ppb.

*** Less than 80% of the possible samples (data) were collected

2.3.3 Monitoring Network

The state currently has six continuous ozone analyzers in operation. These are at Beulah, Dunn Center, Fargo, Hannover, Theodore Roosevelt National Park - North Unit, and Theodore Roosevelt National Park - South Unit. Table 8 presents 2002 1-hour and 8-hour data summaries. Figure 11 shows the maximum 1-hour averages by month for 2002.

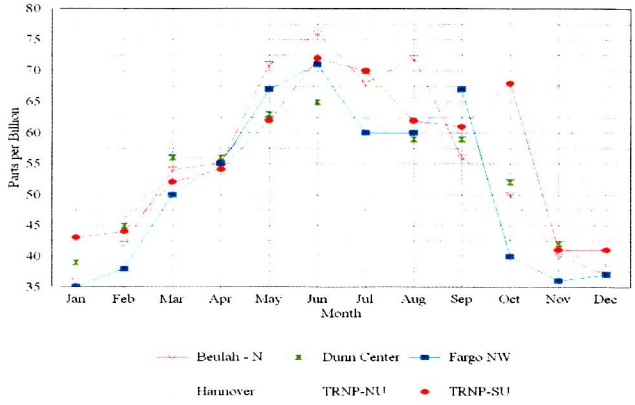

Figure 11 Monthly Maximum Ozone Concentrations

2.3.4 Network Analysis

Only two of the six monitoring sites are in an area not significantly influenced by VOC sources (see Figure 10). Beulah and Hannover are within 45 miles of seven of the ten major VOC sources in the state. TRNP - NU and TRNP-SU are located in a Class I area surrounded by oil fields. Fargo NW is located in Fargo and influenced by city traffic. Dunn Center is located in a rural area surrounded by crop land. With this diversity of site locations and influences, one would expect to see a diversity of ozone concentrations. On the contrary, Figure 12 shows a significant similarity among the maximum 1-hour concentrations. Since 1980, there have been only four hours of data collect higher than 80 ppb and none of these exceeded 100 ppb. Another, even stronger, indication of a uniform ozone distribution is the 8-hour concentrations: for all sites, the difference between the highest and 4th highest concentrations are within 5 ppb (see Table 8).

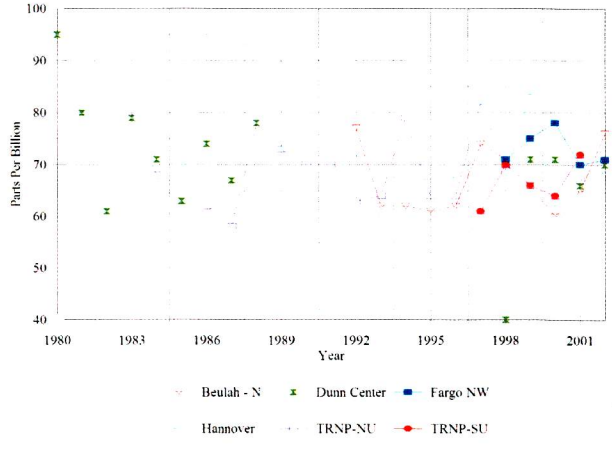

Figure 12 Annual Maximum Ozone Concentrations

2.4 Inhalable Particulates

The inhalable particulate standards are designed to protect against those particulates that can be inhaled deep into the lungs and cause respiratory problems. The major designation for inhalable particulates is PM. Within this designation are two subgroups: PM_{10} and $PM_{2.5}$. The PM_{10} particulates have an aerodynamic diameter less than or equal to a nominal 10 microns and are designated as PM_{10}. The $PM_{2.5}$ particulates have an aerodynamic diameter less than or equal to a nominal 2.5 microns and are designated as $PM_{2.5}$.

2.4.1 Sources

The major PM_{10} point sources (>100 TPY) are listed in Table 9 along with their emissions as calculated from the most recent emissions. Figure 13 shows the approximate locations of these facilities (the numbers correspond to the site and source tables). Most of these sources are large coal-fired facilities, and the PM_{10} particles are part of the boiler stack emissions; However, some of the emissions are the result of processing operations. Not included in this table are sources of fugitive dust such as coal mines, gravel pits, agricultural fields, and unpaved roads. Figure 13A shows the contribution of point sources to the total PM_{10} emissions. The "Utility Boilers"category consists of power plant boilers. The "Other Point Sources" category consists of DGC, refineries, gas processing plants, and agriculture processing plants.

2.4.2 Monitoring Network

The State operates three PM_{10} samplers, five FRM $PM_{2.5}$ samplers, and three sperciation samplers. Data from the two Three Affiliated Tribes sites, Dragswolf and Whiter Shield, are included for informational purposes only. Table 10 shows the inhalable PM_{10} particulate data summary, Table 11 shows the FRM $PM_{2.5}$ particulate data summary and Table 12 shows the continuous $PM_{2.5}$ particulate data summary.

R&P single-day samplers are installed at Beulah, TRNP - SU, and TRNP - NU. And, R&P sequential samplers were installed at Bismarck, Fargo, and Grand Forks. A duplicate single-day sampler is co-located at Beulah.

TABLE 9

Major PM_{10} Sources
(> 100 TPY)

2002

#	Company	Source	County	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Great River Energy	Coal Creek Station	McLean	1724	32.78%	3805500017
2	Basin Electric Power Cooperative	Leland Olds Station	Mercer	642	12.21%	3805700001
3	Basin Electric Power Cooperative	Antelope Valley Station	Mercer	639	12.15%	3805700011
4	Tesoro Refining and Marketing Company	Tesoro Mandan Refinery	Morton	634	12.05%	3805900003
5	Minnkota Power Cooperative, Inc.	M R Young Station	Oliver	391	7.43%	3806500020
6	Dakota Gasification Co.	Plant	Mercer	308	5.86%	3805700013
7	Otter Tail Power Company	Coyote	Mercer	254	4.83%	3805700012
8	American Crystal Sugar	Drayton Plant	Pembina	244	4.64%	3806700003
9	American Crystal Sugar	Hillsboro Plant	Traill	170	3.23%	3809700019
10	Great River Energy	Stanton Station	Mercer	133	2.53%	3805700004
11	Minn-Dak Farmers Cooperative	Wahpeton Plant	Richland	121	2.30%	3807700026

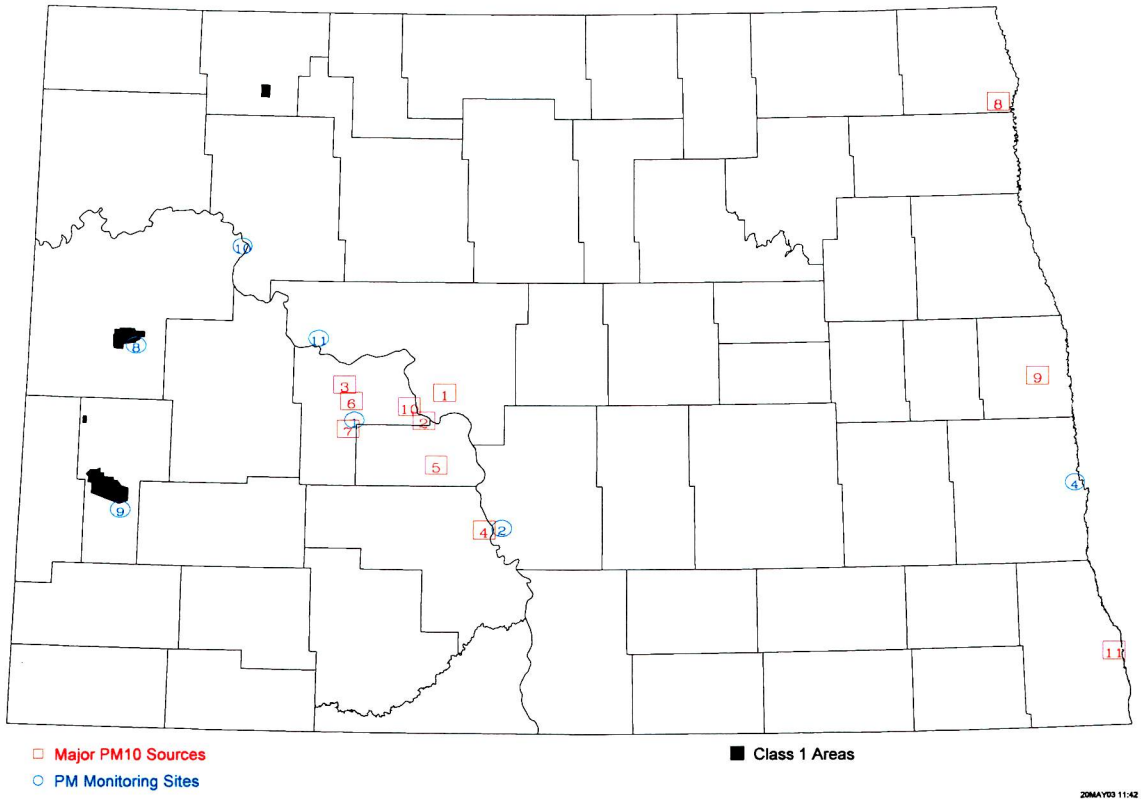

Figure 13 Major PM_{10} Sources

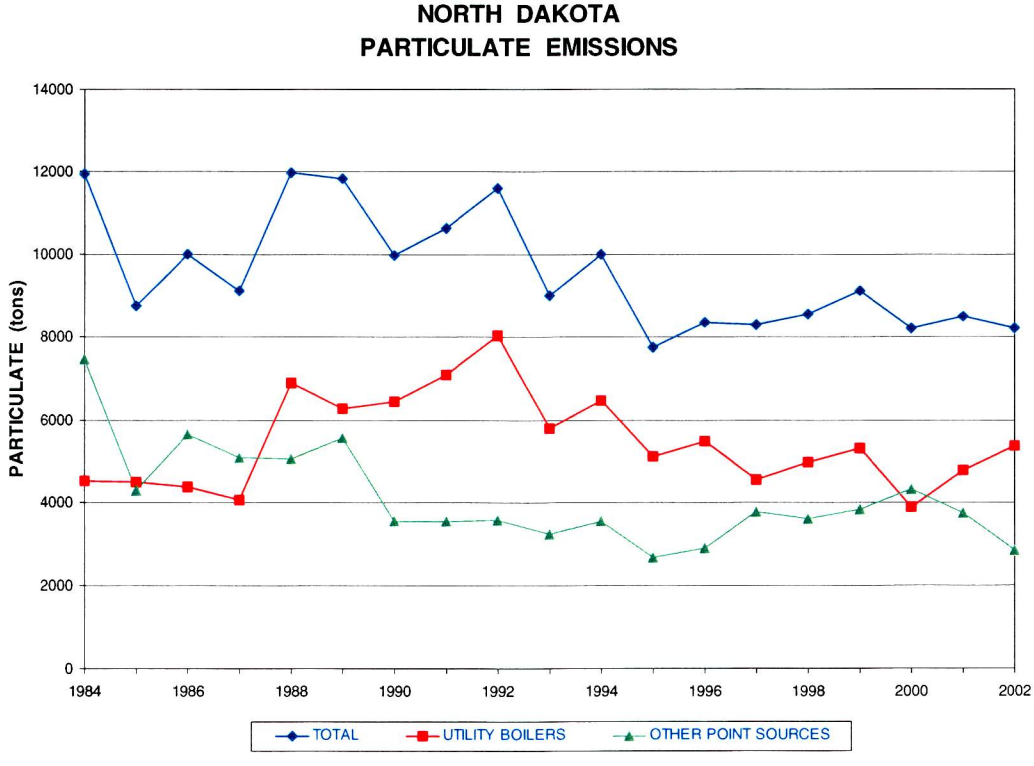

Figure 13A Annual PM Emissions

TABLE 10

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Inhalable PM_{10}Particulates ($\mu g/m^3$)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MIN	MAXIMA 1ST MM/DD	MAXIMA 2ND MM/DD	MAXIMA 3RD MM/DD	ARITH MEAN	#>150	AM>50	% >MDV
Bismarck Residential	2002	JAN-DEC	61	5.0	72.0 04/14	41.0 09/05	36.0 06/01	18.4			100.0
Dragswolf	2002	JAN-DEC	57	0.6	18.9 09/17	18.5 12/16	18.4 06/07	7.0			70.2
Fargo NW	2002	JAN-DEC	118	1.0	149.0 03/27	51.0 06/28	45.0 06/07	17.8			98.3
TRNP - NU	2002	APR-DEC	39	2.0	30.0 09/05	26.0 05/20	26.0 09/17	10.8			97.4
White Shield	2002	JAN-DEC	58	0.7	26.6 06/01	22.3 04/14	17.0 12/16	8.1			79.3

The maximum 24-hour concentration is 149.0 $\mu g/m^3$ at Fargo NW on 03/27

* The STATE and FEDERAL air quality standards are:
1) 150 $\mu g/m^3$ maximum averaged over a 24-hour period with no more than one expected exceedance per year.
2) 50 $\mu g/m^3$ expected annual arithmetic mean.

TABLE 11

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : FRM $PM_{2.5}$ Particulates ($\mu g/m^3$)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MIN	MAXIMA 1ST MM/DD	MAXIMA 2ND MM/DD	MAXIMA 3RD MM/DD	ARITH MEAN	#>150	AM>50	% >MDV
Beulah - North	2002	JAN-DEC	61	0.9	15.5 06/01	15.5 12/16	14.9 01/26	5.9			95.1
Bismarck Residential	2002	JAN-DEC	115	1.2	18.3 02/01	15.9 03/18	15.5 07/16	6.4			98.3
Fargo NW	2002	JAN-DEC	118	0.7	23.4 02/01	21.2 07/19	21.0 07/16	7.4			95.8
TRNP - NU	2002	JAN-DEC	59	1.0	17.8 01/26	12.8 07/19	10.5 09/05	5.3			94.9
TRNP - SU (Painted Canyon)	2002	JAN-DEC	58	1.0	17.9 01/26	9.2 08/06	9.1 07/19	4.1			82.8

The maximum 24-hour concentration is 23.4 $\mu g/m^3$ at Fargo NW on 02/01

* The ambient air quality standards are:
FEDERAL Standards -
1) 24-hour: 3-year average of 98th percentiles not to exceed 65 $\mu g/m^3$.
2) Annual: 3-year average not to exceed 15$\mu g/m^3$.

Table 12

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Continuous $PM_{2.5}$ ($\mu g/m^3$)

				MAXIMA								
				1 - HOUR		24 - HOUR						
LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	1ST MM/DD:HH	2ND MM/DD:HH	1ST MM/DD	2ND MM/DD	3RD MM/DD	4TH MM/DD	MEAN	1HR #>150	24HR #>65
Beulah - North	2002	JAN-DEC	8729	145.4 07/24:10	124.4 02/03:17	28.3 02/03	23.9 07/24	17.8 06/01	17.8 08/07	6.4		
Fargo NW	2002	JAN-DEC	8501	55.3 06/27:22	43.4 11/07:18	21.3 08/31	20.4 07/16	17.4 06/28	17.2 07/19	4.4		
Hannover	2002	OCT-DEC	2200	49.7 12/23:17	48.5 12/23:09	19.3 12/23	11.2 11/03	11.2 11/08	11.0 11/12	5.7		
TRNP - NU	2002	OCT-DEC	2140	29.3 12/02:08	25.3 10/28:09	9.1 10/28	8.6 11/14	8.5 12/17	8.2 10/20	4.8		

The maximum 1-hour concentration is 145.4 $\mu g/m^3$ at Beulah - North on 07/24:10
The highest 24-hour concentration is 28.3 $\mu g/m^3$ at Beulah - North on 02/03

* The ambient air quality standards are:
FEDERAL Standards -
1) 24-hour: 3-year average of 98th percentiles not to exceed 65 $\mu g/m^3$.
2) Annual: 3-year average not to exceed 15 $\mu g/m^3$.

2.4.3 PM_{10} Network Analysis

Since PM_{10} and smaller particles are of concern mainly because of their effects on people, two sites are located in population centers, Bismarck and Fargo. One site, TRNP - NU, is in a Class I area, which is used for background data.

2.4.4 $PM_{2.5}$ Network

The $PM_{2.5}$ network currently has five sites with six samplers. Bismarck, Fargo and Beulah are non-CORE required sites. Bismarck and Fargo operate on a 1-in-3 day schedule and Beulah on a 1-in-6 day schedule with a duplicate sampler. TRNP - SU and TRNP - NU operate on a 1-in-6 day schedule.

The intent of the TEOMs is to begin using these analyzers as the primary data source and use a FRM sampler only for quality assurance purposes. As the $PM_{2.5}$ samplers are replaced or removed from service, some will be converted to PM_{10} samplers and used along with speciation samplers to collect a data set comparable to the IMPROVE samplers. This is expected to provide data that can be used in the regional haze/visibility determinations.

2.4.5 Speciation Network

Speciation samplers are installed in Bismarck, TRNP - NU, and a National Trends Network sampler in Fargo. The goal of the two state-selected sites is to supplement the data collected by the two IMPROVE samplers: TRNP - SU and Lostwood. With the combined data, it is expected the Department will be able to make a better assessment of the current visibility and track improvement over time. The data collected is added to the AQS database by RTI. .

2.5 Carbon Monoxide

Many large urban areas in the United States have problems attaining the NAAQS for carbon monoxide (CO) where the primary source of CO is automobiles. North Dakota does not have sufficient population with the corresponding traffic congestion and geographical/meteorological conditions to create significant CO emission problems. However, there are several stationary sources in the State that emit more than 100 TPY of CO.

2.5.1 Sources

The major stationary CO sources (>100 TPY) are listed in Table 13 along with their emissions as calculated from the most recent emissions inventories reported to the department. Figure 20 shows the approximate locations of these facilities (the numbers correspond to the site and source tables). Most of these sources are the same sources that are the major emitters of SO_2 and NO_x. However, the corresponding levels of CO from these sources are considerably lower.

2.5.2 Monitoring Network

Carbon monoxide monitoring in North Dakota was terminated March 31, 1994, after 5 years of operation. The conclusion drawn from the data was that North Dakota did not have a CO problem. A summary report of the data collected at the West Acres Shopping Mall was drafted for the Fargo-Moorhead Council of Governments for use in their traffic planning program.

TABLE 13

Major CO Sources
(> 100 TPY)

2002

#	Company	Source	County	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Dakota Gasification Co.	Plant	Mercer	1960	18.50%	3805700013
2	Great River Energy	Coal Creek Station	McLean	1908	18.01%	3805500017
3	Minnkota Power Cooperative, Inc.	M R Young Station	Oliver	1100	10.39%	3806500020
4	Otter Tail Power Company	Coyote	Mercer	756	7.14%	3805700012
5	Minn-Dak Farmers Cooperative	Wahpeton Plant	Richland	703	6.64%	3807700026
6	American Crystal Sugar	Hillsboro Plant	Traill	684	6.46%	3809700019
7	Basin Electric Power Cooperative	Antelope Valley Station	Mercer	670	6.33%	3805700011
8	Amerada Hess Corporation	Gas Plant	Williams	528	4.98%	3810500004
9	Basin Electric Power Cooperative	Leland Olds Station	Mercer	465	4.39%	3805700001
10	Tesoro Refining and Marketing Company	Refinery	Morton	458	4.32%	3805900003
11	ADM Processing	Oil Seed Proc	McHenry	306	2.89%	3804900005
12	American Crystal Sugar	Drayton Plant	Pembina	297	2.80%	3806700003
13	Montana Dakota Utilities Co.	RM Heskett Station	Morton	196	1.85%	3805900001
14	ADM Corn Processing	Ethanol Plant	Pembina	167	1.58%	3806700004
15	Great River Energy - SS	Stanton Station	Mercer	144	1.36%	3805700004
16	University of North Dakota	Heating Plant & Incinerator (HMIWI)	Grand Forks	144	1.36%	3803500003
17	Northern Sun (Division of ADM)	Oil Seed Processing	Ransom	106	1.00%	3807300001

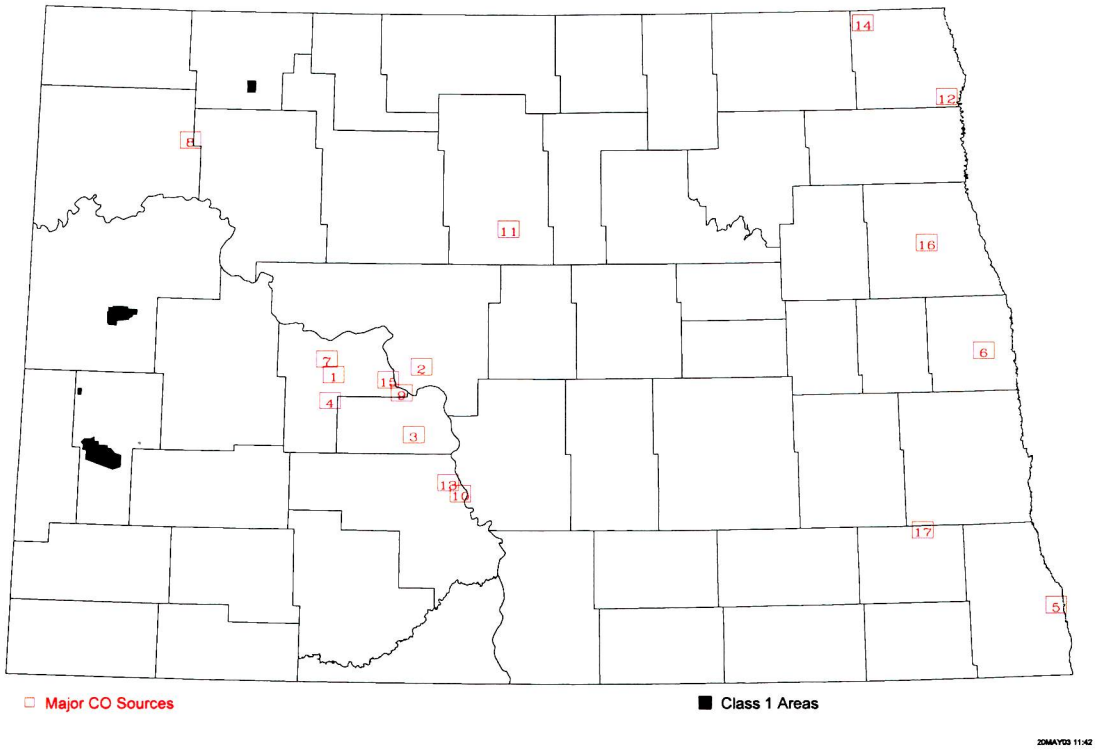

Figure 14 Major CO Sources

2.6 Lead

Through prior sampling efforts, the Department has determined that the State has low lead concentrations (38.6% of the standard) and no significant lead sources. This determination, coupled with the Federal requirement for a NAMS network only in urbanized areas with populations greater than 500,000, resulted in terminating the lead monitoring program effective December 31, 1983. Along with the low monitored concentrations, lead has been completely removed from gasoline since lead monitoring began in 1979.

