UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

AUG 27 1996

Ref: 8P2-A

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ENVIRONMENTAL
ENGINEERING

Daniel E. Harman, Manager
Air Quality Monitoring
Division of Environmental Engineering
P.O. Box 5520
Bismarck, North Dakota 58506-5520

Dear Mr. Harman:

This letter is in reply to your letter to Joe Delwiche dated June 19, 1996. The letter accompanied a word processing file of the report, "Ambient Air Quality Monitoring, Annual Network Review, 1995." The review of North Dakota's ambient air monitoring network was conducted by the Division of Environmental Engineering. We have assessed the report and found that it met the requirements of the State-EPA Agreement.

The report mentions the use of meteorological data for modeling purposes. The stations that are identified as those from which the data may be used for modeling purposes include the Fargo Residential, Hannover, and Sharon stations. Matters related to the suitability of sets of meteorological data to modeling uses should be referred to Kevin Golden, the Regional Meteorologist. His telephone number is (303) 312-6442.

The representativeness of PM_{10} sampling is discussed in the report. We acknowledge that size selective samplers for PM_{10} (and other size selective particulate samplers) cannot exclude all particulate matter of size fractions larger than the desired mode. The report also correctly says that the siting of stations came up in an earlier review of the PM_{10} network in North Dakota. In Region VIII's reply of July 1989 to the report on your network review of that year, it was recommended that the inlets of PM_{10} samplers be two to seven meters above the ground. These are the criteria applied to micro scale PM_{10} stations; the criteria for stations on larger scales of representatives allow the inlets to be two to 15 meters above the ground.

With the advent of a potential $PM_{2.5}$ standard, the EPA might downplay the previous recommendation to place the inlets of samplers two to seven meters above the ground. In general, it is believed that $PM_{2.5}$ tends to have a more uniform vertical and horizontal distribution than PM_{10}. We recommend, however, that the Division of Environmental Engineering watch the developing regulations related to the $PM_{2.5}$ standard, particularly the siting requirements. As promulgation of the new standard approaches, the air monitoring staff of Region VIII will be available to help answer questions about the siting requirements and other technical matters.

If you have any questions or further comments on the network review, please call Joe Delwiche at (303) 312-6448.

Sincerely yours,

Dean Gillam

Dean Gillam
Technical Assistance Team Leader

NORTH DAKOTA
DEPARTMENT OF HEALTH

FILE

ENVIRONMENTAL HEALTH SECTION

1200 Missouri Avenue
P.O. Box 5520
Bismarck, North Dakota 58506-5520
Fax #701-328-5200

June 19, 1996

Mr. Joe Delwiche (3S-509)
U.S. EPA - Region VIII
999 18th Street, Suite 500
Denver, CO 80202-2466

Re: FY '96-'97 Air Quality Media
Workplan, Monitoring, Item C

Dear Mr. Delwiche:

Enclosed is a floppy diskette with the North Dakota Annual Network Review for FY '96 as required by the reference. The enclosed zipped file, 'NDREV.ZIP,' contains the actual network review file 'NWREV95.EPA,' which has been formatted for the HP PaintJet XL300 printer. Please note that each 'Monitoring Network' subsection contains a brief justification for each site move and/or modification. The problem faced in relocating PM_{10} sites is the availability of locations that meet our requirements for population exposure and specific siting criteria for your maximum concentration monitoring.

If you have any questions, please call me at 701-328-5188.

Sincerely,

Daniel E. Harman

Daniel E. Harman
Manager
Air Quality Monitoring
Div. of Environmental Engineering

DEH:saj
Enc:

NORTH DAKOTA DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL ENGINEERING

AMBIENT AIR QUALITY MONITORING
ANNUAL NETWORK REVIEW
1995

May 1996

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1.0 INTRODUCTION

The North Dakota Department of Health, Division of Environmental Engineering, 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 Environmental Engineering 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 Environmental Engineering 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 Environmental Engineering 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 those 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), "Air Quality Monitoring, Data Reporting, and Surveillance Provisions," as amended, has specified a minimum of four basic monitoring objectives. These objectives are as follows:

1. To determine the highest <u>pollutant concentrations</u> 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.

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 4.0 to 50.0 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

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 three basic conditions: 1) background monitoring; 2) population exposure; and 3) highest concentration. The industrial AAQM network sites are designed to monitor air quality data for source specific highest concentration impacts on a neighborhood scale.

The primary function of the department operated continuous sites is to collect background data to determine if and when there is any change in background concentrations. Beulah and Fargo Residential are exceptions to this primary function. Beulah is population exposure because of the major sources in the vicinity. Fargo Residential is also population orintiented because Fargo is a major population center with PSD sources in the Fargo-Moorhead area. The data from this site will be 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. PM_{10} sites, except for Sharon, are population exposure sites: Sharon collects background data for the eastern part of the state.

Two special purpose sites were added to the network: Whiskey Joe - SPM and Mandan Refinery - SPM. Whiskey Joe - SPM serves two purposes. To evaluate the hydrogen sulfide impact of the oil fields on the Theodore Roosevelt National Park - South Unit. And, long-range sulfur dioxide transport from the coal conversion facilities in the central part of the state. Mandan Refinery - SPM monitors for short-term sulfur dioxide concentrations from a nearby refinery. Also added to the network were a PM_{10} sampler at Beulah and a $PM_{2.5}$ sampler at the Bismarck Residential site.

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 general locations are established, all 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 a neighborhood scale. Industrial sites are selected using dispersion modeling results and meteorological data. These sites are the most likely locations to have elevated ambient concentrations.