2.7 Hydrogen Sulfide

Although no Federal Ambient Air Quality Standard exists for hydrogen sulfide (H_2S), the State of North Dakota has developed H_2S standards.

2.7.1 Sources

H_2S emissions of concern stems almost totally from the oil and gas operations in the western part of the State; principally from the green outlined area on Figure 2. Flares and treater stacks associated with oil/gas wells, oil storage tanks, compressor stations, pipeline risers, and natural gas processing plants are potential H_2S emission sources.

2.7.2 Monitoring Network

Currently there are no State or industry H_2S monitoring sites.

2.8 Air Toxics

Air toxics were monitored at Beulah to track air toxics emission at DGC. The data collected is added to the AQS database by ERG.

2.8.1 Sources

The major air toxics sources are listed in Table 14 and Figure 15 shows the approximate locations of these facilities (the numbers correspond to the site and source tables).

Table 14

Major Air Toxics Sources
(>100 TPY)

2002

#	Company	Source	County	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Dakota Gasification Co.	Plant	Mercer	2056	76.95%	3805700013
2	ADM Processing	Oil Seed Proc	McHenry	198	7.41%	3804900005
3	Northern Sun (Division of ADM)	Oil Seed Processing	Ransom	173	6.47%	3807300001
4	Great River Energy	Coal Creek Station	McLean	131	4.90%	3805500017
5	Tesoro Refining and Marketing Company	Refinery	Morton	114	4.27%	3805900003

2.8.2 Monitoring Network

The air toxics network consisted of one site at Beulah - N. The data collected was reviewed and the contractor added the data to the AQS database. Methyl ethyl ketone (MEK) is the only air toxic that produced any results the were of any interest. Based on data provided by DGC, there seems to be a source of MEK other than DGC though it is not clear what that source could be. The expected concentrations based on DGC-provided data are non-detectable (ND). However, typical concentrations are 1-4 ppm with peaks as high as 293 ppm. Since the data is a 24-hour sample, using wind direction to identify the source has been unsuccessful. Several possible sources have been investigated. These sources are the sampler itself, the construction material in the shelter, and the sample train. The conclusion is that the source is an external source we have not been able to identify. The other data, when compared to other sites of similar industrial influence, are comparable to the other sites monitoring at the same time.

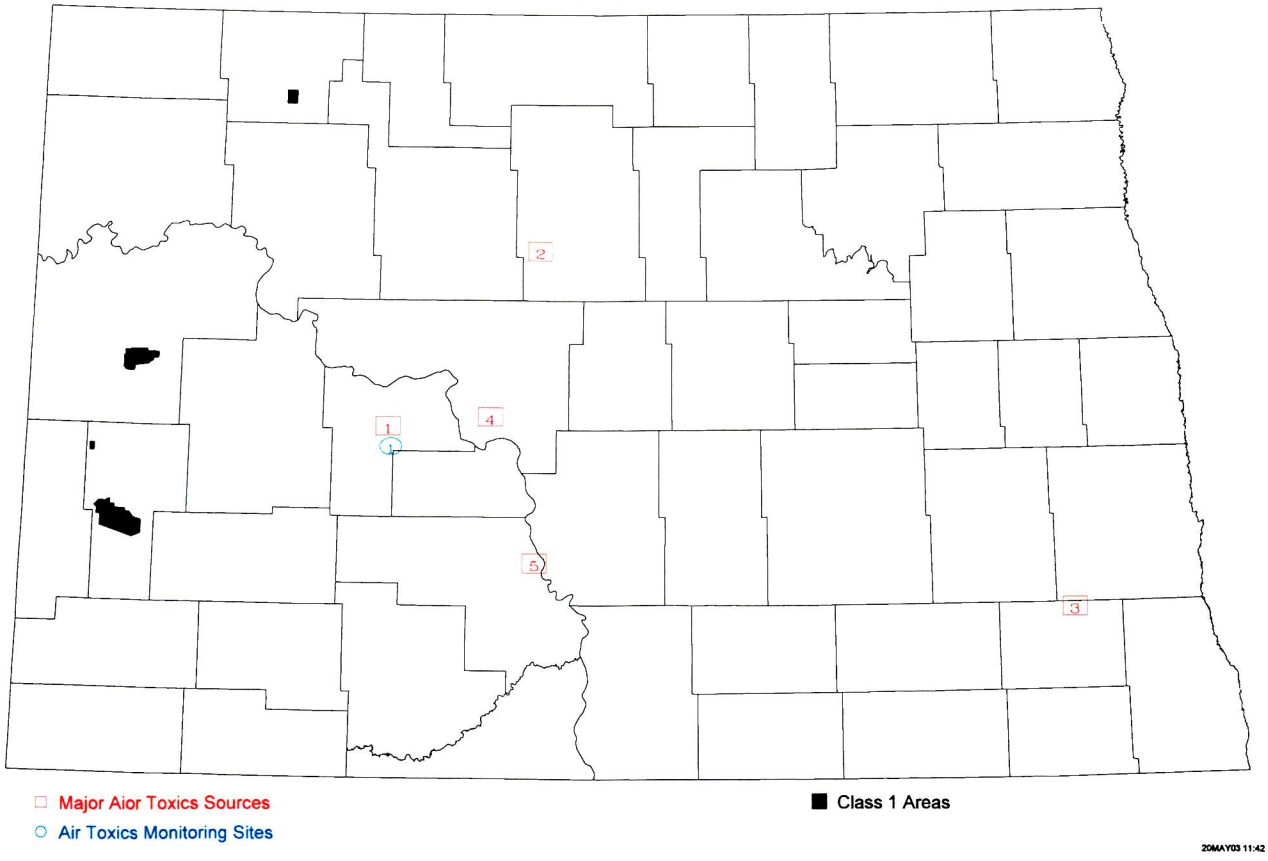

Figure 15 Major Air Toxics Sources

Data summaries are not included in this review because there are approximately 70 parameters reported. The data is available in AQS using Parameter Occurrence Code (POC) 5.

3.0 SUMMARY AND CONCLUSIONS

The North Dakota Ambient Air Quality Monitoring Network is designed to monitor those air pollutants which demonstrate the greatest potential for deteriorating the air quality of North Dakota. Due to a greater number of pollution producing sources in the western part of the State (primarily associated with the energy producing industries) the greatest percentage of the network is located in the western part of the State.

3.1 Sulfur Dioxide (SO_2)

Neither the State nor Federal standards were not exceeded at any monitoring site. The maximum concentrations and the maximum concentrations expressed as a percentage of the applicable standard are as follows: 1-hour - 140 ppb (57.3%); 3-hour - 96 ppb (19.2%); 24-hour - 47 ppb (47.5%); annual - 4.7 ppb (23.9%).

There is no SO_2 5-minute standard currently in effect. The maximum 5-minute average was 360 ppb.

3.2 Nitrogen Dioxide (NO_2)

Neither the State nor Federal standards were exceeded at any of the monitoring sites. The maximum concentrations and the maximum concentrations expressed as a percentage of the applicable standard are as follows: annual - 5.6 ppb (10.6%)

3.3 Ozone (O_3)

Neither the State nor Federal standard was exceeded during the year. The 1-hour maximum and 4th highest 8-hour concentrations and the concentrations expressed as a percentage of the applicable standard are as follows: 1-hour - 76 ppb (63.3%); 4th highest 8-hour - 65 ppb (81.2%).

3.4 Inhalable Particulates

Neither the State nor Federal PM_{10} standards were exceeded during the year. The maximum concentrations and the maximum concentrations expressed as a percentage of the applicable PM_{10} standard are as follows: 24-hour - 149 $\mu g/m^3$ (99.3%); annual - 18.4 $\mu g/m^3$ (36.8%).

The proposed Federal $PM_{2.5}$ standards were exceeded during the year. The maximum concentrations and maximum concentrations expressed as a percentage of the standard are as follows: 24-hour FRM - 23.4 $\mu g/m^3$ (36.0%); annual FRM - 7.4 $\mu g/m^3$ (49.3%).

3.5 Carbon Monoxide (CO)

No monitoring was conducted.

3.6 Lead

No monitoring was conducted.

3.7 Hydrogen Sulfide

No monitoring was conducted.

3.8 Air Toxics

Data at Beulah is similar to comparable sites operating at the same time. The data and data summaries are available on the AQS database.

NORTH DAKOTA DEPARTMENT OF HEALTH
Environmental Health Section

Location:
1200 Missouri Avenue
Bismarck, ND 58504-5264

Fax #:
701-328-5200

Mailing Address:
P.O. Box 5520
Bismarck, ND 58506-5520

July 18, 2003

FILE

Richard R. Long, Director
Air & Radiation Program
U.S. EPA - Region VIII
One Denver Place
999 18th Street, Suite 300
Denver, CO 80202-2466

Dear Dick:

Referenced is your letter of July 14, 2003, pertaining to the North Dakota Ambient Network Review. Following is our response to the questions posed by your staff in reviewing the Department's submittal.

Response to Comment 1
Funds for the Lostwood site $PM_{2.5}$ and PM_{course} continuous monitor were initially identified in FY02 103 Grant and projected for expenditure in July 2003. With the closing of the 103 Grant prior to July 2003, the continuous particulate analyzers for Lostwood were included in the FY02 103 Grant. No projected carryover funds were expended for this purchase.

Response to Comment 2
Due to the short timeframe between the U.S. Fish and Wildlife Service approval of the site including the actual physical location as approved by the refuge manager and the network review submittal, the forms had not been completed. The forms for the Lostwood site are attached.

Response to Comment 3
The Department agrees that the Beulah site better meets the criteria of a non-CORE site than that of the TRNP-NU site. The change will be made.

Response to Comment 4
The Department will consider your recommendation regarding the acquisition of telemetry. Obviously purchasing of such equipment will have to be weighed along with considerations for other needed equipment as well.

Response to Comments 5, 6 and 7

The clarifications requested in these comments have been made and a revised copy will be forwarded electronically to Deirdre Rothery at your offices.

If you or your staff have any questions regarding the revisions to the network review, please contact Dan Harman of my staff at (701)328-5188.

Sincerely,

Terry L. O'Clair, P.E.
Director
Division of Air Quality

TLO:saj
Enc:

REGION VIII AMBIENT AIR MONITORING NETWORK MODIFICATION REQUEST FORM (VERSION 1, 5/20/94)

DATE: 21 Jul 03 CITY: Lostwood NWR HQ STATE: ND
AIRS #: 380130004 SITE NAME: Lostwood HQ
PROPOSED MODIFICATION/REASON WHY: New site

		CHECK ONE OR MORE BOXES BELOW				
AIR QUALITY PARAMETER	MONITOR TYPE	MAX CONC	SOURCE IMPACT	POPULATION EXPOSURE	BACKGROUND	EQUIPMENT
SO2	SLAMS		X		X	TECO 43C
NOx	SLAMS		X		X	TECO 42C
O3	SLAMS		X		X	TECO 49C
PMcourse	SLAMS		X		X	R&P 1400ab
PMfine	Other		X		X	R&P 1400ab

PROPOSED SAMPLING START ~~OR REMOVAL DATE/DATE STARTED OR REMOVED~~: 1 Oct 03

ESTIMATED MEASUREMENTS FOR AIR QUALITY PARAMETERS:

LOCATION(LAT./LONG. OR UTM's) 48.65/102.40
SITE ELEVATION(M. MSL): 690 PROBE HEIGHT(M. AGL): 4

DISTANCE TO TREE DRIPLINE(M)	DIRECTION TO TREE	DISTANCE TO OBSTACLE(M)	DIRECTION TO OBSTACLE	OBSTACLE HEIGHT ABOVE PROBE(M)	OBSTACLE COMMENTS
150	W				

UNRESTRICTED AIR FLOW: >270 DEG. Y >180 DEG. ____ <CRITERIA ____ DEG.
DISTANCE TO FLUES/INCINERATORS(M): 80
DISTANCE TO INTERSECTIONS(M): 900

DISTANCE TO EDGE OF NEAREST ROADWAY(M)	DIRECTION	DAILY TRAFFIC ESTIMATES	TYPE OF ROADWAY	COMMENTS
24000	NORTH	3500	Highway	US 52
70	EAST	100	Highway	ND 8
900	SOUTH	100	Highway	ND 8
28000	WEST	100	Highway	ND 40

DISTANCE FROM SUPPORTING STRUCTURES(M): VERT. 1 HORIZ. ____

DISTANCE TO NEAREST POINT SOURCE(MILES)	DIRECTION TO POINT SOURCE	DISTANCE TO NEAREST AREA SOURCE(MILES)	DIRECTION TO AREA SOURCE	COMMENTS
16	NNW			Lignite Gas Plant

CERTIFICATION:
I certify the site or network modification proposed above meets all 40 CFR 58, Appendix E siting criteria, except as noted with submittal.

Signature

AQNMFM1.94

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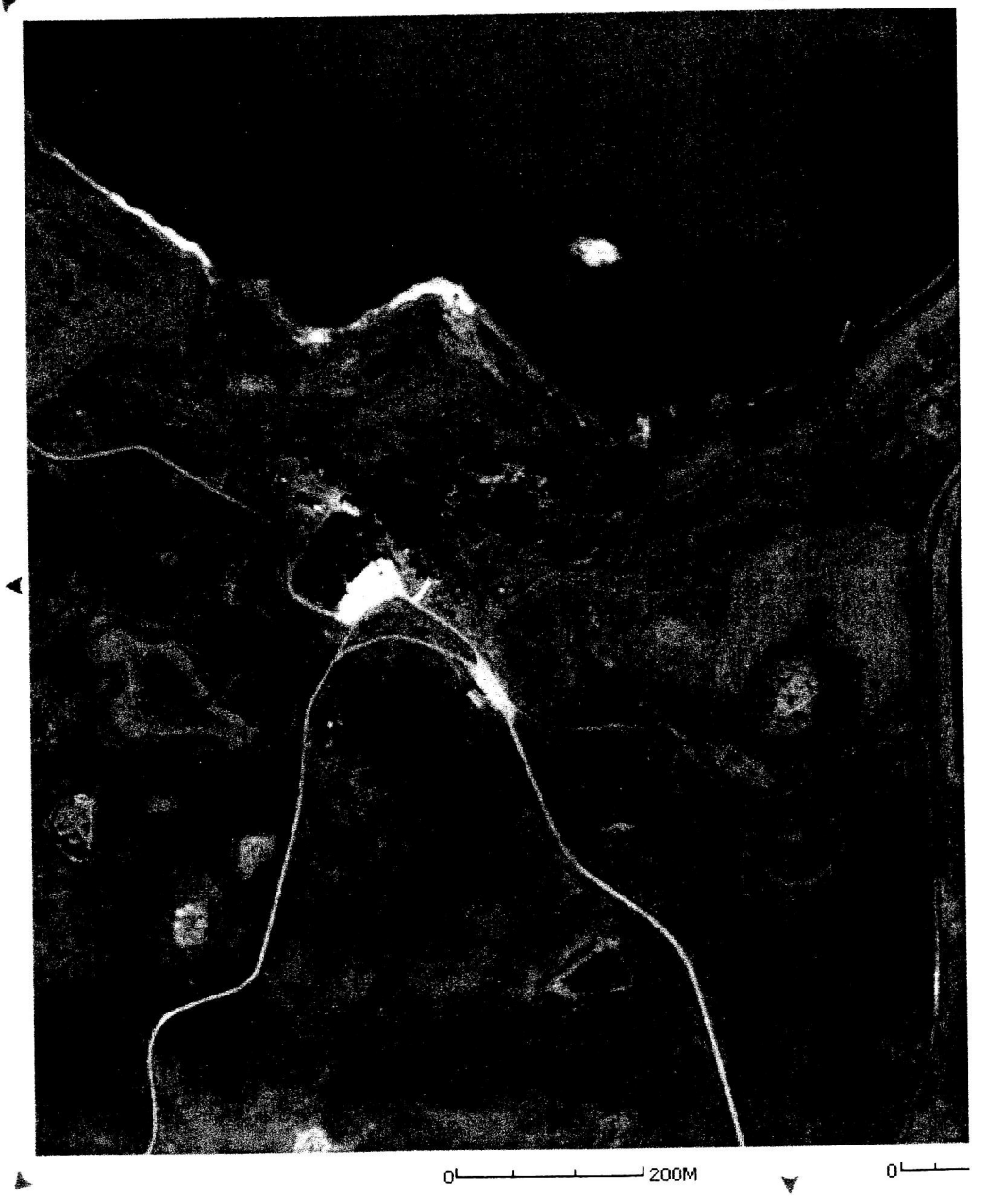
About

2 km NW of Vanville, North Dakota, United States



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Homes for sale in 58773

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Schools, Crime and Demographics for 58773

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32 meter resolution

Map Size: Large

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View: Topo Map

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32 meter resolution

Map Size: Large

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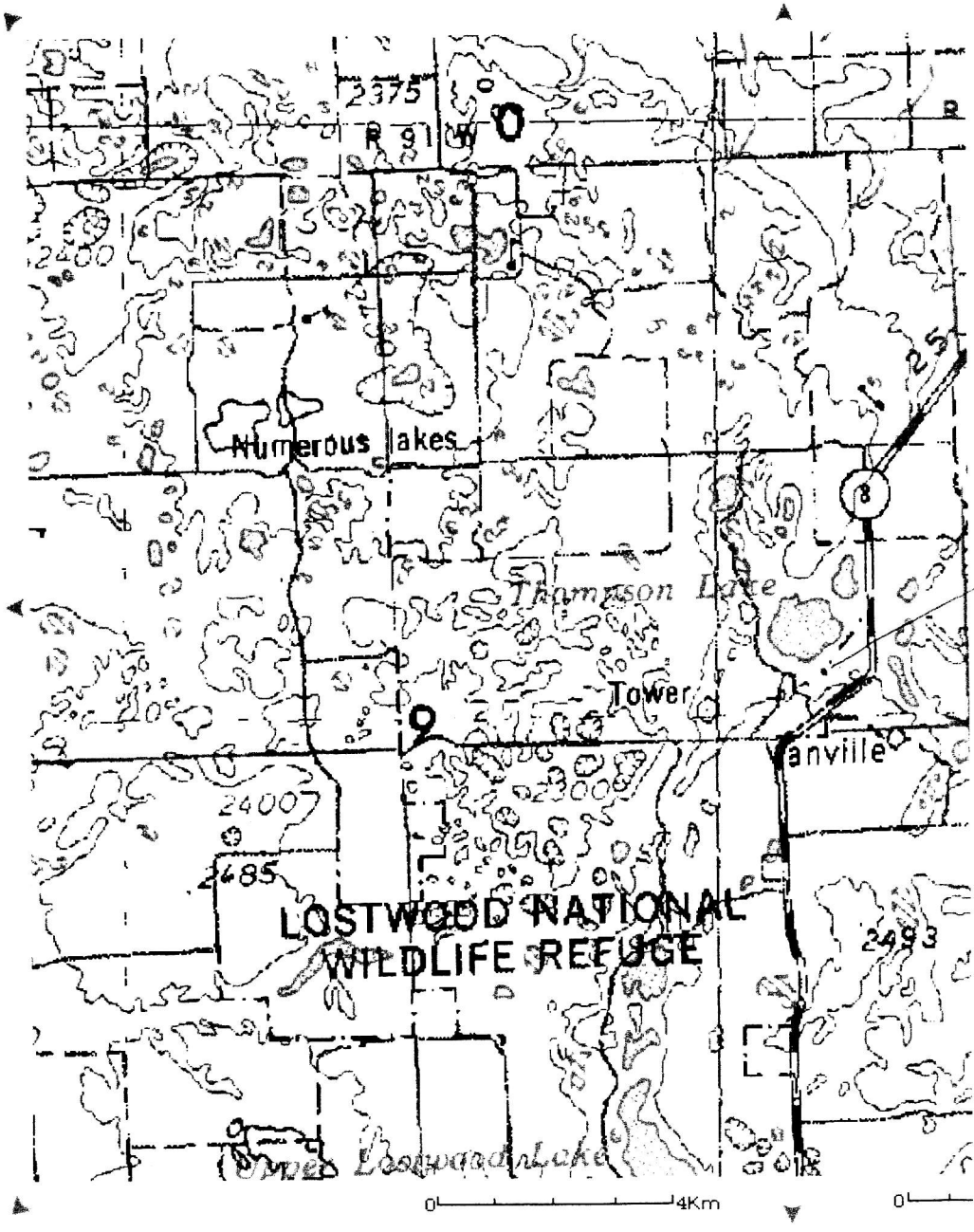

Related Links:

Other Imagery:

USGS Aerial Photo 05 Oct 1997

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Homes for sale in 58721

Homes for sale in 58773

Schools, Crime and Demographics for 58721

Schools, Crime and Demographics for 58773

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TerraServer USA

TerraServer Move is Complete!

Search TerraServer GO

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View: Topo Map

3 km NW of Vanville, North Dakota, United States

2 meter resolution

Map Size: Large

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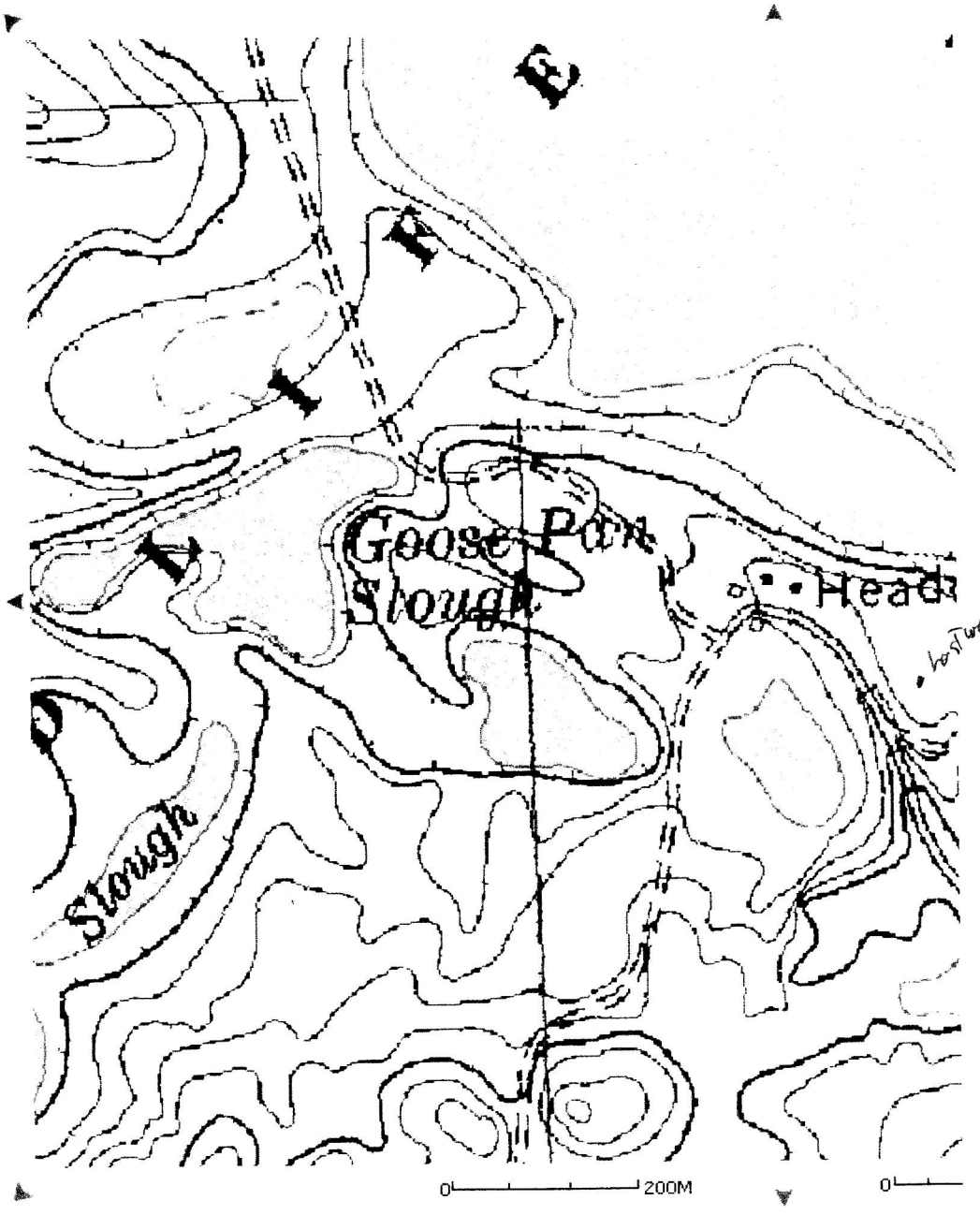

Related Links:

Other Imagery:

USGS Aerial Photo 05 Oct 1997

House and Home:

Homes for sale in 58721

Homes for sale in 58773

Schools, Crime and Demographics for 58721

Schools, Crime and Demographics for 58773

Image courtesy of the U.S. Geological S

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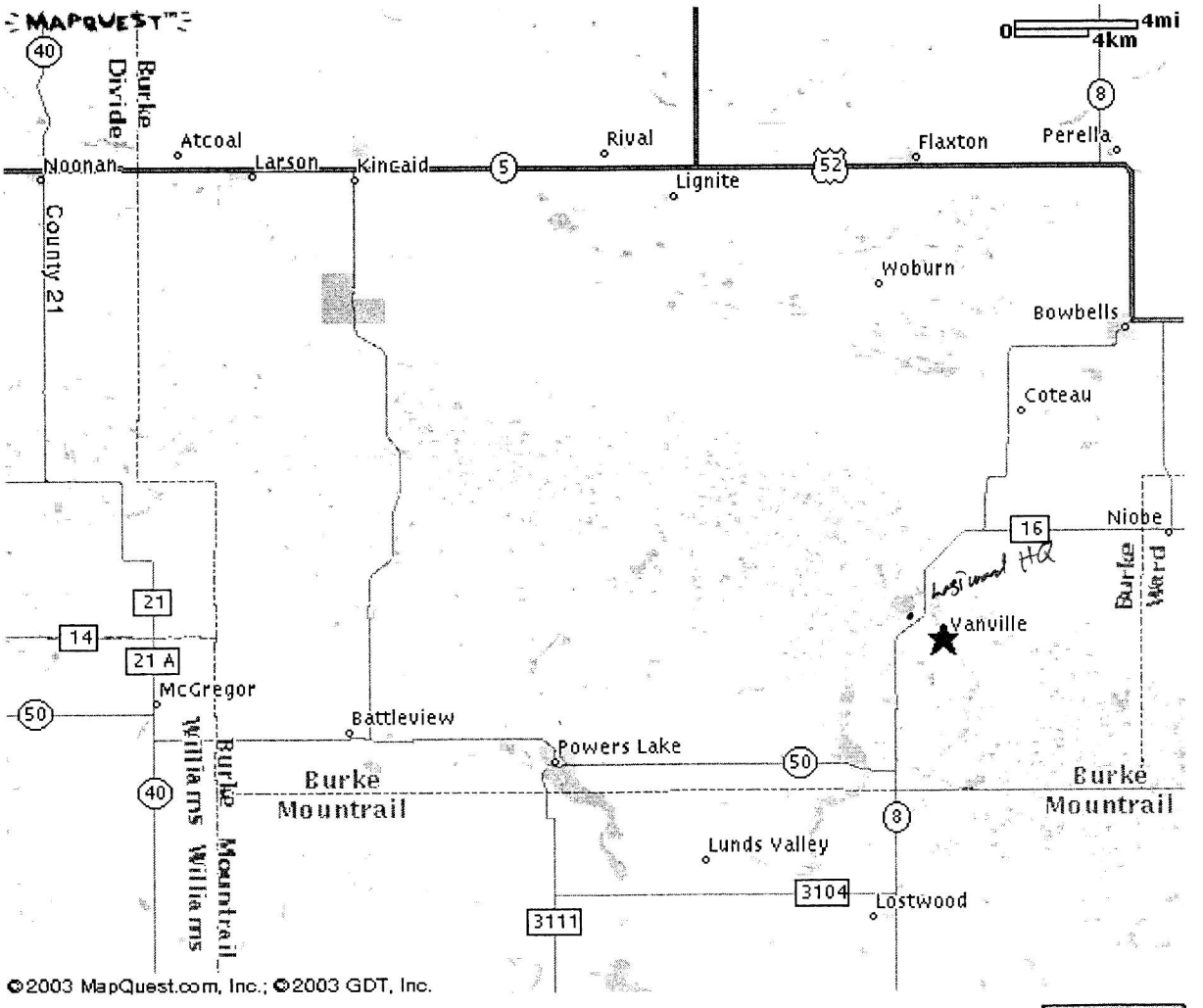
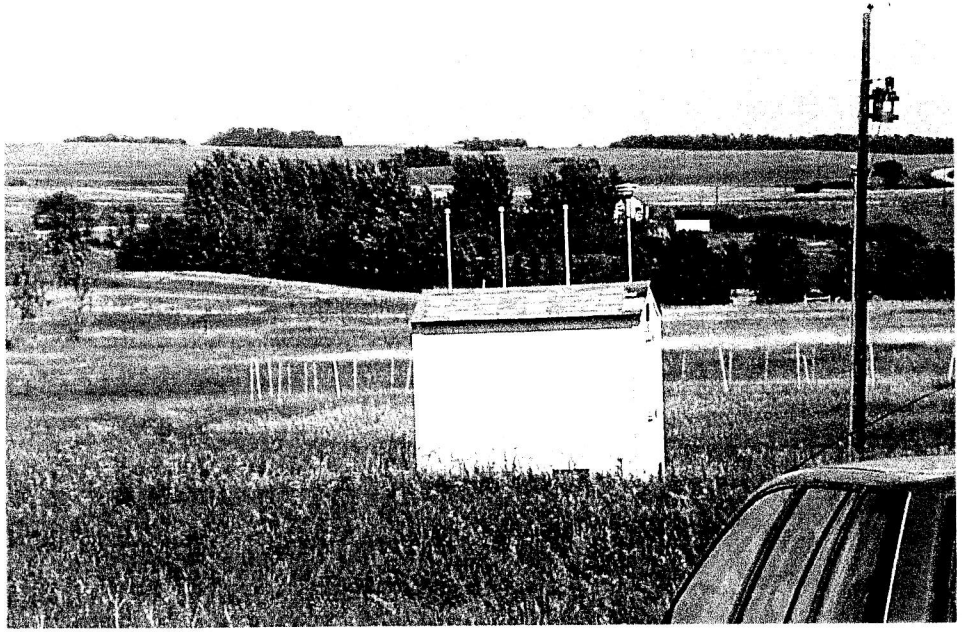
MAPQUEST

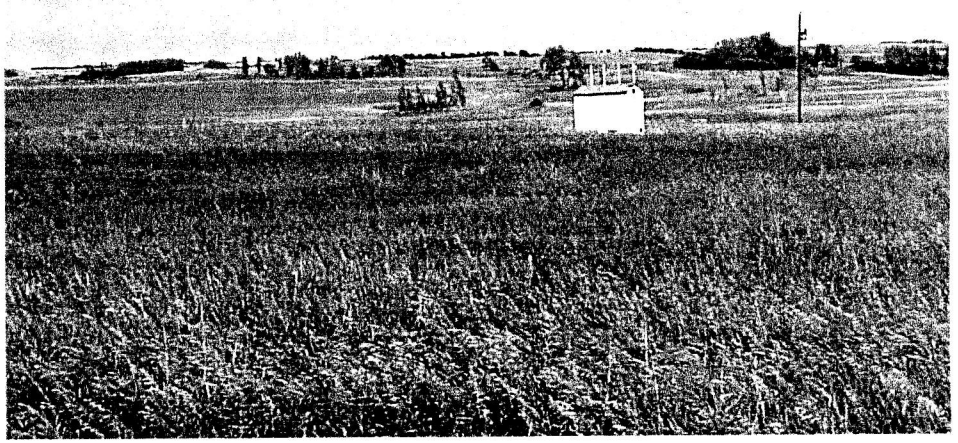
Send To Printer Back to Map

Vanville ND
US

Notes:







UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
Phone 800-227-8917
http://www.epa.gov/region08

JUL 14 2003

Ref: 8P-AR

Terry O'Clair, Director
Division of Air Quality
ND Department of Health
P.O Box 5520
Bismarck, ND 58506-5520

Dear Mr. O'Clair:

Thank you for submitting the 2002 North Dakota Network Review (NR) via an email from Dan Harman dated June 20, 2003. In general, the NR addresses all parameters adequately. Thus, the NR meets the 40 CFR Part 58 requirement and the 105 grant commitment to conduct a review annually. However, before EPA Region 8 can concur on the technical analysis, some additional information is needed to complete the document.

Please have your staff review the enclosed comments. Please address comments 1, 2, and 3 as soon as possible and make the necessary changes in the NR. The remaining comments can be addressed in the next annual review.

If you or your staff have any questions regarding the NR comments or need further assistance, contact your EPA Region 8 state monitoring contact, Deirdre Rothery, at 303-312-6431.

Sincerely,

Richard R. Long, Director
Air and Radiation Program

Enclosure

cc: Dan Harman, ND DAQ

Enclosure

Comment 1:
The cover letter states the equipment for the new Lostwood site has been ordered and the site is expected to be operational by September 1, 2003 and that the additional TRNP-SU site is still in the discussion stage. The application submitted for 103 funds indicated carryover funds would be used to fund continuous monitoring of $PM_{2.5}$ and PM_{coarse} at Lostwood and TRNP-SU. Please note that the spending of carryover funds for these projects will not even be considered for approval until after September 2003. Also, please note that the carryover funds are for one-time cost items; they will not be available to fund extended costs. Please hold off on the spending of any funds related to carryover items until after approval has been given.

Comment 2:
The NR does not include network modification requests for the new Lostwood site and the additional TRNP-SU site as mentioned in the cover letter. Please send the request forms prior to any site changes.

Comment 3:
Second paragraph of your cover letter related to the identification of your non-CORE required sites. 40 CFR 58, Appendix D, Section 2.8.1.4 states: "The State shall also be required to establish additional SLAMS sites based on the total population outside the MSA(s) associated with monitoring planning areas that contain required core SLAMS. There shall be one such additional SLAMS for each 200,000 people." The three non-CORE required sites, described in your cover letter, are in addition to the regional background and regional transport monitors you also mentioned. Since the $PM_{2.5}$ siting criteria is population related, EPA believes that TRNP-NU does not satisfy the monitoring requirement for one of North Dakota's non-CORE required population-based sites. Please designate another high population site instead of TRNP-NU. Suggested sites for North Dakota's three non-CORE required sites are Fargo, Bismarck, and Beulah.

Comment 4:
EPA encourages you to acquire telemetry that will enable the reporting of ozone data to AIRNOW. For reference, a map has been enclosed indicating a high ozone day in Minnesota right up to the eastern border of North Dakota. The addition of ozone telemetry to the North Dakota network and the subsequent reporting of the data to AIRNOW would improve the accuracy of the model used for mapping.

Comment 5:
The last sentence of the first paragraph on page 1 states: "...requires five major industrial pollution sources," yet the last paragraph on page 4 states: "There were three industries reporting." Please clarify which is correct.

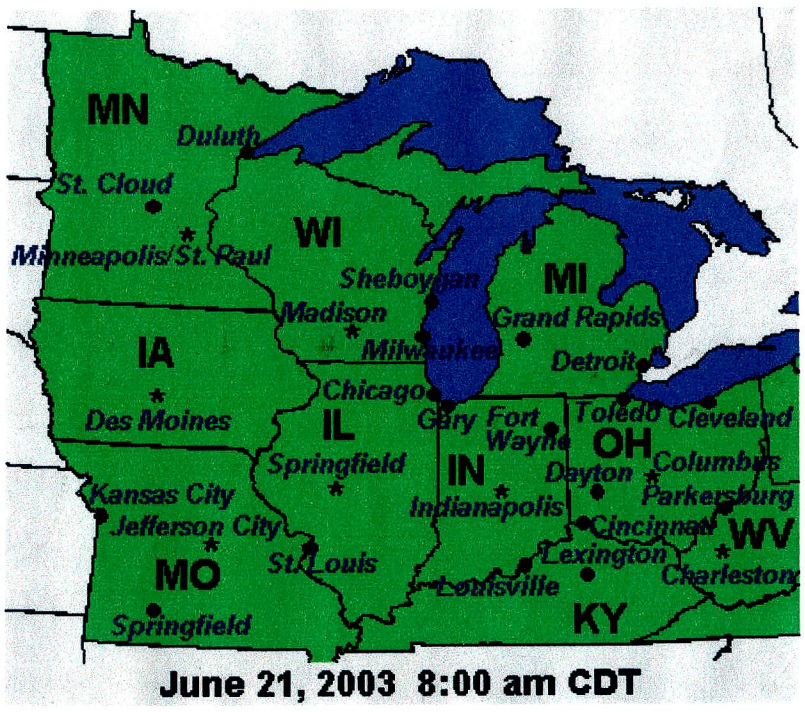
Comment 6:
The second paragraph on page 11 states: "The nine largest sources," yet later in the paragraph, two references are made to "ten" sources. Please clarify which is correct.

Comment 7:
The first paragraph on page 13 states: "MDU's Coyote Power Station," when compared against Table 2 which states "Otter Tail Power Company" as the company associated with the Coyote source. Please clarify which is correct.

U.S. Environmental Protection Agency

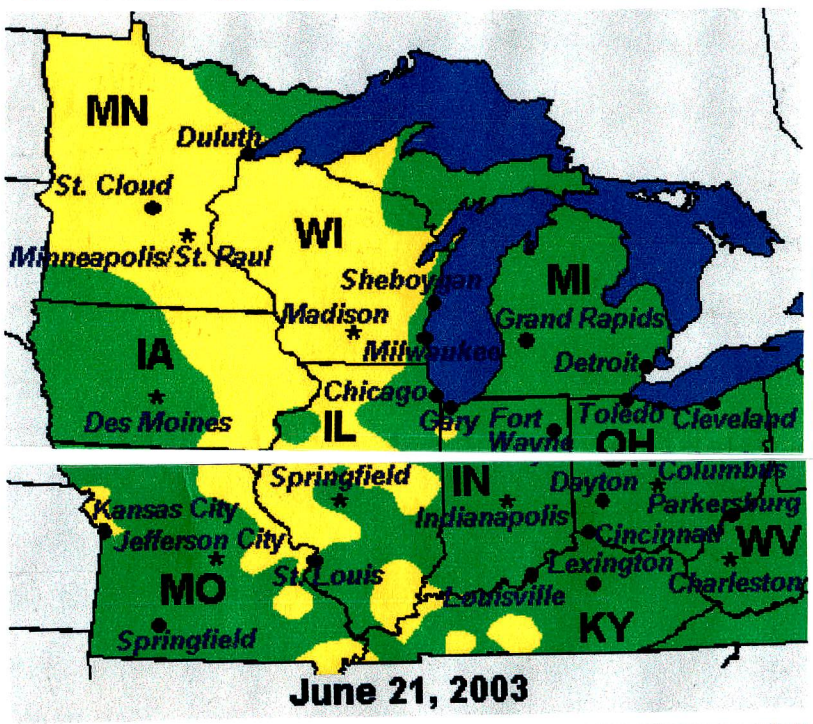
AIRNow

Midwest Maps for June 21, 2003



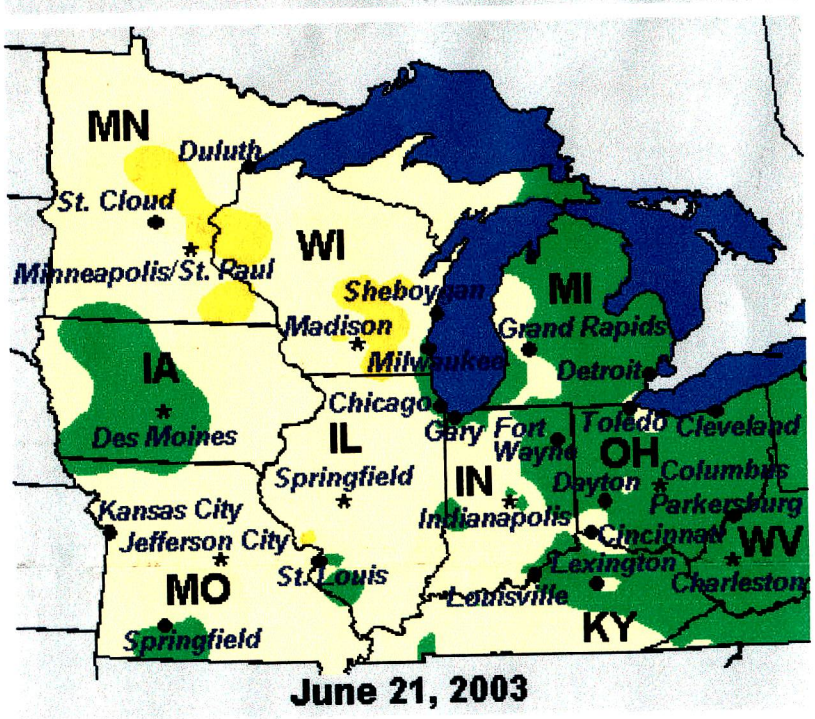
Ozone Animation

- Good
- Moderate
- Unhealthy for Sensitive Groups
- Unhealthy
- Very Unhealthy



8-hour Average Peak Concentration

- Good
- Moderate
- Unhealthy for Sensitive Groups
- Unhealthy
- Very Unhealthy



1-hour Average Peak Concentration

- 0-60 ppb
- 61-79 ppb
- 80-99 ppb
- 100-110 ppb
- 111-124 ppb
- 125+ ppb

Select another map or date.