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 15 AAQM sites around the State. Thirteen were SLAMS/NAMS sites, and two were special purpose monitoring (SPM) sites. There were five industries that reported 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, and 12 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	Type Station	Parameter Monitored[1]	Operating Schedule	Monitoring Objective[2]	Spatial Scale[2]	Date Site Began
1 Beulah Residential[3]	SLAMS	PM_{10} SO_2, NO_2, O_3, MET	6th Day cont.	Population Exposure Population Exposure	Neighborhood Urban	12/95 04/80
2 Bismarck Commercial[4]	SLAMS	PM_{10}	6th Day	Population	Neighborhood	04/85
3 Bismarck Residential[5]	SLAMS	PM_{10}, $PM_{2.5}$	6th Day	Population Exposure	Neighborhood	07/95
4 Dickinson Residential	SLAMS	PM_{10}	6th Day	Population Exposure	Neighborhood	07/89
5 Dunn Center	SLAMS	SO_2, MET	cont.	General Background	Regional	10/79
6 Fargo Commercial[6]	NAMS	PM_{10} PM_{10}	6th Day 6th Day	Population Exposure Collocated SSI	Neighborhood N/A	06/85
7 Fargo Residential[7]	SLAMS	PM_{10} PM_{10} SO_2, NO_2, O_3, MET	6th Day 6th Day cont.	Population Exposure Collocated SSI Population Exposure	Neighborhood N/A Regional	08/95 08/95
8 Grand Forks Commercial	SLAMS	PM_{10}	6th Day	Population Exposure	Neighborhood	07/89
9 Hannover	SLAMS	SO_2, NO_2, O_3, MET	cont.	General Background	Regional	10/84
10 Mandan Refinery - SPM[8]	SPM	SO2, MET	cont.	Source Impact	Neighborhood	12/95
11 Sharon	SLAMS	SO_2, NO_X O_3, MET PM_{10}	cont. 6th Day	General Background	Regional	07/94
12 TRNP - NU	SLAMS	SO_2, O_3, H_2S, MET	cont.	General Background	Regional	02/80
13 Whiskey Joe - SPM[9]	SPM	SO2, H2S, MET	cont.	Source Impact	Neighborhood	07/95
14 Williston Commercial[10]	SLAMS	PM_{10}	6th Day	Population Exposure	Neighborhood	05/85
15 Williston Residential[11]	SLAMS	PM_{10}	6th Day	Population Exposure	Neighborhood	08/95
Company	**Site Name**					
16 Amerada Hess Corporation	TIOGA #1 TIOGA #2 TIOGA #3	SO_2 H_2S, MET SO_2	cont. cont. cont.	Source Source Source	Neighborhood Neighborhood Neighborhood	07/87 07/87 11/87
17 Coteau Properties Company[12]	COTEAU #5 COTEAU #6 COTEAU #7 COTEAU #8	PM_{10} PM_{10} PM_{10} PM_{10}	6th Day 6th Day 6th Day 6th Day	Source Source Source Source	Neighborhood Neighborhood Neighborhood Neighborhood	05/93 05/93 05/93 05/93
18 Dakota Gasification Company	DGC #11[13] DGC #12 DGC #13[14] DGC #14 DGC #15[13] DGC #16[15] DGC #17[15]	SO_2 SO_2, NO_2, MET H_2S SO_2 SO_2, NO_2 SO_2 SO_2, NO_2	cont. cont. cont. cont. cont. cont. cont	Source Source Source Source Source Source Source	Neighborhood Neighborhood Neighborhood Neighborhood Neighborhood Neighborhood Neighborhood	07/84 01/80 02/85 01/89 01/80 10/95 10/95
19 Koch Hydrocarbon Company	KOCH #3 KOCH #4	SO_2, MET H_2S, MET	cont. cont.	Source Source	Neighborhood Neighborhood	11/94 05/94
20 W. H. Hunt Estate	HUNT #5	SO_2, H_2S, MET	cont.	Source	Neighborhood	11/92

1. MET refers to meteorological and indicates wind speed and wind direction monitoring equipment.
2. Not applicable to MET.
3. PM_{10} began on December 11.
4. Shut down on July 24.
5. Began on July 24.
6. Shut down on August 24
7. Began on August 24.
8. Began on December 14.
9. Began on July 27.
10. Shut down on August 16.
11. Began on August 16.
12. Terminated June 30.
13. Shut down September 30.
14. Shut down August 31.
15. Began October 1.