North Dakota Department of Health
Division of Air Quality

Ambient Air Quality Monitoring
Annual Network Review
2002

May 2002

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LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

The North Dakota Department of Health, Division of Air Quality, has the primary responsibility of protecting the health and welfare of North Dakotans from the detrimental effects of air pollution. Toward that end, the Division of Air Quality ensures that the ambient air quality in North Dakota is maintained in accordance with the levels established by the state and federal Ambient Air Quality Standards (AAQS) and the Prevention of Significant Deterioration of Air Quality (PSD) Rules. To carry out this responsibility, the Division of Air Quality operates and maintains a network of ambient air quality monitors and requires three major industrial pollution sources to conduct source specific ambient air quality monitoring.

To evaluate the effectiveness of the State's air quality monitoring effort, the U.S. Environmental Protection Agency (EPA) requires the Division of Air Quality to conduct an annual review of the State's ambient air quality monitoring (AAQM) network. EPA's requirements, as set forth in 40 CFR 58.20, are to (1) determine if the system meets the monitoring objectives defined in 40 CFR 58, Appendix D, and (2) identify network modifications such as termination or relocation of unnecessary sites or establishment of new sites which are necessary. 40 CFR 58.25 requires the state to annually develop and implement a schedule to modify the AAQM network to eliminate any unnecessary sites or correct any inadequacies indicated as a result of the annual review required by 40 CFR 58.20(d). This document and subsequent revisions satisfy these annual requirements.

1.1 Network Review Process

The locations of sites in a monitoring program are established to meet certain objectives. The May 10, 1979, Federal Register (40 CFR 58), "Ambient Air Quality Surveillance Regulations," as amended, has specified a minimum of six basic monitoring objectives. These objectives are as follows:

1. *To determine the highest pollutant concentrations expected to occur in an area covered by the network.*

2. *To determine representative concentrations in areas of high population density.*

3. *To determine the impact on ambient pollution levels by a significant source or class of sources.*

4. *To determine the general/background concentration levels.*

5. *To determine the impact on air quality by regional transport.*

6. *To determine Welfare-related impacts.*

The link between basic monitoring objectives and the physical location of a particular monitoring site involves the concept of spatial scale of representativeness. This spatial scale is determined by the physical dimensions of the air parcel nearest a monitoring site throughout which actual pollutant concentrations are reasonably similar. The goal in locating sites is to match the spatial scale represented by the sample of monitored air with a spatial scale most appropriate for the monitoring objective. Spatial scales of representativeness, as specified by EPA, are described as follows:

Microscale - dimensions ranging from several meters up to about 100 meters.

Middle Scale - areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 km.

Neighborhood Scale - city areas of relatively uniform land use with dimensions of 0.5 to 4.0 km.

Urban Scale - overall, city-wide dimensions on the order of 4 to 50 km. (Usually requires more than one site for definition.)

Regional Scale - rural areas of reasonably homogeneous geography covering from 50 km to hundreds of km.

The relationships between monitoring objectives and spatial scales of representativeness, as specified by EPA, are as follows:

Monitoring Objective	Appropriate Siting Scales
Highest Concentration	Micro, middle, neighborhood
Population Exposure	Neighborhood, urban
Source Impact	Micro, middle, neighborhood
General/Background	Urban, regional
Regional Transport	Urban, regional
Welfare-related Impacts	Urban, regional

Recommended scales of representativeness appropriate to the criteria pollutants monitored in North Dakota are shown below:

Criteria Pollutant	Spatial Scales
Inhalable Particulate (PM_{10})	micro, middle, neighborhood, urban, regional
Sulfur Dioxide (SO_2)	middle, neighborhood, urban, regional
Ozone (O_3)	middle, neighborhood, urban, regional
Nitrogen Dioxide (NO_2)	middle, neighborhood, urban
Carbon Monoxide (CO)	micro, middle, neighborhood

Using this physical basis to locate sites allows for an objective approach, ensures compatibility among sites, and provides a common basis for data interpretation and application. The annual review process involves an examination of existing sites to evaluate

their monitoring objectives and spatial scale with sites deleted, added, or modified accordingly. Further details on network design can be found in 40 CFR 58, Appendix D.

1.2 General Monitoring Needs

As can be gathered from the prior discussion, each air pollutant has certain characteristics which must be considered when establishing a monitoring site. These characteristics may result from 1) variations in the number and types of sources and emissions in question; 2) reactivity of a particular pollutant with other constituents in the air; 3) local site influences such as terrain and land use; and 4) climatology. The State AAQM network is designed to monitor air quality data for four basic conditions: 1) background monitoring; 2) population exposure; 3) highest concentration; and; 4) long range transport/regional haze. Industrial AAQM network sites are designed to monitor air quality data for source specific highest concentration impacts on an urban scale. Tribal network sites and data are included in this review even though there is only minimal influence on the network operation.

The primary function of the department's four required sites (see Table 1) are to satisfy the six monitoring objectives. Beulah is source impact and population exposure because of the major sources in the vicinity of Beulah. The site is a combination of a down-wind site and between the city and two major source. Fargo NW is population orientated because Fargo is a major population center with PSD sources in the Fargo-Moorhead area. The data from this site is used as input to dispersion models to evaluate permits-to-construct and permits-to-operate for projects located in or near population centers in the eastern part of the state. Dunn Center is the background site. And, TRNP-NU is the regional transport site. The remaining sites are used to support modeling and/or supplement data collected at the required sites.

Before the next network modification plan is completed in January 2004, the need for several sites/parameter combinations will be reviewed. The current list of existing sites/parameters to be reviewed are Dunn Center continuous $PM_{2.5}$ and Bismarck Residential SO_2 and NO_x. Consideration is being given to opening sites at Lostwood National Wildlife Refuge and TRNP - SU along the eastern boundary of the park. If approved, the sites will have SO_2, NO_x, O_3, continuous PM_{10} and $PM_{2.5}$, WS, WD, Temperature, Delta Temperature, and Solar Radiation.

Background sites are chosen to determine concentrations of air contaminants in areas remote from urban sources and generally are sited using the regional spatial scale. This is true for

NO_2 despite the fact that the regional spatial scale is not normally used for NO_2 monitoring. Once a specific location is selected for a site, monitoring sites are established in accordance with the specific probe siting criteria specified in 40 CFR 58, Appendix E.

Since all industrial AAQM network sites are source specific, all the pollutants at industry sites are source oriented on an urban scale. Industrial sites are initially selected using dispersion modeling results and meteorological data. If a particular location is determined not to be practical due to, for example, inaccessibility or power not reasonably available, then sites in a prevailing wind direction are considered. These sites are the most likely locations to have elevated ambient concentrations. The data collected at the industry-operated sites is included in the data summaries for comparison but not included in any discussion of the State ambient monitoring network needs or analysis. Each industry network is an entity unto itself and does not influence the placement of State operated sites.

The Fort Berthold Indian Reservation operates an ambient air quality monitoring network. Since the Department has influence on neither the operation nor maintenance of the network, the data collected are included only to indicate the presence of the sites and reflects the data sent to the Department. The data validity is not certified by inclusion.

The Fort Totten Indian Reservation is in the process of evaluating the need for an ambient air monitoring network along with what parameters and how many sites may be needed. If they establish a network with acceptable quality assurance, the data will be included in our data summaries.

1.3 Monitoring Objectives

The monitoring objectives of the Department are to track those pollutants that are judged to have the potential for violating either State or Federal Ambient Air Quality Standards and to ensure that those pollutants do not cause significant deterioration of our existing air quality. To accomplish these objectives, the Department operated nine AAQM sites around the State. Seven were SLAMS sites, and two were special purpose monitoring (SPM) sites. There were three industries reporting ambient air quality data to this Department. Table 1 lists each site's type and the parameters monitored. Figure 1 shows the approximate site locations. For the industry networks, each network is represented by a single circle whether there is a single site or multiple sites.

The numbers in the Site Name/Company column in Table 1 and in the '#' column in Tables 2, 5, 7, 9, 13, and 14 correspond to the numbers on the figures. The numbers in the circles correspond to the monitoring site monitoring that pollutant and the squares correspond to the major sources for that particular pollutant.

TABLE 1

AAQM Network Description

Site Name AQS Site #	Type Station	Parameter Monitored[1]	Operating Schedule	Monitoring Objective[2]	Spatial Scale[2]	Date Site/Parameter Began
1 Beulah North 380570004	SLAMS Required PM non-CORE required	$PM_{2.5}$ SO_2, NO_2, O_3, MET NH_3 cont. $PM_{2.5}$ Air Toxics	6th Day cont. cont. cont. 6th Day	Population Exposure Population Exposure General Background[3] Population Exposure Population Exposure	Neighborhood Neighborhood Regional Neighborhood Neighborhood	12/98 04/80 11/00 10/00 04/99
2 Bismarck Residential 380150003	SLAMS PM non-CORE required	$PM_{2.5}$ $PM_{2.5}$ Speciation PM_{10}	3rd Day 6th Day 6th Day	Population Exposure	Urban	12/98 1/01 1/01
3 Dunn Center 380250003	SLAMS Required	SO_2, NO_2, O_3, MET	cont.	General Background	Regional	10/79
4 Fargo NW 380171004	SLAMS Required PM non-CORE required	SO_2, NO_2, O_3, MET cont. $PM_{2.5}$ PM_{10} $PM_{2.5}$ $PM_{2.5}$ Speciation	cont. cont. 3rd Day 3rd Day 3rd Day	Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure	Urban Urban Urban Urban Urban	05/98 7/00 05/98 12/98 7/01
5 Hannover 380650002	SLAMS	SO_2, NO_2, O_3, MET	cont.	General Background	Regional	10/84
6 Mandan Refinery - SPM 380590002	SPM	SO_2, MET	cont.	Source Impact	Neighborhood	12/95
7 Mandan Refinery NW - SPM 380590003	SPM	SO_2, MET	cont.	Source Impact	Neighborhood	09/98
8 TRNP - NU 380530002	SLAMS Required	SO_2, NO_2, O_3, MET cont. $PM_{2.5}$ PM_{10} $PM_{2.5}$ $PM_{2.5}$ Speciation	cont. cont. 6th Day 6th Day 6th Day	Long range Transport	Regional	8/01
9 TRNP - SU 380070002	SLAMS	SO_2, O_3 MET $PM_{2.5}$	cont. 6th Day	General Background	Regional	07/98 6/00
Tribal	**Site Name** AQS Site #					
10 Three Affiliated Tribes	Dragswolf 380530108	PM_{10} MET	6th Day cont.	General Background	Urban	05/90
11 Three affiliated Tribes	White Shield 380550113	SO_2 PM_{10} MET	cont. 6th Day cont.	Source Impact Source Impact	Urban Urban	07/90
Company	**Site Name** AQS Site #					
12 Amerada Hess Corporation	TIOGA #1 381050103 TIOGA #3 381050105	SO_2 SO_2	cont. cont.	Source Impact Source Impact	Urban Urban	07/87 11/87
13 Bear Paw Energy, Inc.	MGP #3 380530104 MGP #5 380530111	SO_2, MET SO_2, MET	cont. cont.	Source Impact Source Impact	Urban Urban	11/94 05/94
14 Dakota Gasification Company	DGC #12 380570102 DGC #14 380570118 DGC #16 380570123 DGC #17 380570124	SO_2, NO_2, MET SO_2 SO_2 SO_2, NO_2	cont. cont. cont. cont.	Source Impact Source Impact Source Impact Source Impact	Urban Urban Urban Urban	01/80 01/89 10/95 10/95

1. MET refers to meteorological and indicates wind speed and wind direction monitoring equipment.
2. Not applicable to MET.
3. This analyzer will serve a dual role of population exposure and general background

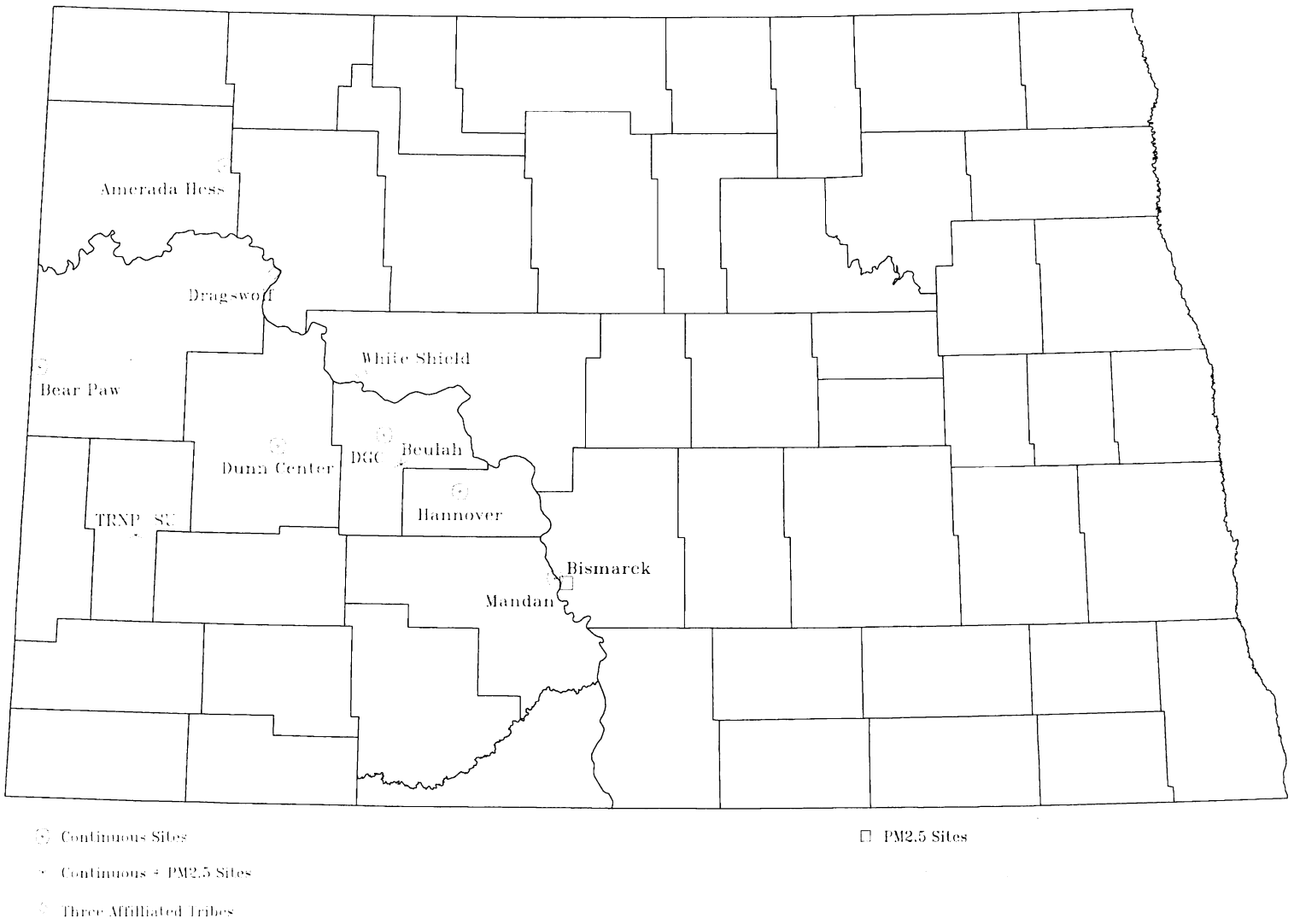

Figure 1 North Dakota Ambient Air Quality Monitoring Sites

2.0 AMBIENT AIR MONITORING NETWORK COVERAGE

The state of North Dakota is attainment for all criteria pollutants. As such, there are no "problem areas" in the general sense of the term. However, there are areas of concern where the Department has established monitoring sites to track the emissions of specific pollutants from point sources. Also, three major sources maintained monitoring networks in the vicinity of their plants (see Table 1 and Figure 1).

2.1 Sulfur Dioxide

Energy development in the west and west-central portions of North Dakota has produced a number of sources of sulfur dioxide (SO_2). These sources include coal-fired steam-powered electrical generating facilities, a coal gasification plant, natural gas processing plants, an oil refinery, and flaring at oil/gas well sites. As a result, SO_2 is one of the Department's major concerns in regard to ambient air quality monitoring.

2.1.1 Point Sources

The major SO_2 point sources (>100 TPY) are listed in Table 2 along with their emissions from the emissions inventories reported to the Department. Figure 2 shows the approximate locations of these facilities (the numbers correspond to the site and source tables). Figure 2A shows the contribution of point sources to the total SO_2 emissions.

2.1.2 Other Sources

The western part of the State has a number of potential SO_2 sources associated with the development of oil and gas. These sources include individual oil/gas wells, oil storage facilities, and compressor stations. Emissions from such sources can create two problems. First, these sources may directly emit significant amounts of hydrogen sulfide (H_2S) to the ambient air (see Section 2.7). Second, flaring the H_2S from these sources can create significant concentrations of SO_2 in the ambient air. The primary counties for these sources in western North Dakota are outlined in green on Figure 2. Figure 2A shows the contribution of "Other Point Sources" that consists of DGC, refineries, gas processing plants, and agriculture processing plants.

TABLE 2

Major SO_2 Sources

(>100 TPY)

2002

#	Company	Source	County	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Basin Electric Power Cooperative	Leland Olds Station	Mercer	47399	30.29%	3805700001
2	Minnkota Power Cooperative, Inc.	M R Young Station	Oliver	28565	18.25%	3806500001
3	Great River Energy	Coal Creek Station	McLean	24428	15.61%	3805500017
4	Otter Tail Power Company	Coyote	Mercer	14073	8.99%	3805700012
5	Basin Electric Power Cooperative	Antelope Valley Station	Mercer	13863	8.86%	3805700011
6	Great River Energy	Stanton Station	Mercer	9648	6.17%	3805700004
7	Dakota Gasification Co.	Plant	Mercer	6264	4.00%	3805700013
8	Tesoro Refining and Marketing Company	Refinery	Morton	4592	2.93%	3805900003
9	Montana Dakota Utilities Co.	RM Heskett Station	Morton	2811	1.80%	3805900001
10	Amerada Hess Corporation	Tioga Gas Plant	Williams	1605	1.03%	3810500004
11	University of North Dakota	Heating Plant & Incinerator (HMIWI)	Grand Forks	641	0.41%	3803500003
12	American Crystal Sugar	Drayton Plant	Pembina	503	0.32%	3806700003
13	American Crystal Sugar	Hillsboro Plant	Traill	479	0.31%	3809700019
14	Bear Paw Energy,LLC	Lignite Gas Plant	Burke	426	0.27%	3801300071
15	North Dakota State University	Heating Plant	Cass	338	0.22%	3801700005
16	Petro-Hunt, LLC	Little Knife Gas Plant	Billings	283	0.18%	3800700002
17	ADM Corn Processing - Walhalla	Ethanol Plant	Pembina	220	0.14%	3806700004
18	Bear Paw Energy,LLC	Grasslands Plant	McKenzie	199	0.13%	3805300023
19	Minn-Dak Farmers Cooperative	Wahpeton Plant	Richland	149	0.10%	3807700026

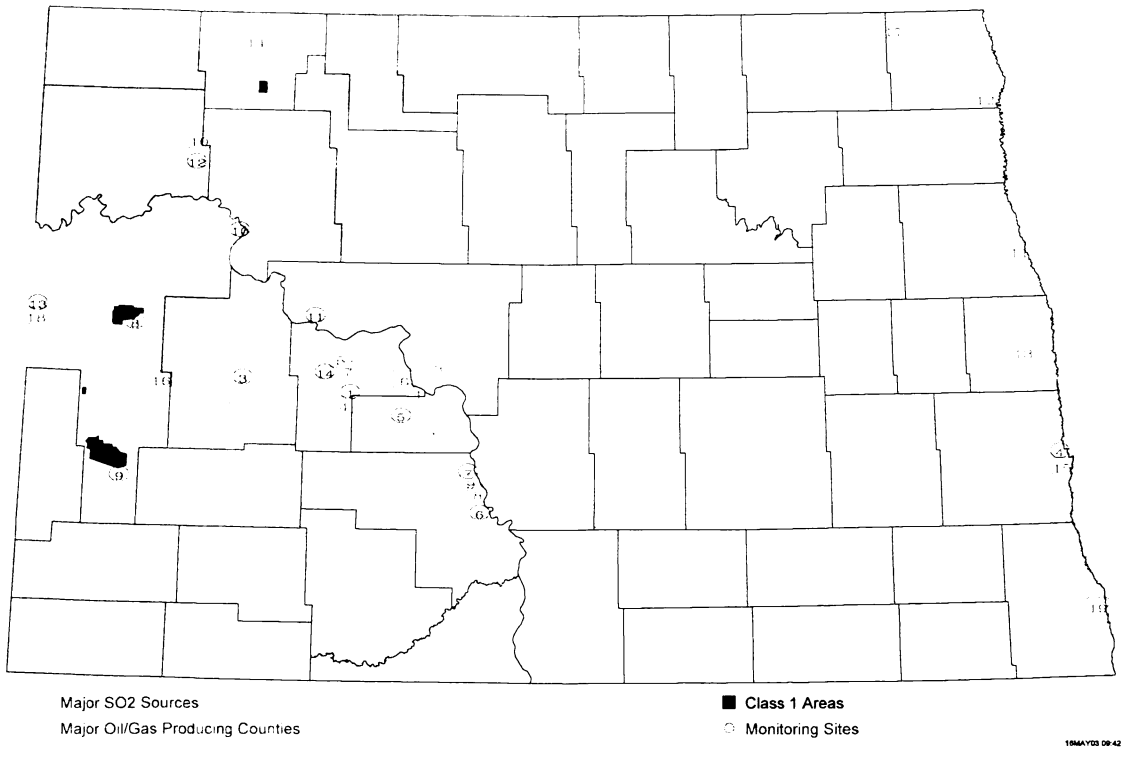

Figure 2 Major Sulfur Dioxide Sources

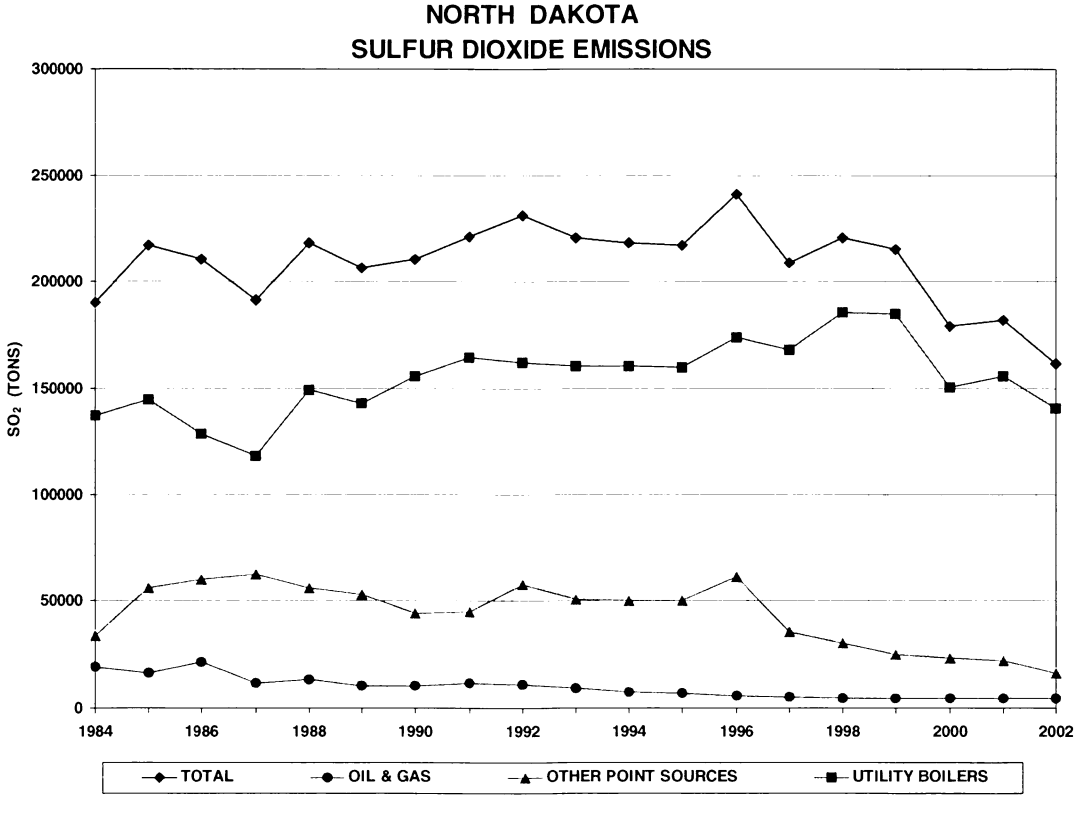

Figure 2A Annual Sulfur Dioxide Emissions

2.1.3 Monitoring Network

The SO_2 monitoring sites are shown on Figure 2. As can be seen, these monitoring sites are concentrated in the vicinity of the oil and gas development in the west and the coal-fired steam electrical generating plants in the central part of the State. Table 3 shows the 2002 annual SO_2 data summaries; Table 4 shows the 5-minute data summary. There were no exceedances of either state or federal SO_2 standards.

2.1.4 Network Analysis

The nine largest SO_2 sources in the state are within 45 miles of both the Beulah and Hannover sites. This makes these two sites very important in tracking the impact of these nine sources on the ambient air. One would expect that as the large sources came on line, beginning in 1980, a noticeable change would be seen on the ambient air quality. This has not been the case. There have been possible short term influences, but no significant long term impact by these nine sources combined. Figures 3, 4, 5, and 6, present a 23-year view of the percentage of data greater than the minimum detectable value (MDV), 1-hour maximums, 3-hour maximums, and 24-hour maximums, for the state operated sites. Because the industry sites are sited specifically for maximum expected concentrations (primarily as predicted by dispersion models and secondarily in a downwind direction), the industry sites are not reviewed for particular long term trends.

The best long term indicator of any change in the amount of SO_2 in the ambient air is seen by reviewing the percentages of data points greater than the MDV. Figure 3 presents this data for the active state sites from 1980 through 2001. To calculate valid annual statistics, at least 75% of the data must be greater than the MDV. Therefore, the annual mean is not a valid indicator and, consequently, not addressed.

TABLE 3

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Sulfur Dioxide (PPB)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMA 1 - HOUR 1ST MM/DD:HH	MAXIMA 1 - HOUR 2ND MM/DD:HH	MAXIMA 3 - HOUR 1ST MM/DD:HH	MAXIMA 3 - HOUR 2ND MM/DD:HH	MAXIMA 24 - HOUR 1ST MM/DD	MAXIMA 24 - HOUR 2ND MM/DD	ARITH MEAN	1HR #>273	24HR #>99	% >MDV
Amerada Hess - Tioga #1	2002	JAN-DEC	8652	140 10/24:02	134 10/25:03	85 10/24:02	72 10/24:05	47 10/24	15 10/23	1.7			11.4
Amerada Hess - Tioga #3	2002	JAN-DEC	8510	118 10/22:06	115 12/18:12	82 10/29:17	73 12/18:14	20 12/18	19 01/13	2.9			18.8
Bear Paw - MGP #3	2002	JAN-DEC	8463	100 04/04:13	54 06/29:17	42 04/04:14	26 06/29:17	7 04/04	6 09/24	1.2			4.6
Bear Paw - MGP #5	2002	JAN-DEC	8686	77 05/17:08	66 06/27:09	27 05/17:08	25 06/22:14	7 06/27	5 06/22	1.2			7.7
Beulah - North	2002	JAN-DEC	8702	131 06/18:14	101 06/18:15	52 06/18:14	44 02/20:20	16 02/20	14 02/14	1.7			17.6
DGC #12	2002	JAN-DEC	8678	76 02/12:06	51 02/20:17	38 02/12:08	31 02/20:20	13 02/20	8 02/12	1.9			22.9
DGC #14	2002	JAN-DEC	8659	68 02/13:09	63 06/20:10	31 01/08:11	28 01/08:05	13 01/08	11 02/13	1.7			14.9
DGC #16	2002	JAN-DEC	8688	62 05/21:04	60 06/17:09	48 05/21:05	40 06/17:11	18 05/21	12 02/20	1.9			16.6
DGC #17	2002	JAN-DEC	8651	110 06/17:10	86 06/22:01	70 06/21:11	54 06/17:11	18 06/21	10 06/17	1.9			24.6
Dunn Center	2002	JAN-DEC	8695	23 01/26:11	21 01/28:11	12 01/26:11	11 04/05:11	3 01/26	3 01/28	1.2			8.1
Fargo NW	2002	JAN-DEC	8479	6 06/16:23	6 12/25:03	6 12/25:05	4 03/10:20	3 12/25	2 02/01	1.0			2.7
Hannover	2002	JAN-DEC	8693	77 07/24:16	67 07/30:08	49 07/24:14	47 07/24:17	14 07/24	10 07/30	1.9			20.3
Mandan - SPM	2002	JAN-DEC	8704	133 02/25:23	125 09/19:05	96 05/03:20	94 01/11:23	33 04/02	32 02/26	4.8			36.1
Mandan NW - SPM	2002	JAN-DEC	8361	100 05/20:21	91 05/20:22	73 05/20:23	63 04/06:02	19 05/20	14 04/06	3.1			34.7
TRNP - NU	2002	JAN-DEC	8700	13 03/14:11	12 03/07:01	9 03/14:11	9 03/14:14	3 03/07	3 03/14	1.1			5.4
TRNP - SU (Painted Canyon)	2002	JAN-DEC	8703	26 10/10:14	15 01/26:16	10 01/26:17	9 10/10:14	5 09/05	3 01/26	1.2			9.8
White Shield	2002	JAN-DEC	8693	37 06/17:13	32 05/07:09	20 06/17:14	19 02/20:17	6 03/11	5 02/20	1.3			10.2

The maximum 1-hour concentration is 140 ppb at Amerada Hess - Tioga #1 on 10/24:02
The maximum 3-hour concentration is 96 ppb at Mandan - SPM on 05/03:20
The maximum 24-hour concentration is 47 ppb at Amerada Hess - Tioga #1 on 10/24

* The air quality standards are:
STATE Standards -
1) 273 ppb maximum 1-hour average concentration.
2) 99 ppb maximum 24-hour average concentration.
3) 23 ppb maximum annual arithmetic mean concentration.

FEDERAL Standards -
1) 500 ppb maximum 3-hour concentration not to be exceeded more than once per year.
2) 140 ppb maximum 24-hour concentration not to be exceeded more than once per year.
3) 30 ppb annual arithmetic mean.

TABLE 4

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : SO_2 5-Minute Averages (ppb)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	5 - M I N U T E M A X I M A 1ST	DATE MM/DD:HH	2ND	DATE MM/DD:HH	3RD	DATE MM/DD:HH	# HOURS >600	% >MDV
Amerada Hess - Tioga #1	2002	JAN-DEC	8652	301	10/24:00	273	10/25:01	249	10/24:02	0	16.9
Amerada Hess - Tioga #3	2002	JAN-DEC	8510	302	10/22:11	280	10/22:06	271	10/29:17	0	31.1
Bear Paw - MGP #3	2002	JAN-DEC	8463	284	03/29:17	227	03/29:12	221	06/23:12	0	11.3
Bear Paw - MGP #5	2002	JAN-DEC	8686	360	06/27:08	283	05/17:08	255	06/27:09	0	16.6
Beulah - North	2002	JAN-DEC	8702	274	06/18:14	221	06/18:15	152	02/14:13	0	26.9
Dunn Center	2002	JAN-DEC	8697	41	01/26:11	35	01/26:12	25	10/21:15	0	15.3
Fargo NW	2002	JAN-DEC	8479	17	02/11:16	12	06/16:23	10	03/26:08	0	6.3
Hannover	2002	JAN-DEC	8693	137	07/18:09	123	07/30:07	105	02/08:22	0	31.3
Mandan - SPM	2002	JAN-DEC	8704	207	09/19:05	191	09/19:04	185	05/03:19	0	47.2
Mandan NW - SPM	2002	JAN-DEC	8361	208	02/17:09	168	06/17:08	164	08/25:09	0	48.2
TRNP - NU	2002	JAN-DEC	8700	18	03/14:11	17	03/07:01	15	10/29:10	0	9.5
TRNP - SU (Painted Canyon)	2002	JAN-DEC	8703	53	10/10:14	32	10/10:15	25	10/09:09	0	16.4

The maximum 5-minute concentration is 360 ppb at Bear Paw - MGP #5 on 06/27:08

* No Standard is currently in effect:

Beginning in 1980, major events are easily traceable. In 1980, the oil industry was expanding. In 1981, Otter Tail Power's Coyote Power Station began operation. In 1982 the oil industry in western North Dakota hit its peak activity. 1983, 1984, and 1985 were startup years for Basin Electric's Antelope Valley Unit #1, the synthetic natural gas plant (aka, Dakota Gasification Company), and Antelope Valley Unit #2, respectively. From 1987 through 1993, for the Beulah and Hannover sites, there was a steady increasing trend in the percentage of data greater than the MDV. However, Hannover showed a decrease from 1993 to 1997 while Beulah continued to increase until 1997. The Beulah - N site began operation in 1998 and has shown a decreasing trend in percentage detectable.

The same patterns seen in Figure 3 are discernable in the 1-hour, 3-hour, and 24-hour maximum concentration graphs (see Figures 4, 5, and 6, respectively). As can be seen from the graphs, in 1998, the Mandan Refinery - SPM site exceeded the state and nearly the Federal 24-hour standard (see Figure 6): The 24-hour average was 143 ppb.

Because the newer sites (Fargo NW, Mandan Refinery - SPM, Mandan Refinery NW - SPM, and TRNP - SU) have a limited amount of data, no attempt is made to evaluate the results.