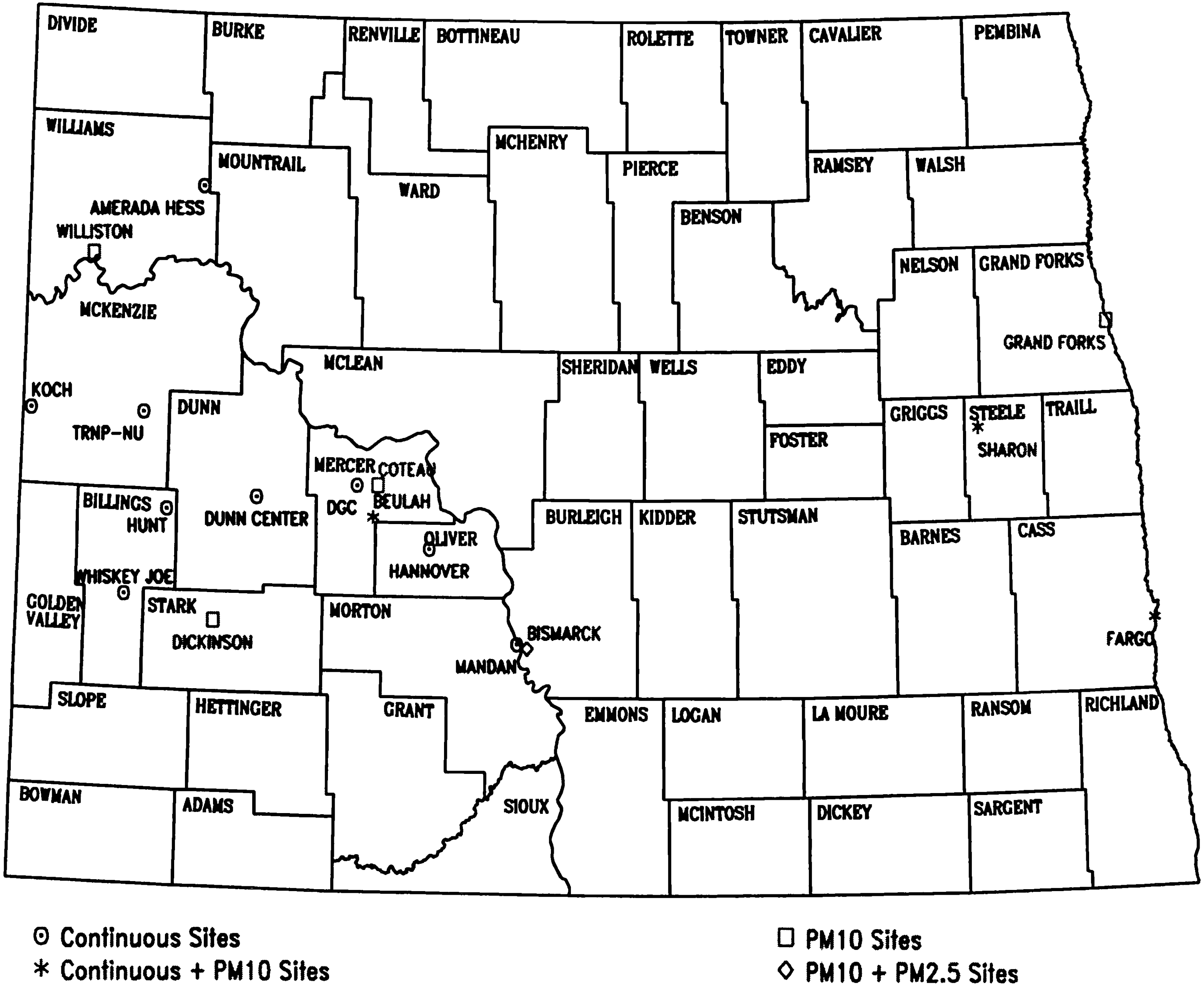

Figure 1 North Dakota Ambient Air Quality Monitoring Sites

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 area sources. Also, five 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 as of May 1. Figure 2 shows the approximate locations of these facilities (the numbers correspond to the respective positions in the site and source tables).

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.

TABLE 2

Major SO_2 Sources
(>100 TPY)

1995

#	Name of Company	Type of Source	Location	County	SO_2 Emissions Ton/Yr
1	CPA/UPA (Coal Creek)	Steam Electric Gen. Facility	Underwood	Mc Lean	46915
2	Minnkota Power Coop.	Steam Electric Gen. Facility	Center	Oliver	41722
3	Dakota Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	38550
4	Basin Electric Power Cooperative (Leland Olds)	Steam Electric Gen. Facility	Stanton	Mercer	30805
5	Montana Dakota Utilities (Coyote Station)	Steam Electric Gen. Facility	Beulah	Mercer	16172
6	Basin Electric Power Cooperative (AVS)	Steam Electric Gen. Facility	Beulah	Mercer	14669
7	United Power Association	Steam Electric Gen. Facility	Stanton	Mercer	7771
8	Amoco Oil Company	Oil Refinery	Mandan	Morton	6069
9	Montana Dakota Utilities (Heskett)	Steam Electric Gen. Facility	Mandan	Morton	1894
10	Amerada-Hess Corporation (Tioga Gas Plant)	Natural Gas Processing Plant	Tioga	Williams	924
11	Koch Hydrocarbon - MGP	Natural Gas Processing Plant	---	McKenzie	907
12	American Crystal Sugar	Sugar Beet Processing Plant	Drayton	Pembina	837
13	Univ. of North Dakota	Steam Heat	Grand Forks	Grand Forks	618
14	W. H. Hunt Trust Estate	Natural Gas Processing Plant	---	Billings	523
16	Western Gas Resources	Natural Gas Processing Plant	McGregor	Williams	235

TABLE 2 (cont.)

Major SO_2 Sources
(>100 TPY)

1995

#	Name of Company	Type of Source	Location	County	SO_2 Emissions Ton/Yr
16	American Crystal Sugar	Sugar Beet Processing Plant	Hillsboro	Traill	518
17	Interenergy Sheffield	Natural Gas Processing Plant	Lignite	Burke	234
18	Minn-Dak Farmers Cooperative	Sugar Beet Processing Plant	Wahpeton	Richland	168
19	Archer-Daniels-Midland	Corn Processing	Walhalla	Pembina	129
20	North Dakota State	Steam Heat	Fargo	Cass	125