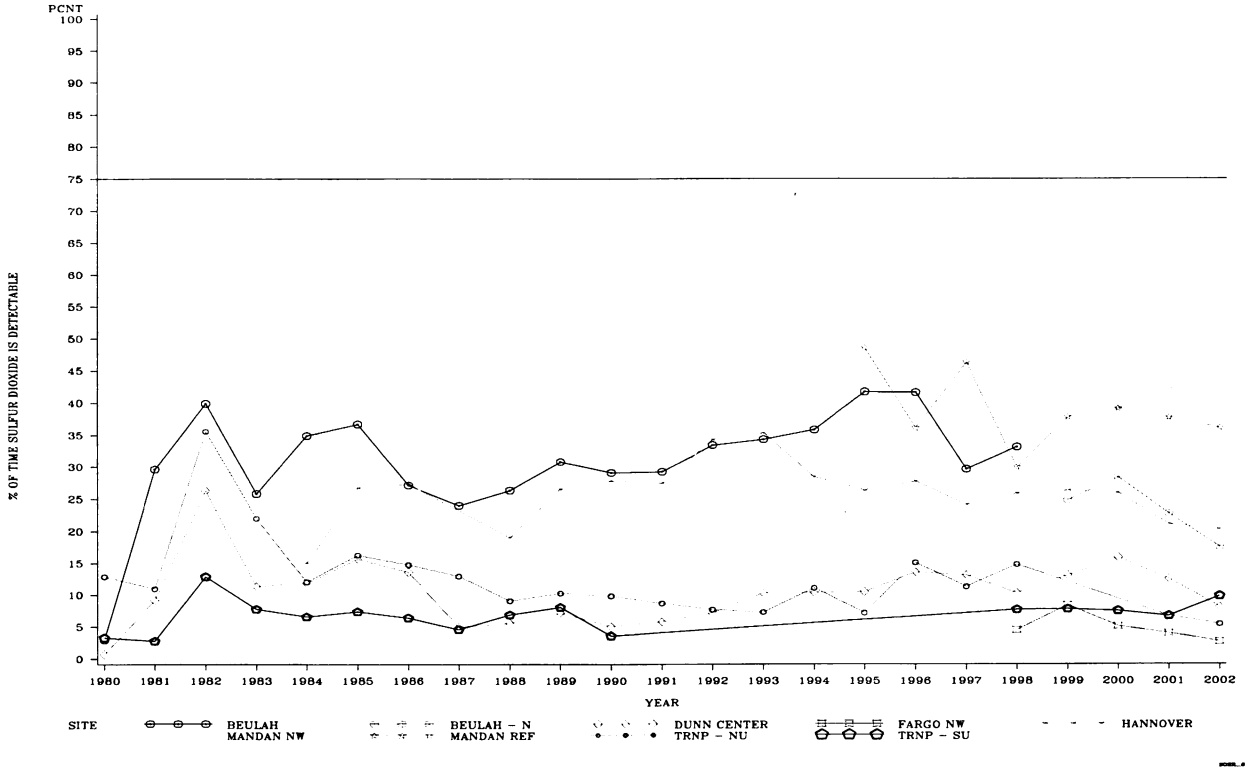

Figure 3 Percentage of Time SO_2 Detectable

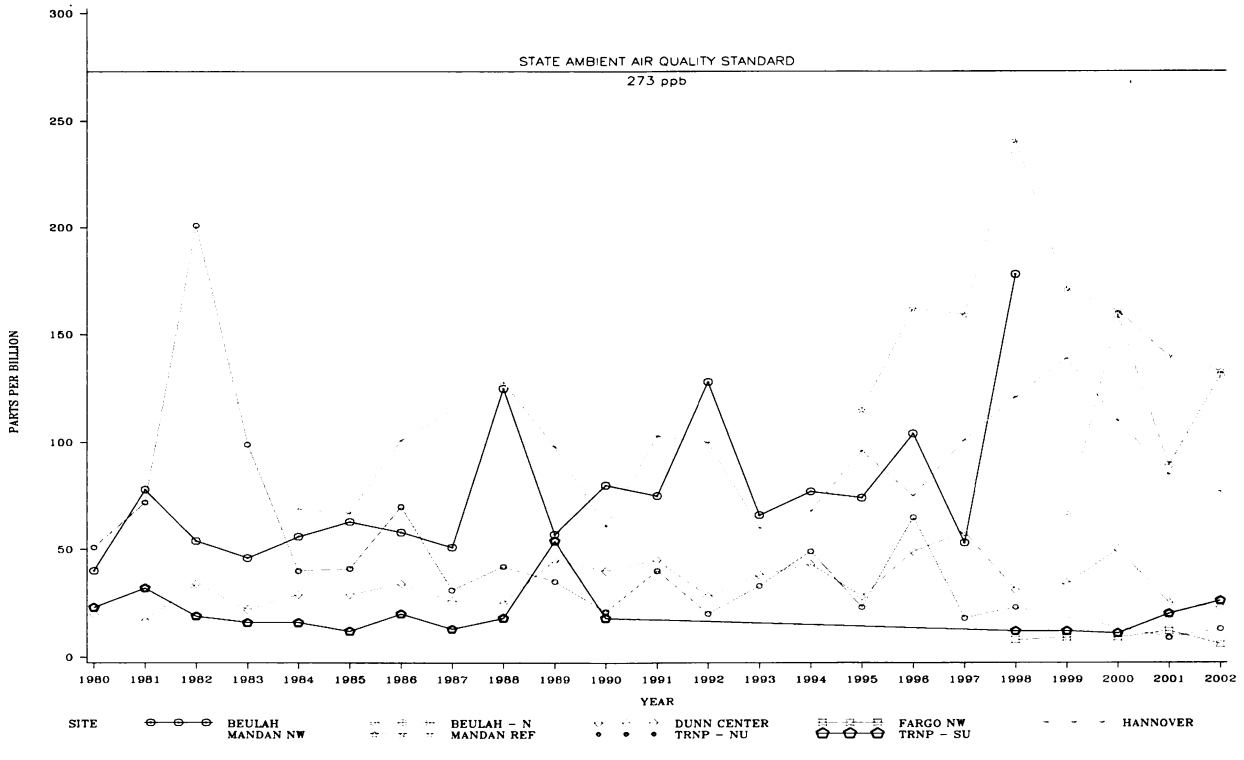

Figure 4 SO_2 Maximum 1-Hour Concentrations

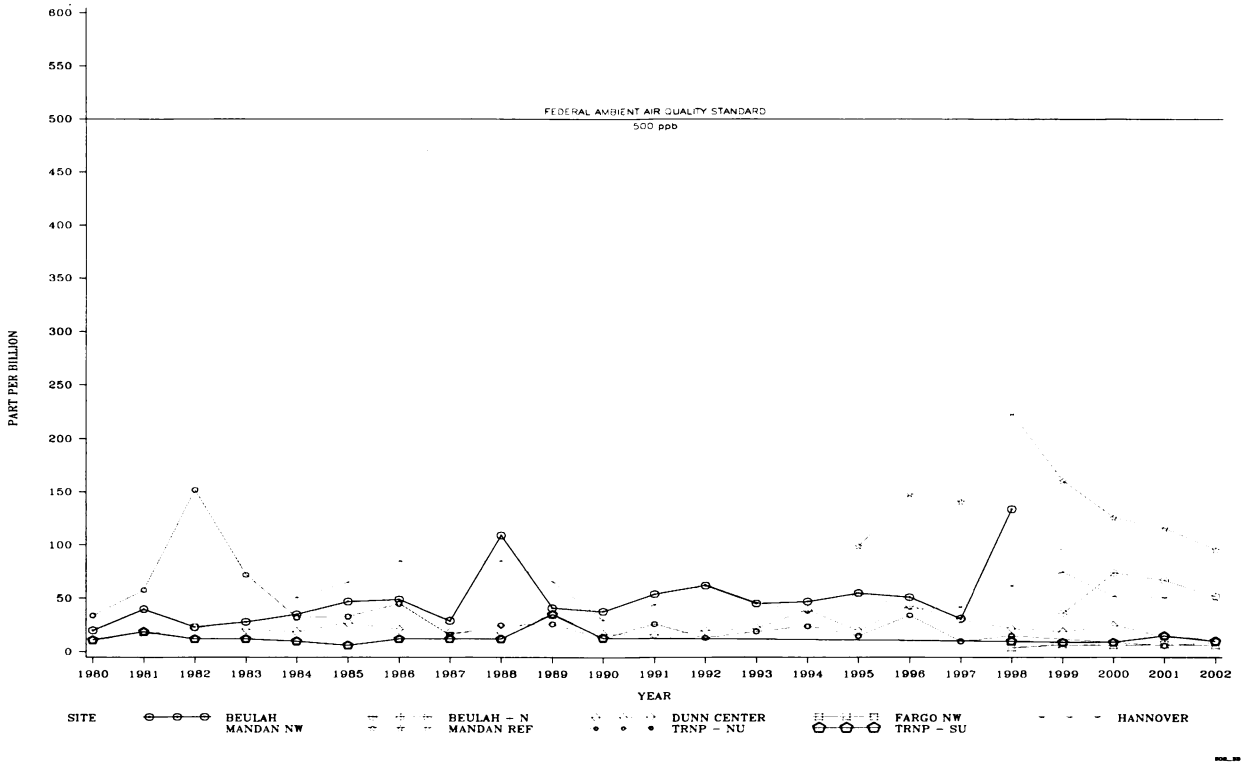

Figure 5 SO_2 Maximum 3-Hour Concentrations

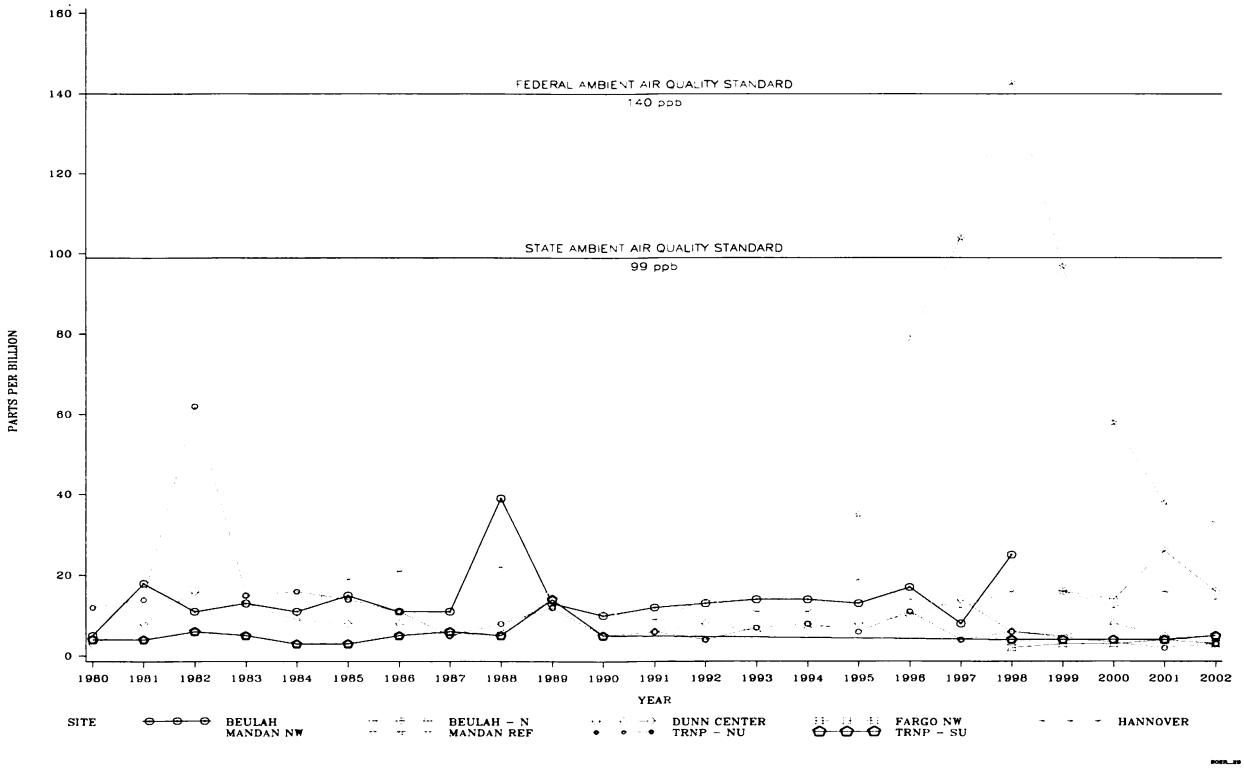

Figure 6 SO_2 Maximum 24-Hour Concentrations

2.2 Oxides of Nitrogen

Oxides of Nitrogen (NO_x) is the term used to represent both nitric oxide (NO) and nitrogen dioxide (NO_2). NO_2 is formed when NO is oxidized in the ambient air. There are no ambient air quality standards for NO.

2.2.1 Point Sources

The major NO_x stationary point sources (>100 TPY) are listed in Table 5 along with their emissions as calculated from the most recent emission inventories reported to the department. Figure 7 shows the approximate locations of these facilities (the numbers correspond to the site and source tables). The larger NO_x point sources in North Dakota are associated with coal-fired steam-powered electrical generating plants in the west-central portion of the State and large internal combustion compressor engines in the natural gas fields in the western part of the State. Figure 7A shows the contribution of point sources to the total NO_2 emissions. The "Point Sources"category consists of Utility Boilers (power plant boilers) and oil and gas wells.

2.2.2 Area Sources

Another source of NO_X is automobile emissions. North Dakota has no significant urbanized areas with regard to oxides of nitrogen; the entire population of the State is less than the 1,000,000 population figure that EPA specifies in the NO_2 requirement for NAMS monitoring. Figure 7A shows the contribution of "Other Point Sources" and "Utility Boilers." The "Other Point Sources" category consists of DGC, refineries, gas processing plants, and agriculture processing plants.

2.2.3 Monitoring Network

The Department currently operates five $NO/NO_2/NO_x$ analyzers. These are located at Beulah, Dunn Center, Fargo, Hannover, and TRNP - NU. The Dakota Gasification Company (DGC) network also operates analyzers at sites DGC #12 and DGC #17. Table 6 shows the 2002 NO_2 data summaries. The measured NO_2 values are quite low, particularly the annual means. From Figure 7 it can be seen that $NO/NO_2/NO_x$ analyzers, except for Dunn Center and TRNP - NU, are well placed with respect to the major NO_x sources: Dunn Center and TRNP - NU are defined as a background site and long range transport/regional haze, respectively.

TABLE 5

Major NO_x Sources
(> 100 TPY)

2002

#	Company	Source	County	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Minnkota Power Cooperative, Inc.	M R Young Station	Oliver	22738	26.68%	3806500020
2	Basin Electric Power Cooperative	Leland Olds Station	Mercer	13647	16.01%	3805700001
3	Otter Tail Power Company	Coyote	Mercer	13041	15.30%	3805700012
4	Basin Electric Power Cooperative	Antelope Valley Station	Mercer	11627	13.64%	3805700011
5	Great River Energy	Coal Creek Station	McLean	10147	11.91%	3805500017
6	Dakota Gasification Co.	Plant	Mercer	3523	4.13%	3805700013
7	Great River Energy	Stanton Station	Mercer	3101	3.64%	3805700004
8	Amerada Hess Corporation	Tioga Gas Plant	Williams	2316	2.72%	3810500004
9	Montana Dakota Utilities Co.	RM Heskett Station	Morton	1068	1.25%	3805900001
10	Tesoro Refining and Marketing Co.	Refinery	Morton	864	1.01%	3805900003
11	American Crystal Sugar	Hillsboro Plant	Traill	460	0.54%	3809700019
12	American Crystal Sugar	Drayton Plant	Pembina	435	0.51%	3806700003
13	Minn-Dak Farmers Cooperative	Wahpeton Plant	Richland	390	0.46%	3807700026
14	University of North Dakota	Heating Plant & Incinerator (HMIWI)	Grand Forks	229	0.27%	3803500003
15	Cavalier AFS	Power Plant	Pembina	196	0.23%	3806700005
16	Bear Paw Energy,LLC	Lignite Gas Plant	Burke	181	0.21%	3801300071
17	Williston Basin Interstate Pipeline Co.	Dickinson Compressor	Stark	180	0.21%	3808900004
18	Northern Border Pipeline Co.	Station #4	McKenzie	172	0.20%	3805300014
19	Amerada Hess Corporation	Antelope Plant No. 2	McKenzie	168	0.20%	3805300045
20	Bear Paw Energy,LLC	Alexander	McKenzie	165	0.19%	3805300024
21	North Dakota State University	Heating Plant	Cass	142	0.17%	3801700005
22	ADM Corn Processing	Ethanol Plant	Pembina	128	0.15%	3806700004
23	Northern Border Pipeline Co.	Station #8	McIntosh	105	0.12%	3805100001
24	Northern Border Pipeline Co.	Station #6	Morton	101	0.12%	3805900007
25	Northern Border Pipeline Co.	Station #5	Dunn	100	0.12%	3802500014

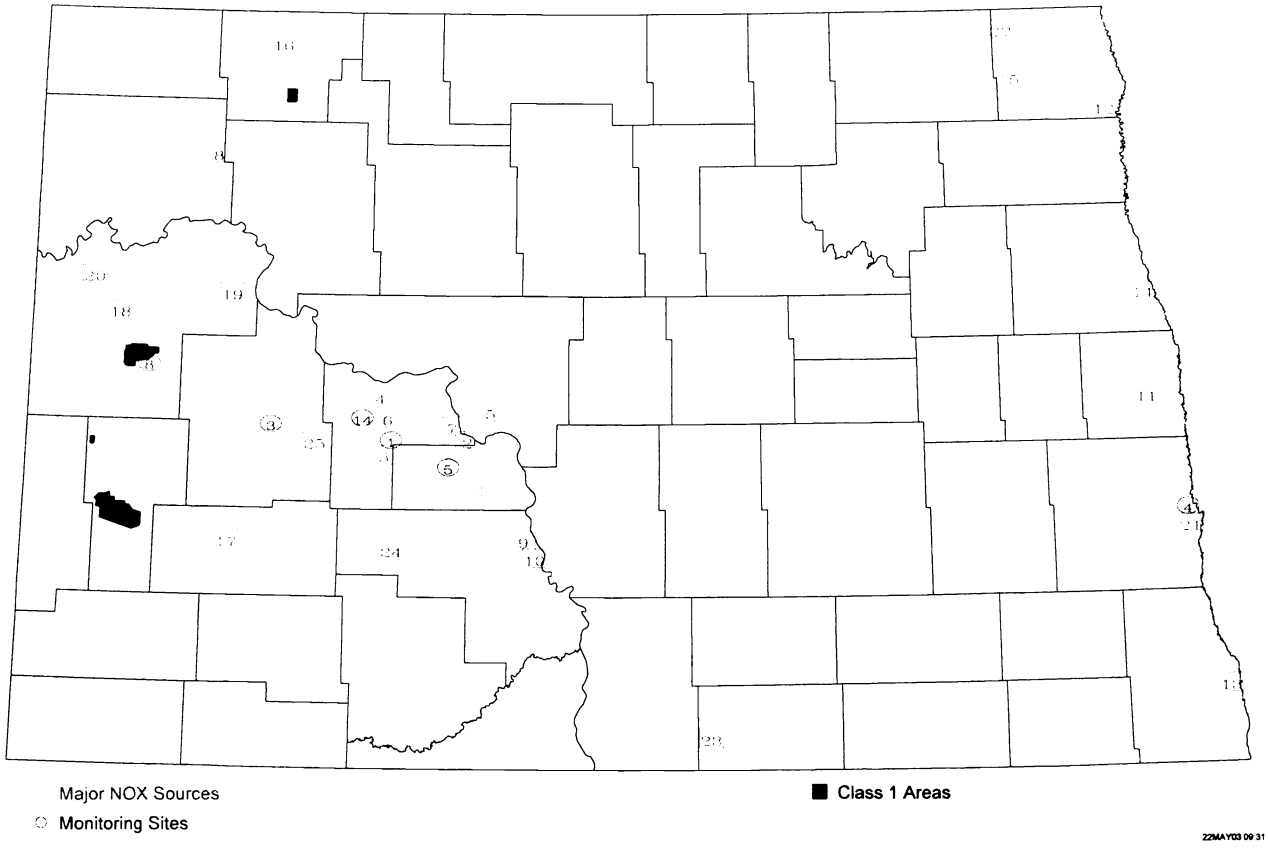

Figure 7 Major Nitrogen Dioxide Sources

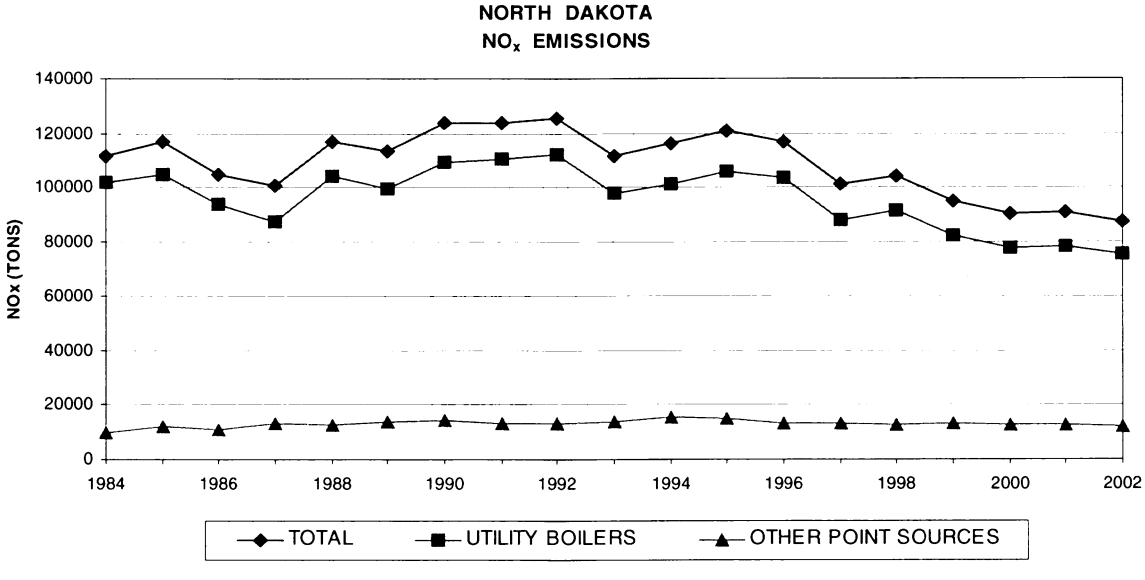

Figure 7A Annual Nitrogen Dioxide Emissions

TABLE 6

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Nitrogen Dioxide (PPB)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMA 1 - HOUR 1ST MM/DD:HH	MAXIMA 1 - HOUR 2ND MM/DD:HH	ARITH MEAN	% >MDV
Beulah - North	2002	JAN-DEC	8478	34 01/31:22	34 02/20:17	3.0	72.5
DGC #12	2002	JAN-DEC	8504	30 01/31:20	30 01/31:21	2.8	64.5
DGC #17	2002	JAN-DEC	8607	29 08/05:22	28 02/03:17	2.3	53.5
Dunn Center	2002	JAN-DEC	8674	18 06/18:12	12 06/28:21	1.7	36.8
Fargo NW	2002	JAN-DEC	8439	37 09/26:18	36 02/01:19	5.6	82.4
Hannover	2002	JAN-DEC	7980	27 12/24:03	26 06/20:22	2.3	52.9
TRNP - NU	2002	JAN-DEC	8679	9 03/14:13	8 03/07:04	1.3	18.8

The maximum 1-hour concentration is 37 ppb at Fargo NW on 09/26:18

* The air quality standards are:
STATE - 53 ppb maximum annual arithmetic mean.

FEDERAL - 53 ppb annual arithmetic mean.

2.2.4 Network Analysis

Nine of the ten largest NO_2 sources in the state are within 45 miles of the Beulah and Hannover monitoring sites. Figures 8 and 9 show the trends for the state operated sites for 1980 - 2002. Since the industry operated sites are placed for maximum concentrations, trends are not considered.

With the exception of Beulah in 1981, the percentage of data greater than the MDV, shown in Figure 8, was reasonably stable until 1993. The significant increase in the percentage of detectable concentrations is contrary to the quantity of NO_2 emitted. In Figure 7A show an increasing, but slow, trend in NO2 emissions from 1980 until 1993. From 1994 until present, there has been a decreasing trend in NO2 emissions. A possible explanation for Hannover is the analyzer was changed in March 1992 from a Meloy 8101C to a TECO 42. However, the analyzer change did not produce a discreet jump: the increase was seen at both the Beulah and Hannover sites. A possible conclusion is the increase in detectable NO_2 concentrations is real and not the result of equipment changes. Another possibility, and more likely, is a change in the wind flow patterns. In 2000, Hannover was the only site that had a decrease in the number of hourly averages less than the minimum detectable value. Fargo NW is the only State site with more then 75% of the possible values greater then the MDV.

If the 1-hour maximum concentrations had followed a pattern similar to the one shown in Figure 8, the equipment change could have accounted for the increase in the percentage of data greater than the MDV. However, the 1-hour maximums, shown in Figure 9, have shown an overall decrease. Since Beulah - N, TRNP-NU, and Dunn Center are relatively new sites, no valid trending is possible.

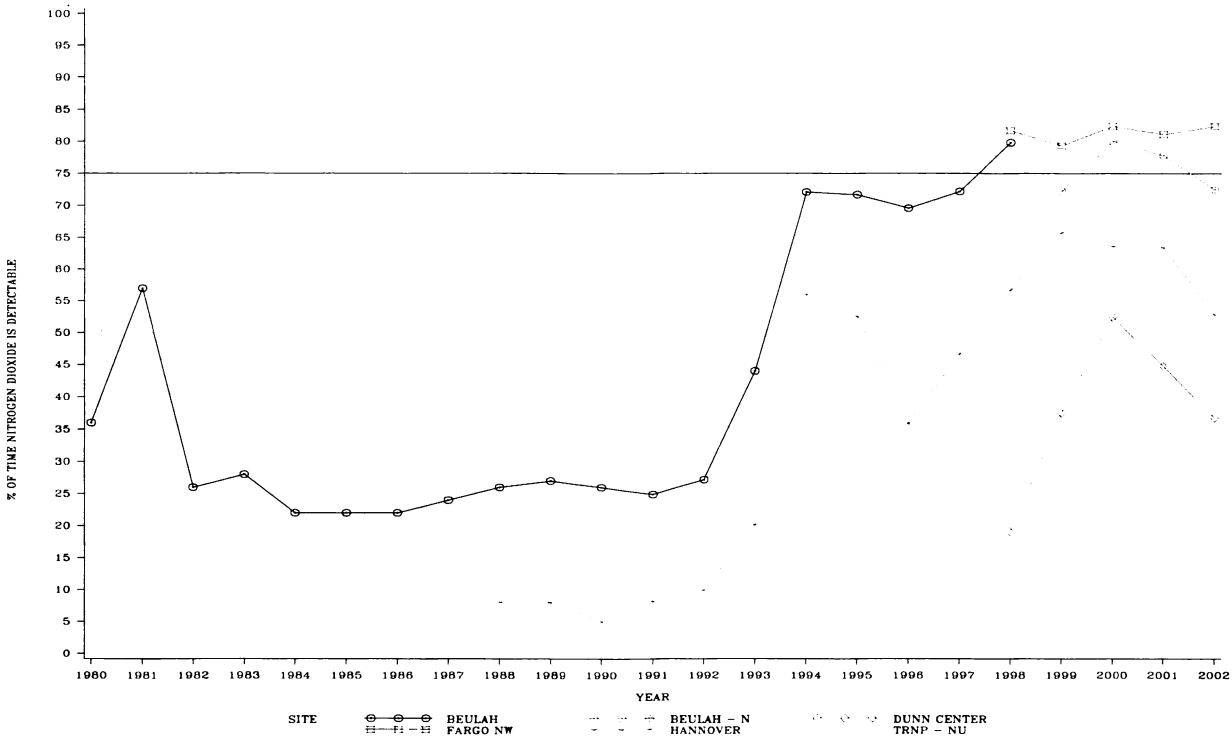

Figure 8 Percentage of Time NO_2 Detectable

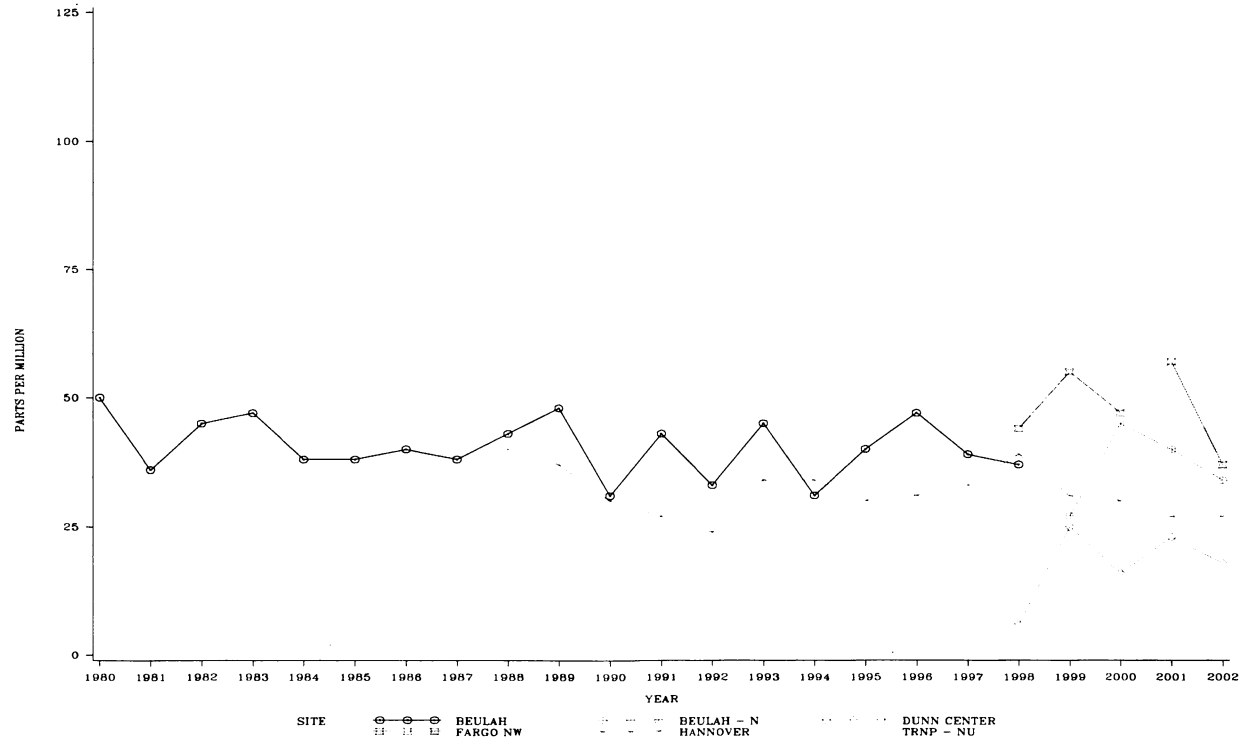

Figure 9 NO_2 Maximum 1-Hour Concentrations

2.3 Ozone

Unlike most other pollutants, ozone (O_3) is not emitted directly into the atmosphere but results from a complex photochemical reaction between volatile organic compounds (VOC), oxides of nitrogen (NO_x), and solar radiation. Both VOC and NO_x are emitted directly into the atmosphere from sources within the State. Since solar radiation is a major factor in O_3 production, O_3 concentrations are known to peak in summer months. 40 CFR 58 defines the O_3 monitoring season for North Dakota as May 1 through September 30. However, O_3 analyzers at all sites collect data year round for use in dispersion modeling.

2.3.1 Point Sources

The major stationary point sources (> 100 TPY) of VOC, as calculated from the most recent emission inventories reported to the Department, are listed in Table 7. Figure 10 shows the approximate locations of these facilities.

2.3.2 Area Sources

Point sources contribute only part of the total VOC and NO_x emissions. The remaining emissions are attributed to mobile sources in urban areas. The EPA has specified a design criteria for selecting NAMS locations for O_3 as any urbanized area having a population of more than 200,000. North Dakota has no urbanized areas large enough to warrant population-oriented monitoring.

TABLE 7

Major VOC Sources
(> 100 TPY)

2002

#	Company	Source	County	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Northern Sun (Division of ADM)	Oil Seed Processing	Ransom	298	16.37%	3807300001
2	Dakota Gasification Co.	Plant	Mercer	295	16.21%	3805700013
3	Minnkota Power Cooperative, Inc.	M R Young Station	Oliver	241	13.24%	3806500020
4	Kaneb Pipe Line Operating Partnership, L.P.	Jamestown Products Terminal	Stutsman	185	10.16%	3809300037
5	Tesoro Refining and Marketing Company	Refinery	Morton	161	8.85%	3805900003
6	Great River Energy	Coal Creek Station	McLean	153	8.41%	3805500017
7	Otter Tail Power Company	Coyote	Mercer	139	7.64%	3805700012
8	ADM Corn Processing	Ethanol Plant	Pembina	130	7.14%	3806700004
9	Basin Electric Power Cooperative	Leland Olds Station	Mercer	111	6.10%	3805700001
10	Basin Electric Power Cooperative	Antelope Valley Station	Mercer	107	5.88%	3805700011

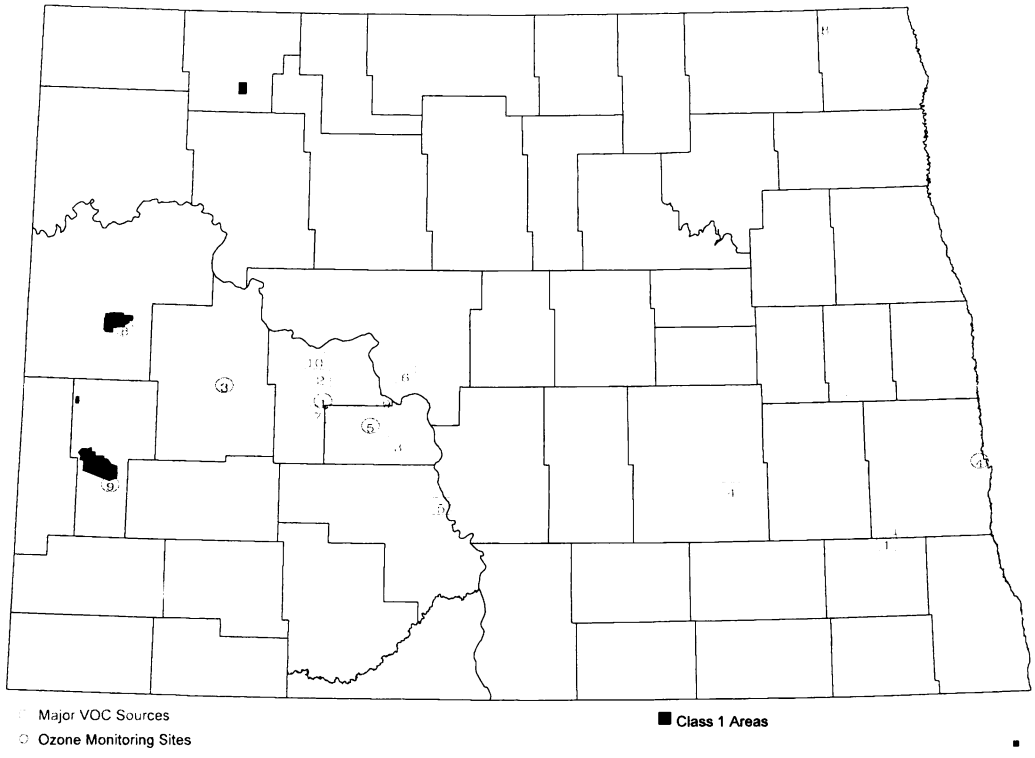

Figure 10 Major VOC Sources

TABLE 8

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Ozone (PPB)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMA 1-HOUR 1ST MM/DD:HH	MAXIMA 1-HOUR 2ND MM/DD:HH	MAXIMA 8-HOUR 1ST MM/DD:HH	MAXIMA 8-HOUR 2ND MM/DD:HH	MAXIMA 8-HOUR 3RD MM/DD:HH	MAXIMA 8-HOUR 4TH MM/DD:HH	1HR #>120	8HR #>80
Beulah - North	2002	JAN-DEC	8709	76 06/28:15	75 06/29:14	68 06/28:10	68 06/29:09	65 05/31:10	65 06/01:09		
Dunn Center	2002	JAN-DEC	8715	70 07/04:15	65 06/01:11	62 06/01:08	61 05/31:08	60 05/21:13	58 04/01:10		
Fargo NW	2002	JAN-DEC	7814	71 06/29:14	67 05/27:14	67 06/29:12	64 05/27:10	62 06/28:11	62 09/01:09		
Hannover	2002	JAN-DEC	8700	69 06/28:14	68 06/26:12	61 06/28:09	61 06/29:09	59 08/07:09	58 05/31:10		
TRNP - NU	2002	JAN-DEC	8706	71 07/04:14	68 06/29:12	63 07/04:11	63 07/19:10	62 06/01:09	60 05/31:09		
TRNP - SU (Painted Canyon)	2002	JAN-DEC	8711	72 06/28:17	70 07/01:13	67 06/28:11	66 07/04:11	63 07/19:09	62 06/29:09		

The maximum 1-hour concentration is 76 ppb at Beulah - North on 06/28:15
The 4th highest 8-hour concentration is 65 ppb at Beulah - North on 06/01:09

* The air quality standards for ozone are:
STATE - 120 ppb not to be exceeded more than once per year.

FEDERAL Standards -
1) 120 ppb maximum 1-hour concentration with no more than one expected exceedance per year.
2) Fourth highest daily maximum 8-hour averages for a 3-year period not to exceed 80 ppb.

*** Less than 80% of the possible samples (data) were collected

2.3.3 Monitoring Network

The state currently has six continuous ozone analyzers in operation. These are at Beulah, Dunn Center, Fargo, Hannover, Theodore Roosevelt National Park - North Unit, and Theodore Roosevelt National Park - South Unit. Table 8 presents 2002 1-hour and 8-hour data summaries. Figure 11 shows the maximum 1-hour averages by month for 2002.

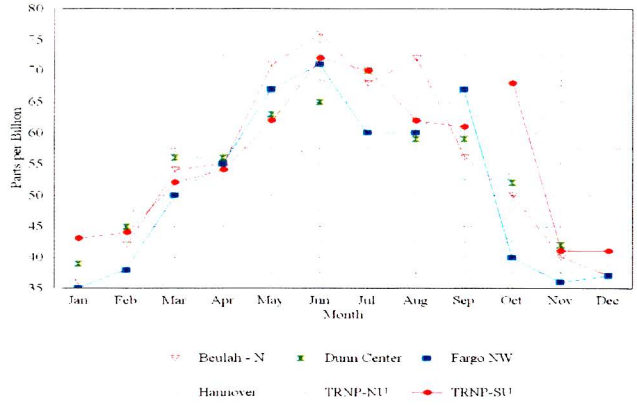

Figure 11 Monthly Maximum Ozone Concentrations

2.3.4 Network Analysis

Only two of the six monitoring sites are in an area not significantly influenced by VOC sources (see Figure 10). Beulah and Hannover are within 45 miles of seven of the ten major VOC sources in the state. TRNP - NU and TRNP-SU are located in a Class I area surrounded by oil fields. Fargo NW is located in Fargo and influenced by city traffic. Dunn Center is located in a rural area surrounded by crop land. With this diversity of site locations and influences, one would expect to see a diversity of ozone concentrations. On the contrary, Figure 12 shows a significant similarity among the maximum 1-hour concentrations. Since 1980, there have been only four hours of data collect higher than 80 ppb and none of these exceeded 100 ppb. Another, even stronger, indication of a uniform ozone distribution is the 8-hour concentrations: for all sites, the difference between the highest and 4th highest concentrations are within 5 ppb (see Table 8).

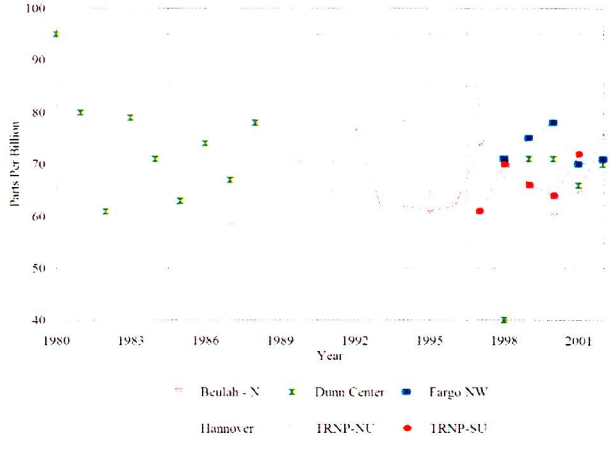

Figure 12 Annual Maximum Ozone Concentrations

2.4 Inhalable Particulates

The inhalable particulate standards are designed to protect against those particulates that can be inhaled deep into the lungs and cause respiratory problems. The major designation for inhalable particulates is PM. Within this designation are two subgroups: PM_{10} and $PM_{2.5}$. The PM_{10} particulates have an aerodynamic diameter less than or equal to a nominal 10 microns and are designated as PM_{10}. The $PM_{2.5}$ particulates have an aerodynamic diameter less than or equal to a nominal 2.5 microns and are designated as $PM_{2.5}$.

2.4.1 Sources

The major PM_{10} point sources (>100 TPY) are listed in Table 9 along with their emissions as calculated from the most recent emissions. Figure 13 shows the approximate locations of these facilities (the numbers correspond to the site and source tables). Most of these sources are large coal-fired facilities, and the PM_{10} particles are part of the boiler stack emissions; However, some of the emissions are the result of processing operations. Not included in this table are sources of fugitive dust such as coal mines, gravel pits, agricultural fields, and unpaved roads. Figure 13A shows the contribution of point sources to the total PM_{10} emissions. The "Utility Boilers"category consists of power plant boilers. The "Other Point Sources" category consists of DGC, refineries, gas processing plants, and agriculture processing plants.

2.4.2 Monitoring Network

The State operates three PM_{10} samplers, five FRM $PM_{2.5}$ samplers, and three speciation samplers. Data from the two Three Affiliated Tribes sites, Dragswolf and White Shield, are included for informational purposes only. Table 10 shows the inhalable PM_{10} particulate data summary, Table 11 shows the FRM $PM_{2.5}$ particulate data summary and Table 12 shows the continuous $PM_{2.5}$ particulate data summary.

R&P single-day samplers are installed at Beulah, TRNP - SU, and TRNP - NU. And, R&P sequential samplers were installed at Bismarck, Fargo, and Grand Forks. A duplicate single-day sampler is co-located at Beulah.

TABLE 9

Major PM_{10} Sources
(> 100 TPY)

2002

#	Company	Source	County	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Great River Energy	Coal Creek Station	McLean	1724	32.78%	3805500017
2	Basin Electric Power Cooperative	Leland Olds Station	Mercer	642	12.21%	3805700001
3	Basin Electric Power Cooperative	Antelope Valley Station	Mercer	639	12.15%	3805700011
4	Tesoro Refining and Marketing Company	Tesoro Mandan Refinery	Morton	634	12.05%	3805900003
5	Minnkota Power Cooperative, Inc.	M R Young Station	Oliver	391	7.43%	3806500020
6	Dakota Gasification Co.	Plant	Mercer	308	5.86%	3805700013
7	Otter Tail Power Company	Coyote	Mercer	254	4.83%	3805700012
8	American Crystal Sugar	Drayton Plant	Pembina	244	4.64%	3806700003
9	American Crystal Sugar	Hillsboro Plant	Traill	170	3.23%	3809700019
10	Great River Energy	Stanton Station	Mercer	133	2.53%	3805700004
11	Minn-Dak Farmers Cooperative	Wahpeton Plant	Richland	121	2.30%	3807700026

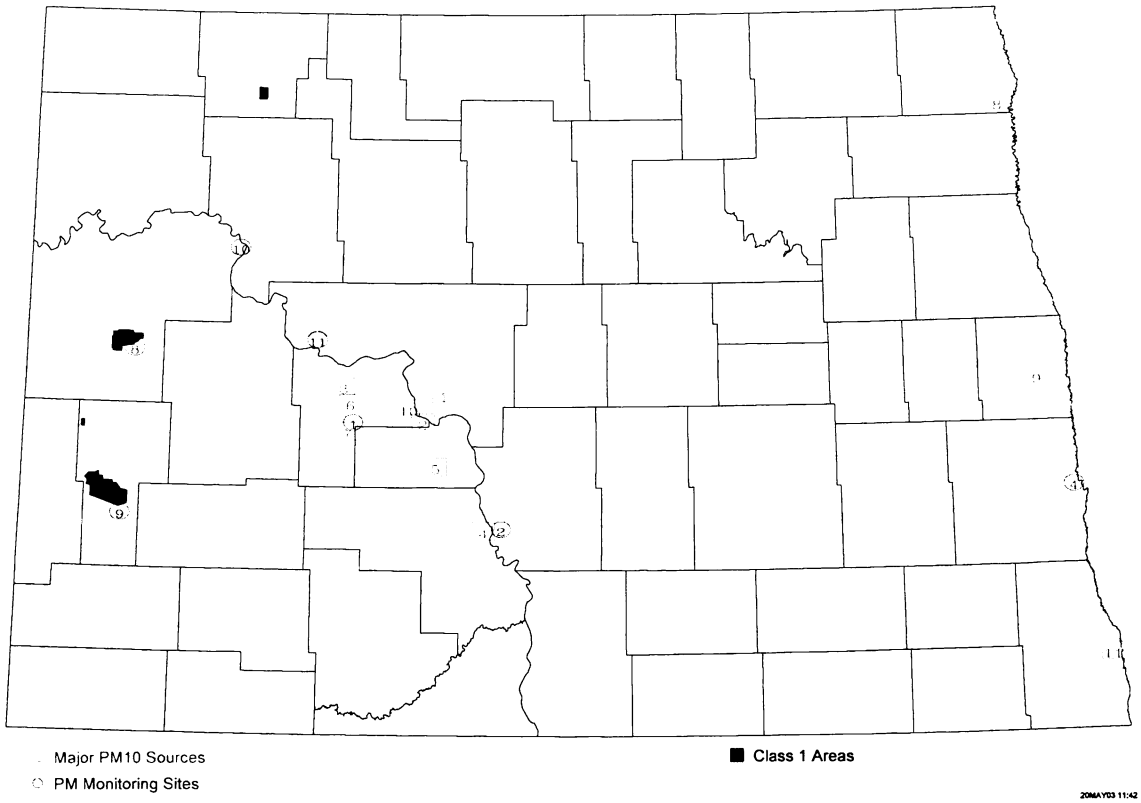

Figure 13 Major PM_{10} Sources

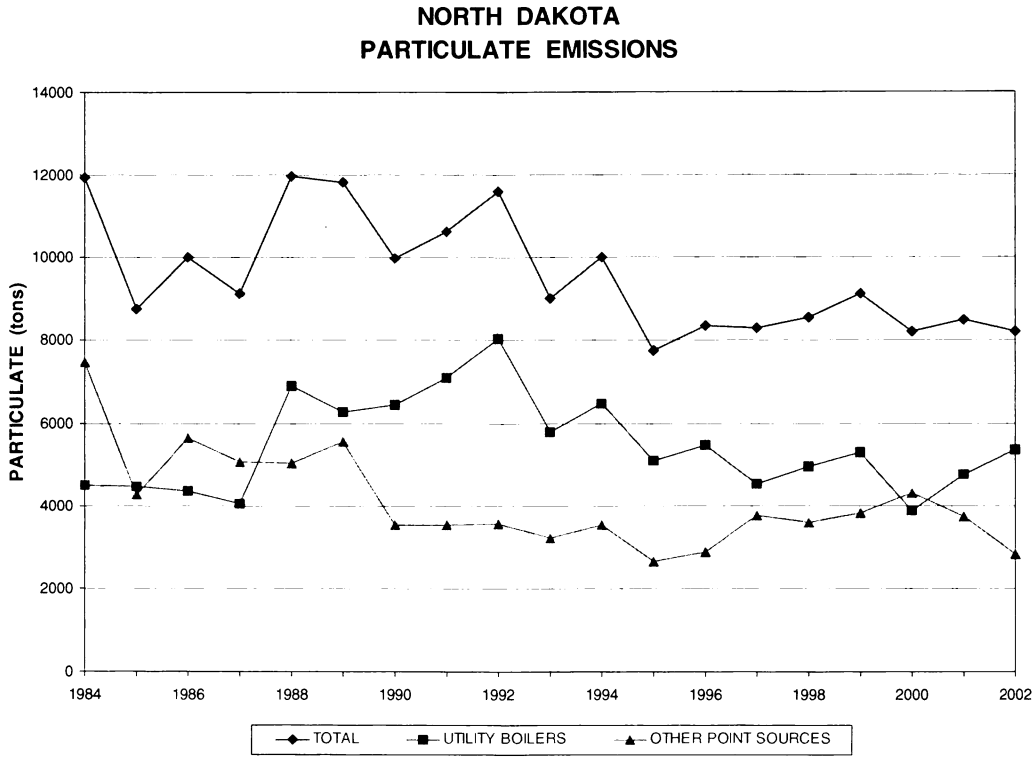

Figure 13A Annual PM Emissions

TABLE 10

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Inhalable PM_{10} Particulates ($\mu g/m^3$)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MIN	MAXIMA 1ST MM/DD	MAXIMA 2ND MM/DD	MAXIMA 3RD MM/DD	ARITH MEAN	#>150	AM>50	% >MDV
Bismarck Residential	2002	JAN-DEC	61	5.0	72.0 04/14	41.0 09/05	36.0 06/01	18.4			100.0
Dragswolf	2002	JAN-DEC	57	0.6	18.9 09/17	18.5 12/16	18.4 06/07	7.0			70.2
Fargo NW	2002	JAN-DEC	118	1.0	149.0 03/27	51.0 06/28	45.0 06/07	17.8			98.3
TRNP - NU	2002	APR-DEC	39	2.0	30.0 09/05	26.0 05/20	26.0 09/17	10.8			97.4
White Shield	2002	JAN-DEC	58	0.7	26.6 06/01	22.3 04/14	17.0 12/16	8.1			79.3

The maximum 24-hour concentration is 149.0 $\mu g/m^3$ at Fargo NW on 03/27

* The STATE and FEDERAL air quality standards are:
1) 150 $\mu g/m^3$ maximum averaged over a 24-hour period with no more than one expected exceedance per year.
2) 50 $\mu g/m^3$ expected annual arithmetic mean.