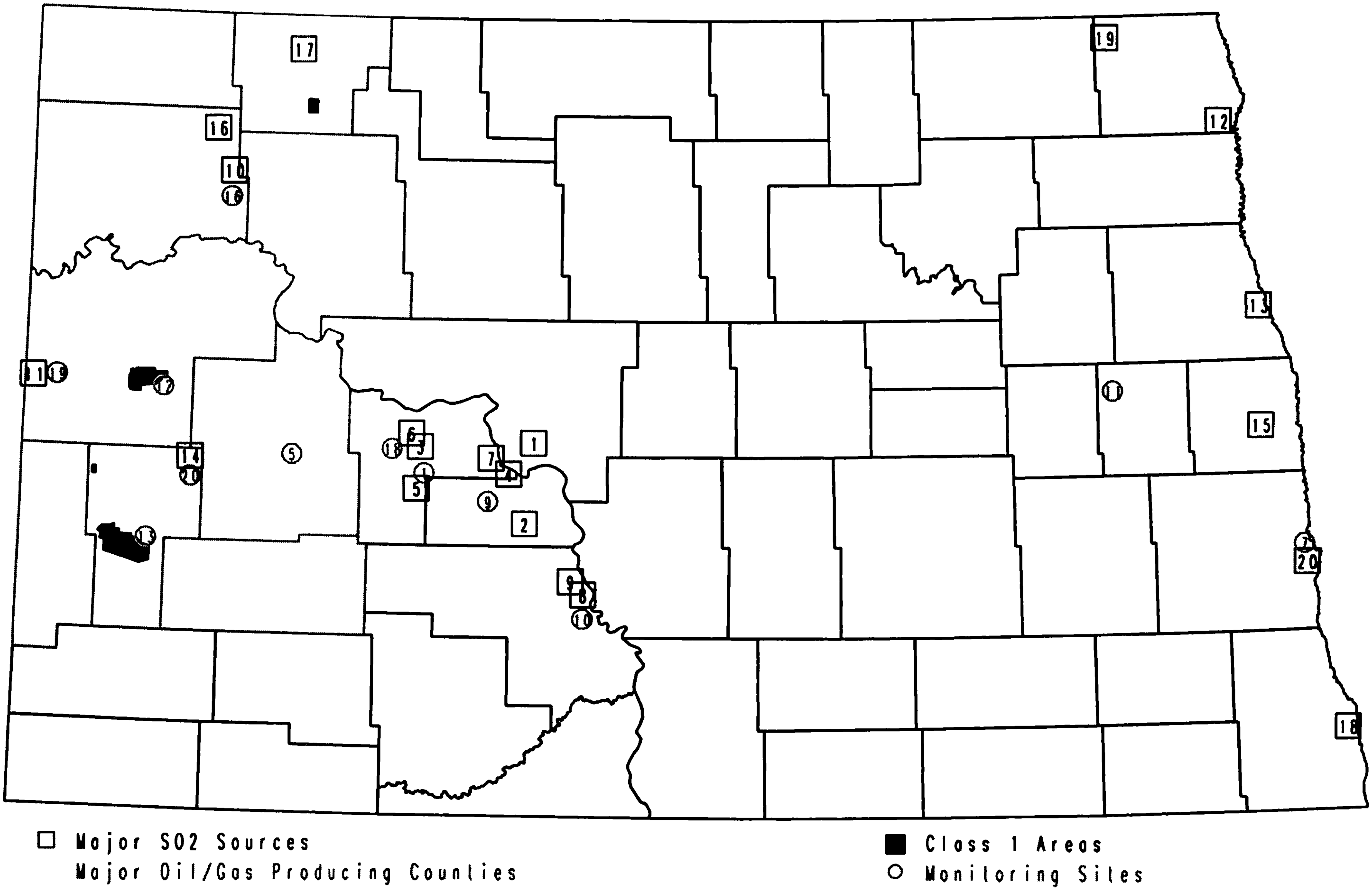

Figure 2 Major Sulfur Dioxide Sources

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 1995 SO_2 data summaries. There were no exceedances of either State or Federal SO_2 standards.

An urban population exposure site in Fargo began operation on August 24. The major sources in the Fargo-Moorhead, Minnesota, area are American Crystal Sugar (MN), Busch Agricultural Resources (MN), and North Dakota State University (ND). This data will be used to evaluate urban and suburban expansion projects in the eastern part of the State. This location is in the vicinity of the predicted maximum concentrations for major sources in the area. Since this site is on the edge of town, we will be able to separate the data into two categories: from a rural influence and from an urban influence. By separating the data into these two categories we should be able to identify the relative amounts of pollution added by the urban activities in Fargo-Moorhead area. The ambient data collected at this site may be used to evaluate permits to construct in or near eastern populations centers.

The National Park Service has raised questions about possible exceedances of the PSD Class 1 increment in the T. R. Roosevelt National Park - South Unit and has requested a monitoring site be established either in the park or somewhere along the northern border of the park. Since there are four oil fields with relatively sour gas (1 - 8 % H_2S) just north of the park with some sour gas flaring, and considering some of the problems the department has encountered in these four oil fields, it was decided that a monitoring site was justified. A monitoring site was established July 27, in the Whiskey Joe oil field on the northeast TRNP - NU boundary. This SO_2 data will be used to evaluate the potential for PSD Class I exceedances in the park. This site is expected to be active not more than three years.

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	1995	JAN-DEC	8684	58 03/26/01	50 07/25/15	25 12/10/20	23 03/26/02	7 12/10	6 02/17	1.4			12.3
AMERADA HESS - TIOGA #3	1995	JAN-DEC	8685	85 12/07/22	49 01/27/23	38 01/27/23	34 12/07/23	15 11/02	11 01/27	2.1			22.5
BEULAH	1995	JAN-DEC	8711	74 07/05/07	72 07/05/09	55 07/05/08	37 04/16/11	13 01/25	12 07/05	2.8			41.7
DGC #11	1995	JAN-SEP	6500 ***	146 08/20/15	122 05/09/10	101 05/09/11	88 05/09/08	30 05/09	15 08/20	3.7			60.4
DGC #12	1995	JAN-DEC	8645	108 08/20/09	104 01/07/12	69 01/07/14	65 01/01/14	23 01/07	22 02/11	4.1			57.2
DGC #14	1995	JAN-DEC	8704	143 10/24/10	120 10/14/11	85 10/24/11	83 07/15/11	21 08/09	20 10/24	2.9			46.4
DGC #15	1995	JAN-SEP	6443 ***	96 06/13/08	88 08/06/20	53 05/17/14	48 05/17/11	18 05/17	17 06/13	3.3			58.8
DGC #16	1995	OCT-DEC	1919 ***	61 10/20/12	55 10/16/07	42 10/20/14	37 10/16/08	11 10/16	10 12/22	3.1			52.5
DGC #17	1995	OCT-DEC	1876 ***	96 12/11/08	80 10/20/12	54 12/12/11	42 12/12/14	25 12/12	10 12/11	2.5			34.8
DUNN CENTER	1995	JAN-DEC	8544	28 12/16/14	27 11/26/09	20 12/21/23	19 03/04/05	8 12/21	6 03/04	1.3			10.5
FARGO RESIDENTIAL	1995	AUG-DEC	2941 ***	25 09/23/06	16 09/23/21	15 09/09/05	14 09/02/02	9 09/03	7 09/10	1.8			24.3
HANNOVER	1995	JAN-DEC	8696	96 07/13/11	92 08/26/19	55 06/13/11	50 03/05/14	19 07/13	16 08/26	2.5			26.3
KOCH - MGP #3	1995	JAN-DEC	7609	92 09/11/11	53 09/12/11	31 09/11/11	18 09/12/11	8 09/11	6 09/12	1.4			12.7
LITTLE KNIFE #5	1995	JAN-DEC	8716	31 12/15/03	31 12/15/04	28 12/15/05	16 04/07/11	12 12/15	6 12/16	1.3			13.2
MANDAN REFINERY - SPM	1995	DEC-DEC	297 ***	115 12/23/18	115 12/25/22	99 12/23/20	79 12/24/05	35 12/24	27 12/23	11.8			48.5
SHARON	1995	JAN-DEC	8691	16 01/30/01	13 01/30/02	13 01/30/02	9 01/30/05	4 01/18	4 02/18	1.2			10.4
TRNP - NU	1995	JAN-DEC	6972 ***	23 12/18/04	17 04/07/10	15 04/07/11	14 12/18/05	6 12/11	5 12/21	1.2			7.2
WHISKEY JOE - SPM	1995	JUL-DEC	3723 ***	28 11/26/14	26 10/23/19	20 08/26/20	18 08/26/14	9 08/26	7 08/23	1.7			19.6

* 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.