TABLE 11

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : FRM $PM_{2.5}$ Particulates ($\mu g/m^3$)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MIN	MAXIMA 1ST MM/DD	MAXIMA 2ND MM/DD	MAXIMA 3RD MM/DD	ARITH MEAN	#>150	AM>50	% >MDV
Beulah - North	2002	JAN-DEC	61	0.9	15.5 06/01	15.5 12/16	14.9 01/26	5.9			95.1
Bismarck Residential	2002	JAN-DEC	115	1.2	18.3 02/01	15.9 03/18	15.5 07/16	6.4			98.3
Fargo NW	2002	JAN-DEC	118	0.7	23.4 02/01	21.2 07/19	21.0 07/16	7.4			95.8
TRNP - NU	2002	JAN-DEC	59	1.0	17.8 01/26	12.8 07/19	10.5 09/05	5.3			94.9
TRNP - SU (Painted Canyon)	2002	JAN-DEC	58	1.0	17.9 01/26	9.2 08/06	9.1 07/19	4.1			82.8

The maximum 24-hour concentration is 23.4 $\mu g/m^3$ at Fargo NW on 02/01

* The ambient air quality standards are:
FEDERAL Standards -
1) 24-hour: 3-year average of 98th percentiles not to exceed 65 $\mu g/m^3$.
2) Annual: 3-year average not to exceed 15$\mu g/m^3$.

Table 12

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Continuous $PM_{2.5}$ ($\mu g/m^3$)

				MAXIMA								
				1 - HOUR		24 - HOUR						
LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	1ST MM/DD:HH	2ND MM/DD:HH	1ST MM/DD	2ND MM/DD	3RD MM/DD	4TH MM/DD	MEAN	1HR #>150	24HR #>65
Beulah - North	2002	JAN-DEC	8729	145.4 07/24:10	124.4 02/03:17	28.3 02/03	23.9 07/24	17.8 06/01	17.8 08/07	6.4		
Fargo NW	2002	JAN-DEC	8501	55.3 06/27:22	43.4 11/07:18	21.3 08/31	20.4 07/16	17.4 06/28	17.2 07/19	4.4		
Hannover	2002	OCT-DEC	2200	49.7 12/23:17	48.5 12/23:09	19.3 12/23	11.2 11/03	11.2 11/08	11.0 11/12	5.7		
TRNP - NU	2002	OCT-DEC	2140	29.3 12/02:08	25.3 10/28:09	9.1 10/28	8.6 11/14	8.5 12/17	8.2 10/20	4.8		

The maximum 1-hour concentration is 145.4 $\mu g/m^3$ at Beulah - North on 07/24:10
The highest 24-hour concentration is 28.3 $\mu g/m^3$ at Beulah - North on 02/03

* The ambient air quality standards are:
FEDERAL Standards -
1) 24-hour: 3-year average of 98th percentiles not to exceed 65 $\mu g/m^3$.
2) Annual: 3-year average not to exceed 15 $\mu g/m^3$.

2.4.3 PM_{10} Network Analysis

Since PM_{10} and smaller particles are of concern mainly because of their effects on people, two sites are located in population centers, Bismarck and Fargo. One site, TRNP - NU, is in a Class I area, which is used for background data.

2.4.4 $PM_{2.5}$ Network

The $PM_{2.5}$ network currently has five sites with six samplers. Bismarck, Fargo and Beulah are non-CORE required sites. Bismarck and Fargo operate on a 1-in-3 day schedule and Beulah on a 1-in-6 day schedule with a duplicate sampler. TRNP - SU and TRNP - NU operate on a 1-in-6 day schedule.

The intent of the TEOMs is to begin using these analyzers as the primary data source and use a FRM sampler only for quality assurance purposes. As the $PM_{2.5}$ samplers are replaced or removed from service, some will be converted to PM_{10} samplers and used along with speciation samplers to collect a data set comparable to the IMPROVE samplers. This is expected to provide data that can be used in the regional haze/visibility determinations.

2.4.5 Speciation Network

Speciation samplers are installed in Bismarck, TRNP - NU, and a National Trends Network sampler in Fargo. The goal of the two state-selected sites is to supplement the data collected by the two IMPROVE samplers: TRNP - SU and Lostwood. With the combined data, it is expected the Department will be able to make a better assessment of the current visibility and track improvement over time. The data collected is added to the AQS database by RTI. .

2.5 Carbon Monoxide

Many large urban areas in the United States have problems attaining the NAAQS for carbon monoxide (CO) where the primary source of CO is automobiles. North Dakota does not have sufficient population with the corresponding traffic congestion and geographical/meteorological conditions to create significant CO emission problems. However, there are several stationary sources in the State that emit more than 100 TPY of CO.

2.5.1 Sources

The major stationary CO sources (>100 TPY) are listed in Table 13 along with their emissions as calculated from the most recent emissions inventories reported to the department. Figure 20 shows the approximate locations of these facilities (the numbers correspond to the site and source tables). Most of these sources are the same sources that are the major emitters of SO_2 and NO_x. However, the corresponding levels of CO from these sources are considerably lower.

2.5.2 Monitoring Network

Carbon monoxide monitoring in North Dakota was terminated March 31, 1994, after 5 years of operation. The conclusion drawn from the data was that North Dakota did not have a CO problem. A summary report of the data collected at the West Acres Shopping Mall was drafted for the Fargo-Moorhead Council of Governments for use in their traffic planning program.

TABLE 13

Major CO Sources
(> 100 TPY)

2002

#	Company	Source	County	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Dakota Gasification Co.	Plant	Mercer	1960	18.50%	3805700013
2	Great River Energy	Coal Creek Station	McLean	1908	18.01%	3805500017
3	Minnkota Power Cooperative, Inc.	M R Young Station	Oliver	1100	10.39%	3806500020
4	Otter Tail Power Company	Coyote	Mercer	756	7.14%	3805700012
5	Minn-Dak Farmers Cooperative	Wahpeton Plant	Richland	703	6.64%	3807700026
6	American Crystal Sugar	Hillsboro Plant	Traill	684	6.46%	3809700019
7	Basin Electric Power Cooperative	Antelope Valley Station	Mercer	670	6.33%	3805700011
8	Amerada Hess Corporation	Gas Plant	Williams	528	4.98%	3810500004
9	Basin Electric Power Cooperative	Leland Olds Station	Mercer	465	4.39%	3805700001
10	Tesoro Refining and Marketing Company	Refinery	Morton	458	4.32%	3805900003
11	ADM Processing	Oil Seed Proc	McHenry	306	2.89%	3804900005
12	American Crystal Sugar	Drayton Plant	Pembina	297	2.80%	3806700003
13	Montana Dakota Utilities Co.	RM Heskett Station	Morton	196	1.85%	3805900001
14	ADM Corn Processing	Ethanol Plant	Pembina	167	1.58%	3806700004
15	Great River Energy - SS	Stanton Station	Mercer	144	1.36%	3805700004
16	University of North Dakota	Heating Plant & Incinerator (HMIWI)	Grand Forks	144	1.36%	3803500003
17	Northern Sun (Division of ADM)	Oil Seed Processing	Ransom	106	1.00%	3807300001

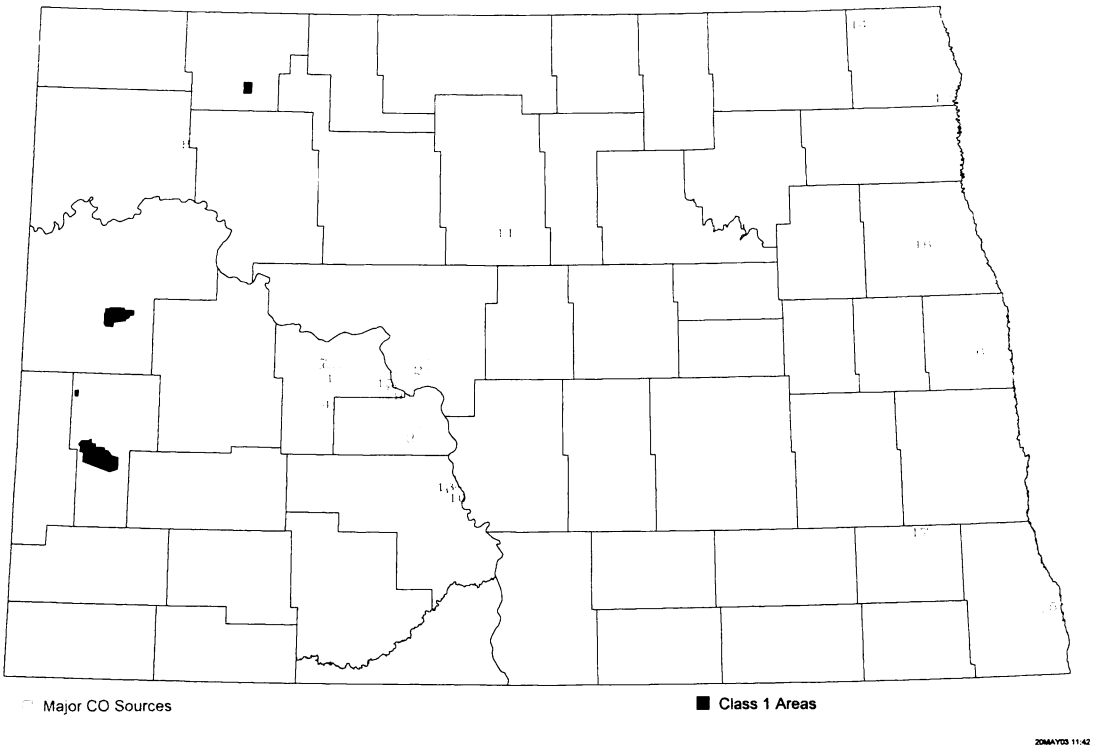

Figure 14 Major CO Sources

2.6 Lead

Through prior sampling efforts, the Department has determined that the State has low lead concentrations (38.6% of the standard) and no significant lead sources. This determination, coupled with the Federal requirement for a NAMS network only in urbanized areas with populations greater than 500,000, resulted in terminating the lead monitoring program effective December 31, 1983. Along with the low monitored concentrations, lead has been completely removed from gasoline since lead monitoring began in 1979.

2.7 Hydrogen Sulfide

Although no Federal Ambient Air Quality Standard exists for hydrogen sulfide (H_2S), the State of North Dakota has developed H_2S standards.

2.7.1 Sources

H_2S emissions of concern stems almost totally from the oil and gas operations in the western part of the State; principally from the green outlined area on Figure 2. Flares and treater stacks associated with oil/gas wells, oil storage tanks, compressor stations, pipeline risers, and natural gas processing plants are potential H_2S emission sources.

2.7.2 Monitoring Network

Currently there are no State or industry H_2S monitoring sites.

2.8 Air Toxics

Air toxics were monitored at Beulah to track air toxics emission at DGC. The data collected is added to the AQS database by ERG.

2.8.1 Sources

The major air toxics sources are listed in Table 14 and Figure 15 shows the approximate locations of these facilities (the numbers correspond to the site and source tables).

Table 14

Major Air Toxics Sources
(>100 TPY)

2002

#	Company	Source	County	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Dakota Gasification Co.	Plant	Mercer	2056	76.95%	3805700013
2	ADM Processing	Oil Seed Proc	McHenry	198	7.41%	3804900005
3	Northern Sun (Division of ADM)	Oil Seed Processing	Ransom	173	6.47%	3807300001
4	Great River Energy	Coal Creek Station	McLean	131	4.90%	3805500017
5	Tesoro Refining and Marketing Company	Refinery	Morton	114	4.27%	3805900003

2.8.2 Monitoring Network

The air toxics network consisted of one site at Beulah - N. The data collected was reviewed and the contractor added the data to the AQS database. Methyl ethyl ketone (MEK) is the only air toxic that produced any results the were of any interest. Based on data provided by DGC, there seems to be a source of MEK other than DGC though it is not clear what that source could be. The expected concentrations based on DGC-provided data are non-detectable (ND). However, typical concentrations are 1-4 ppm with peaks as high as 293 ppm. Since the data is a 24-hour sample, using wind direction to identify the source has been unsuccessful. Several possible sources have been investigated. These sources are the sampler itself, the construction material in the shelter, and the sample train. The conclusion is that the source is an external source we have not been able to identify. The other data, when compared to other sites of similar industrial influence, are comparable to the other sites monitoring at the same time.

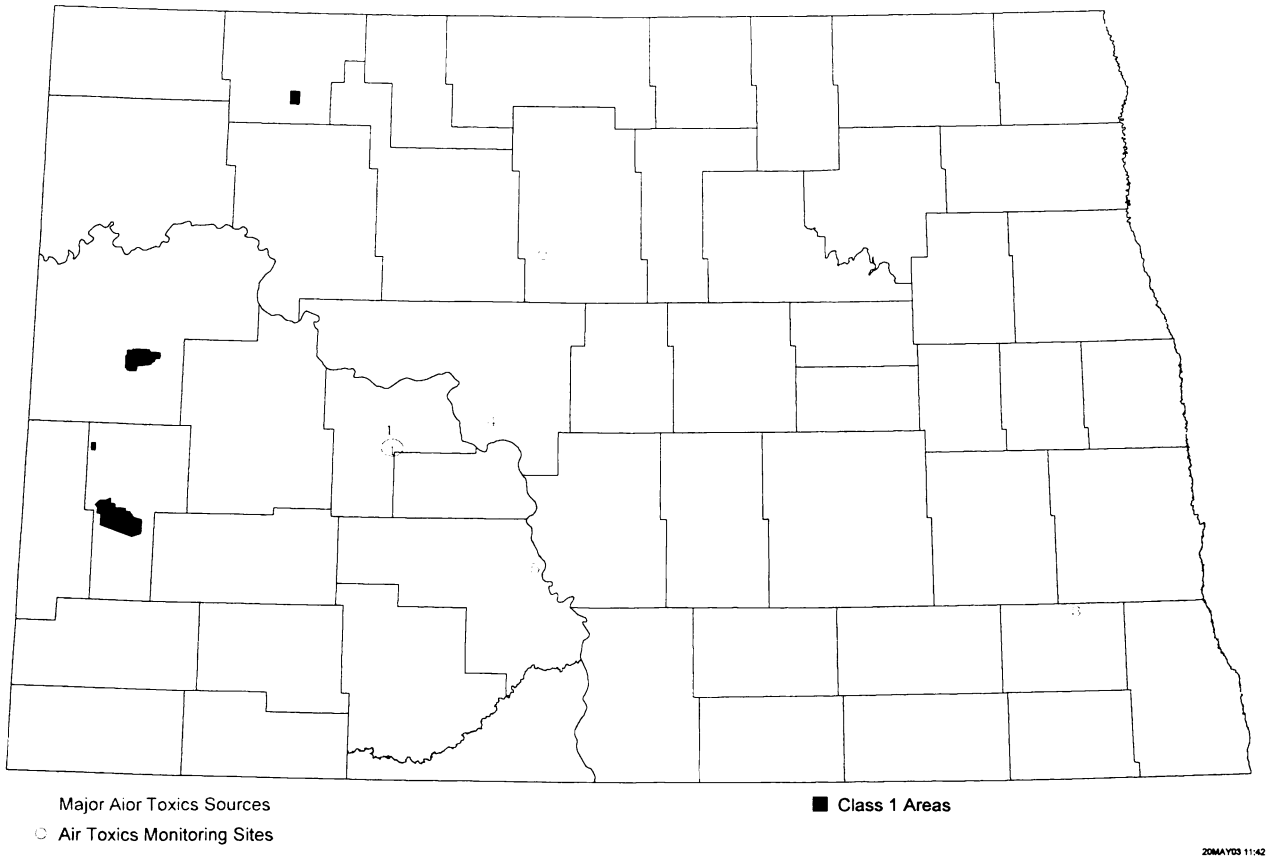

Figure 15 Major Air Toxics Sources

Data summaries are not included in this review because there are approximately 70 parameters reported. The data is available in AQS using Parameter Occurrence Code (POC) 5.

3.0 SUMMARY AND CONCLUSIONS

The North Dakota Ambient Air Quality Monitoring Network is designed to monitor those air pollutants which demonstrate the greatest potential for deteriorating the air quality of North Dakota. Due to a greater number of pollution producing sources in the western part of the State (primarily associated with the energy producing industries) the greatest percentage of the network is located in the western part of the State.

3.1 Sulfur Dioxide (SO_2)

Neither the State nor Federal standards were not exceeded at any monitoring site. The maximum concentrations and the maximum concentrations expressed as a percentage of the applicable standard are as follows: 1-hour - 140 ppb (57.3%); 3-hour - 96 ppb (19.2%); 24-hour - 47 ppb (47.5%); annual - 4.7 ppb (23.9%).

There is no SO_2 5-minute standard currently in effect. The maximum 5-minute average was 360 ppb.

3.2 Nitrogen Dioxide (NO_2)

Neither the State nor Federal standards were exceeded at any of the monitoring sites. The maximum concentrations and the maximum concentrations expressed as a percentage of the applicable standard are as follows: annual - 5.6 ppb (10.6%)

3.3 Ozone (O_3)

Neither the State nor Federal standard was exceeded during the year. The 1-hour maximum and highest 4th highest 8-hour concentrations and the concentrations expressed as a percentage of the applicable standard are as follows: 1-hour - 76 ppb (63.3%); highest 4th highest 8-hour - 65 ppb (81.2%).

3.4 Inhalable Particulates

Neither the State nor Federal PM_{10} standards were exceeded during the year. The maximum concentrations and the maximum concentrations expressed as a percentage of the applicable PM_{10} standard are as follows: 24-hour - 149 $\mu g/m^3$ (99.3%); annual - 18.4 $\mu g/m^3$ (36.8%).

The Federal $PM_{2.5}$ standards were not exceeded during the year. The maximum concentrations and maximum concentrations expressed as a percentage of the standard are as follows: 24-hour FRM - 23.4 $\mu g/m^3$ (36.0%); annual FRM - 7.4 $\mu g/m^3$ (49.3%).

3.5 Carbon Monoxide (CO)

No monitoring was conducted.

3.6 Lead

No monitoring was conducted.

3.7 Hydrogen Sulfide

No monitoring was conducted.

3.8 Air Toxics

Data at Beulah is similar to comparable sites operating at the same time. The data and data summaries are available on the AQS database.