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

A new site was established December 14, southeast of the Mandan AMOCO refinery to collect 1-hour and peak 5-minute average SO_2 data to be used in evaluating a short-term SO_2 standard. The peak 5-minute data summary is presented in Table 4. This site is not expected to be active more than three years.

TABLE 4

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

POLLUTANT : SO2 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
MANDAN - REFINERY	1995	DEC-DEC	295	209	12/25/22	174	12/23/18	165	12/23/15	0	49.5

* The proposed air quality standards for SO2 5-minute averages are:

STATE - 600 ppb not to be exceeded.

FEDERAL - 600 ppb not to be exceeded.

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 these 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 16 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 the change in the amount of SO_2 in the ambient air is seen by reviewing the MDV. Figure A presents this data for the active state sites from 1980 through 1995. With the exception the three new sites (Fargo Res, Mandan Ref, and Whiskey Joe), the remaining sites fit into two distinct groupings: near major sources (Beulah and Hannover) and sites remote to major sources (Dunn Center, Sharon, and TRNP - NU). To calculate valid annual statistics, at least 75% of the data must be grater than the MDV. Therefore, the annual mean is not a valid indicator and , therefore, not addressed.

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 1995, for the Beulah and Hannover sites, there has been a steady increasing trend in the percentage of data greater than the MDV. However, Hannover has shown a decrease the last two years while Beulah has continued to increase. In contrast, the Dunn Center and TRNP - NU sites have remained consistently between 5% and 10% since 1988.

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, none of the maximum concentrations approached the applicable standards.

Because the newer sites (Fargo Residential, Mandan Refinery - SPM, Sharon, and Whiskey Joe - SPM) have limited amount of data, no attempt is made to evaluate the results other than no standards were exceeded.

At DGC (Table 2, Source #3), sites DGC #11 and DGC #15 were terminated and the equipment moved to new locations. DGC is building a new stack and dispersion modeling for the new stack emissions indicate the locations of the maximum concentrations occurring northwest of the stack are in new locations.

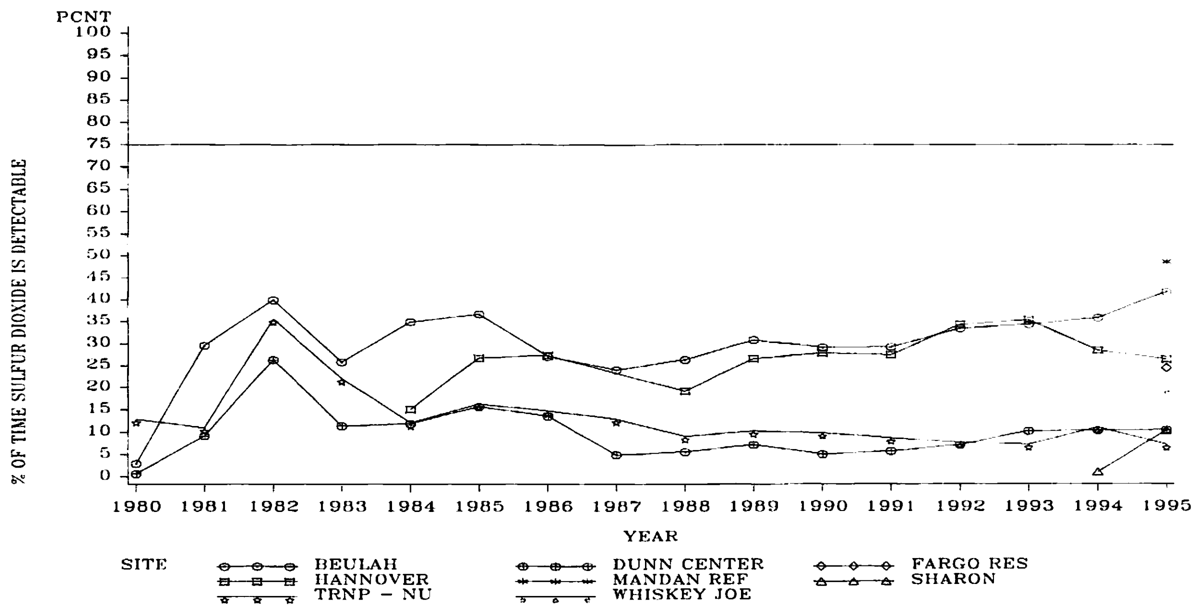

Figure 3 Percentage of Time SO_2 Detectable

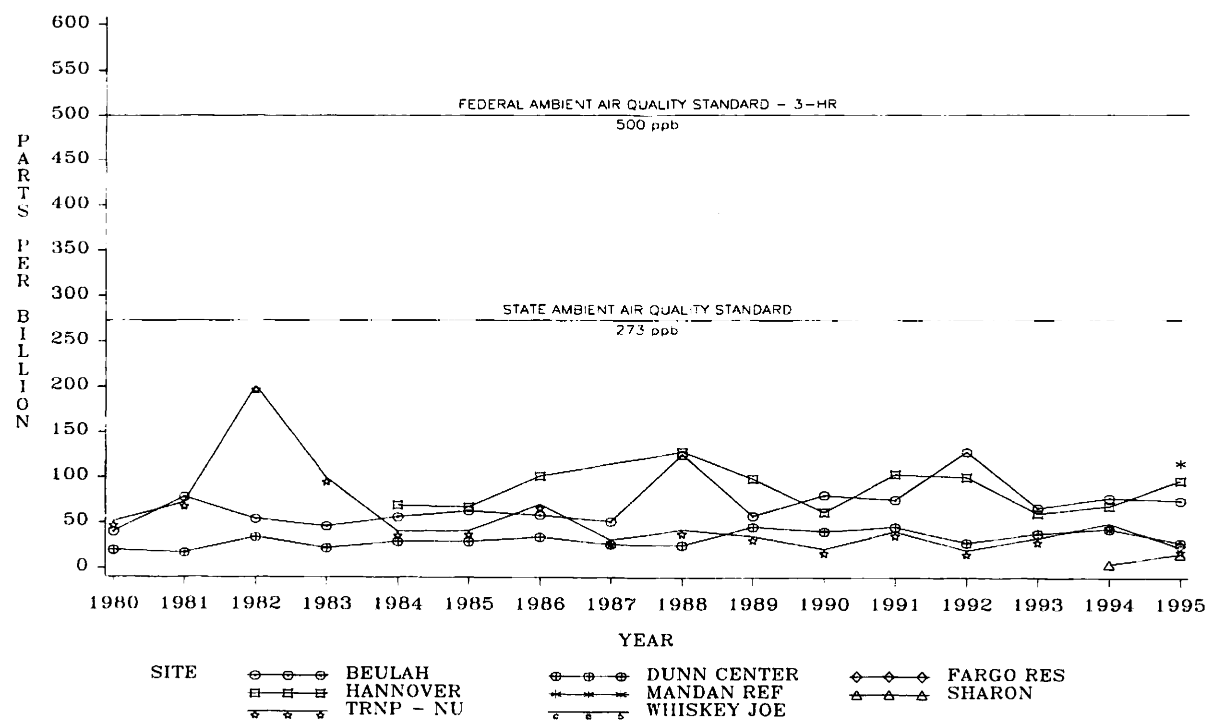

Figure 4 SO_2 Maximum 1-Hour Concentrations

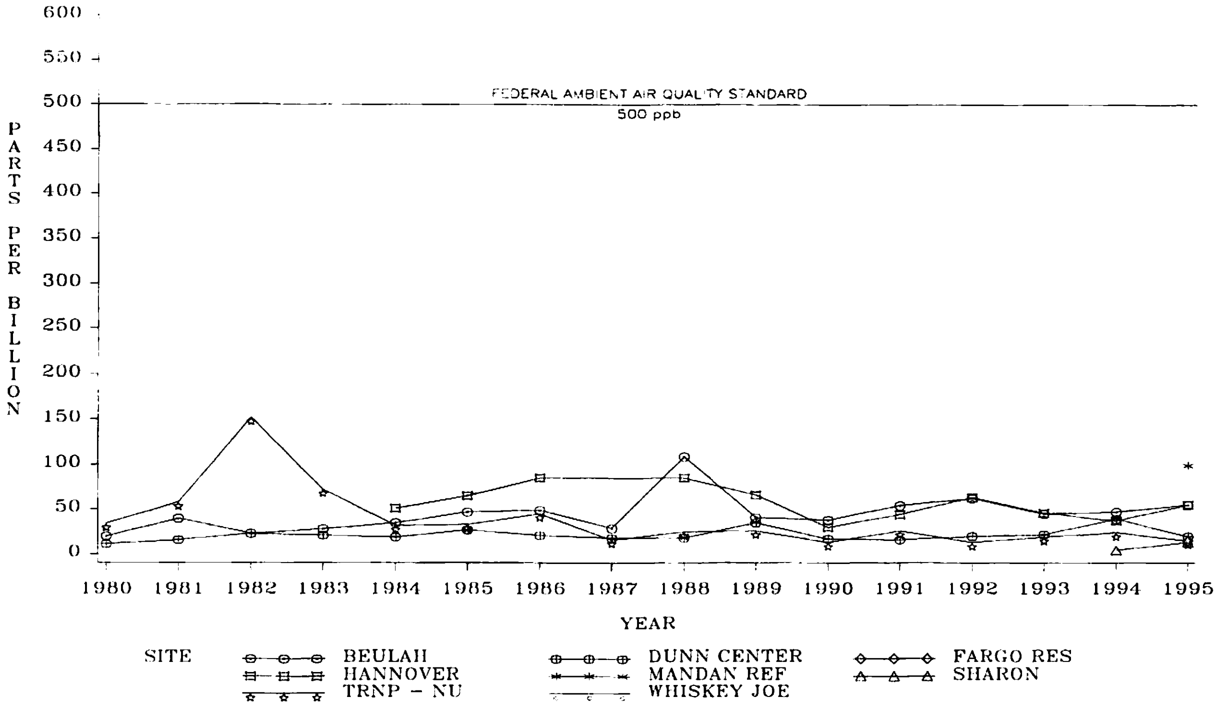

Figure 5 SO_2 Maximum 3-Hour Concentrations

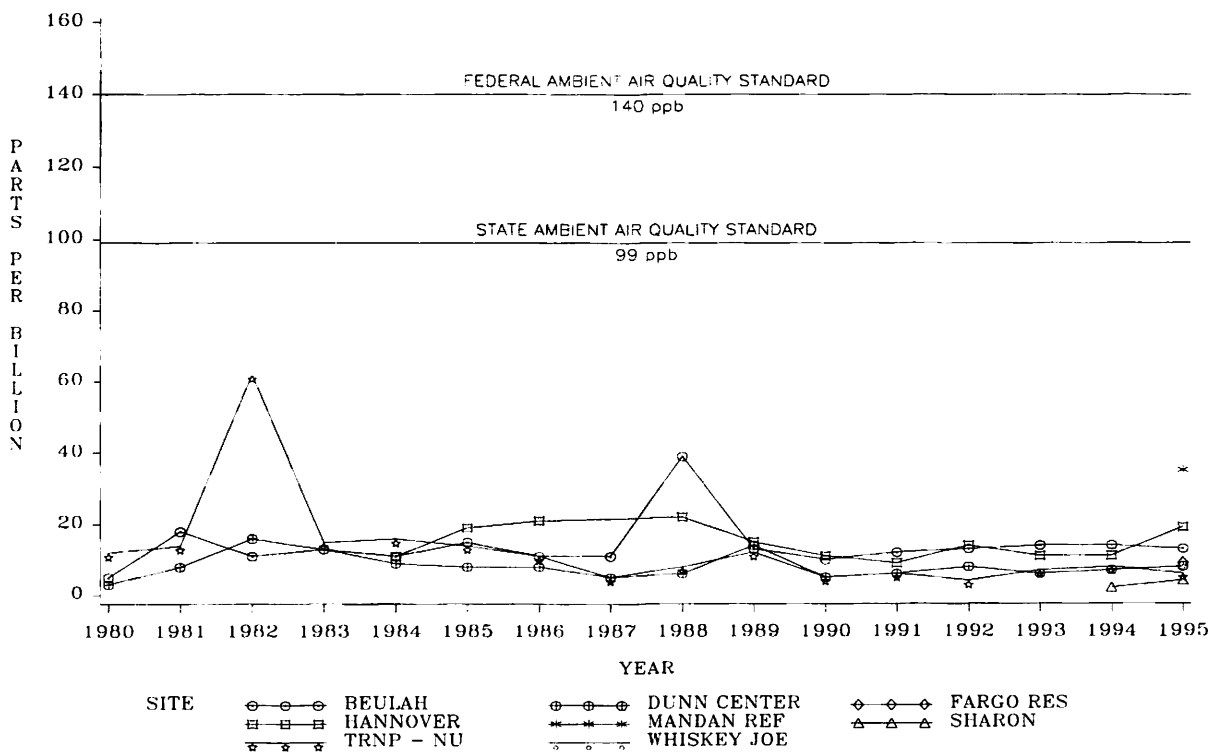

Figure 6 SO_2 Maximum 24-Hour Concentrations

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 as of May 1. Figure 7 shows the approximate locations of these facilities (the numbers correspond to the respective positions in 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.

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.

2.2.3 Monitoring Network

The Department currently operates four $NO/NO_2/NO_x$ analyzers. These are located at Beulah, Fargo, Hannover, and Sharon. The Dakota Gasification Company (DGC) network also operated analyzers at sites DGC #12, DGC #15, and DGC #17. Table 6 shows the 1995 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 Sharon, are well placed with respect to the major NO_x sources: Sharon is a background site.

TABLE 5

Major NO_x Sources
(> 100 TPY)

1995

#	Name of Company	Type of Source	Location	County	NO_x Emissions Ton/Yr
1	CPA/UPA (Coal Creek)	Steam Electric Gen. Facility	Underwood	McLean	30266
2	Minnkota Power Coop.	Steam Electric Gen. Facility	Center	Oliver	28919
3	Montana Dakota Utilities (Coyote Station)	Steam Electric Gen. Facility	Beulah	Mercer	13265
4	Basin Electric Power Cooperative (AVS)	Steam Electric Gen. Facility	Beulah	Mercer	11694
5	United Power Association	Steam Electric Gen. Facility	Stanton	Mercer	4705
6	Dakota Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	3302
7	Amoco Oil Company	Oil Refinery	Mandan	Morton	1753
8	Basin Electric Power Cooperative (Leland Olds)	Steam Electric Gen. Facility	Stanton	Mercer	1662
9	Amerada Hess Corporation (Tioga Gas Plant)	Natural Gas Processing Plant	Tioga	Williams	1557
10	American Crystal - Drayton	Sugar Beet Processing	Drayton	Pembina	852
11	MDU - Heskett	Steam Electric Gen. Facility	Mandan	Morton	532
12	MINN-DAK Farmers	Sugar Beet Processing	Wahpeton	Richland	481
13	American Crystal - Hillsboro	Sugar Beet Processing	Hillsboro	Traill	460
14	University of North Dakota	Heating Plant	Grand Forks	Grand Forks	344
15	Amerada Hess - Antelope #2	Compressor Station	---	McKenzie	307

TABLE 5 (cont.)

Major NO_x Sources
(> 100 TPY)

1995

#	Name of Company	Type of Source	Location	County	NO_x Emissions Ton/Yr
16	Amerada Hess - Hawkeye	Compressor Station	---	McKenzie	231
17	Interenergy Sheffield Processing Co.	Natural Gas Processing	Lignite	Burke	208
18	Northern Border Pipeline - CS #6	Compressor Station	Glen Ullin	Morton	207
19	Northern Border Pipeline - CS #4	Compressor Station	---	McKenzie	198
20	Archer-Daniels-Midland	Corn Processing	Walhalla	Pembina	186
20	Northern Border Pipeline - CS #8	Compressor Station	---	McIntosh	194
21	Amerada Hess - Antelope #1	Compressor Station	---	McKenzie	189
22	True Oil - Red Wing Gas Plant	Compressor Station	---	McKenzie	188
23	Western Gas Resources Temple Gas Plant	Natural Gas Processing Plant	McGregor	Williams	185
24	Koch Hydrocarbon - Alexander	Compressor Station	---	McKenzie	164
25	Koch Hydrocarbon-Tree Top	Compressor Station	---	Billings	159
26	Amerada Hess-Cherry Creek	Compressor Station	---	McKenzie	150
27	Koch Hydrocarbon - Demmik Lake	Compressor Station	---	McKenzie	123
28	Koch Hydrocarbon - Cow Creek	Compressor Station	---	Williams	121
29	Cavalier Air Station	Power Plant	Concrete	Pembina	116

TABLE 5 (cont.)

Major NO_x Sources
(> 100 TPY)

1995

#	Name of Company	Type of Source	Location	County	NO_x Emissions Ton/Yr
30	ND State University	Heating Plant	Fargo	Cass	113
31	Northern Sun	Oil Seed Crushing	Enderlin	Ransom	109
32	Koch Hydroncarbon - Mystery Creek	Compressor Station	---	Billings	107
33	Williston Basin IPC	Compressor Station	Williston	Williams	107

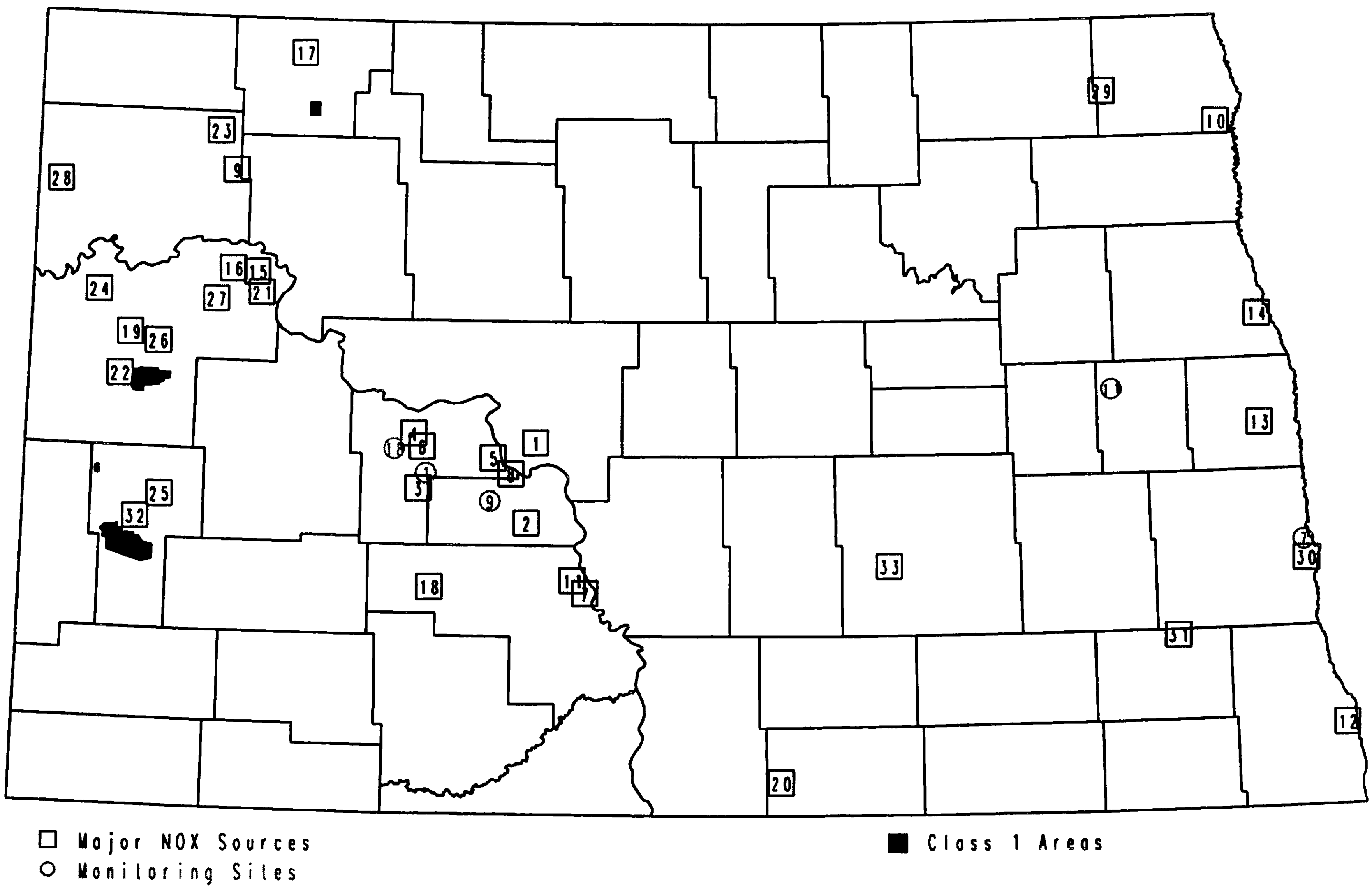

Figure 7 Major Nitrogen Dioxide Sources

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	2ND MM/DD/HH	ARITH MEAN	% >MDV
BEULAH	1995	JAN-DEC	8700	40 01/29/21	36 04/10/20	4.0	71.7
DGC #12	1995	JAN-DEC	8611	56 06/28/12	41 01/19/11	3.8	91.0
DGC #15	1995	JAN-SEP	6430 ***	114 04/13/07	91 05/04/04	5.6	88.1
DGC #17	1995	OCT-DEC	1407 ***	24 12/16/01	21 12/16/02	3.5	92.2
FARGO RESIDENTIAL	1995	AUG-DEC	2943 ***	43 12/30/00	42 10/12/17	7.4	86.1
HANNOVER	1995	JAN-DEC	7991	30 03/16/03	30 03/16/04	2.5	52.6
SHARON	1995	JAN-DEC	8688	16 01/11/23	16 12/13/22	1.6	25.8

* The air quality standards are:

STATE - 50 ppb maximum annual arithmetic mean.

FEDERAL - 53 ppb annual arithmetic mean.

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

An urban population exposure site in Fargo began operation on August 24. The major sources in the Fargo-Moorhead area are American Crystal Sugar (MN), Busch Agricultural Resources (MN), and North Dakota State University (ND). This data will be used to evaluate urban and suburban expansion projects in the eastern part of the State. This location is in the vicinity of the predicted maximum concentrations for the major sources in the area. Since this site is on the edge of town, we will be able to separate the data into two categories: from a rural influence and from an urban influence. By separating the data into these two categories we should be able to identify the relative amounts of pollution added by the urban activities in Fargo-Moorhead area. The ambient data collected at this site may be used to evaluate permits to construct in or near eastern populations centers.

2.2.4 Network Analysis

Nine of the eleven largest NO_2 sources in the state are within 45 miles of the monitoring sites in Beulah and Hannover. monitoring sites. Figures E and F show the trends for the state operated sites for the last 16 years. 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 1992 these nine sources emitted 119,213 tons; in 1993, 103,673 tons; in 1994, 97,583 tons; and in 1995, 96,098 tons. 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. The conclusion is the increase in detectable NO_2 concentrations is real and not the result of an analyzer change.

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.

Because the Fargo Residential and Sharon sites are new and do not have enough data to identify any trends, only the summary data are presented in Table 6.

The only change to an industry network was DGC (Table 5, Source #6) closing DGC #15 and moving the equipment to a new site, DGC #17. DGC is building a new stack and dispersion modeling showed a significant change in the location of several maximum concentrations. The location selected for DGC #17 is the best combination of the NO_2 annual mean and the SO_2 ND/Federal annual mean, PSD 3-hour and PSD annual standards.

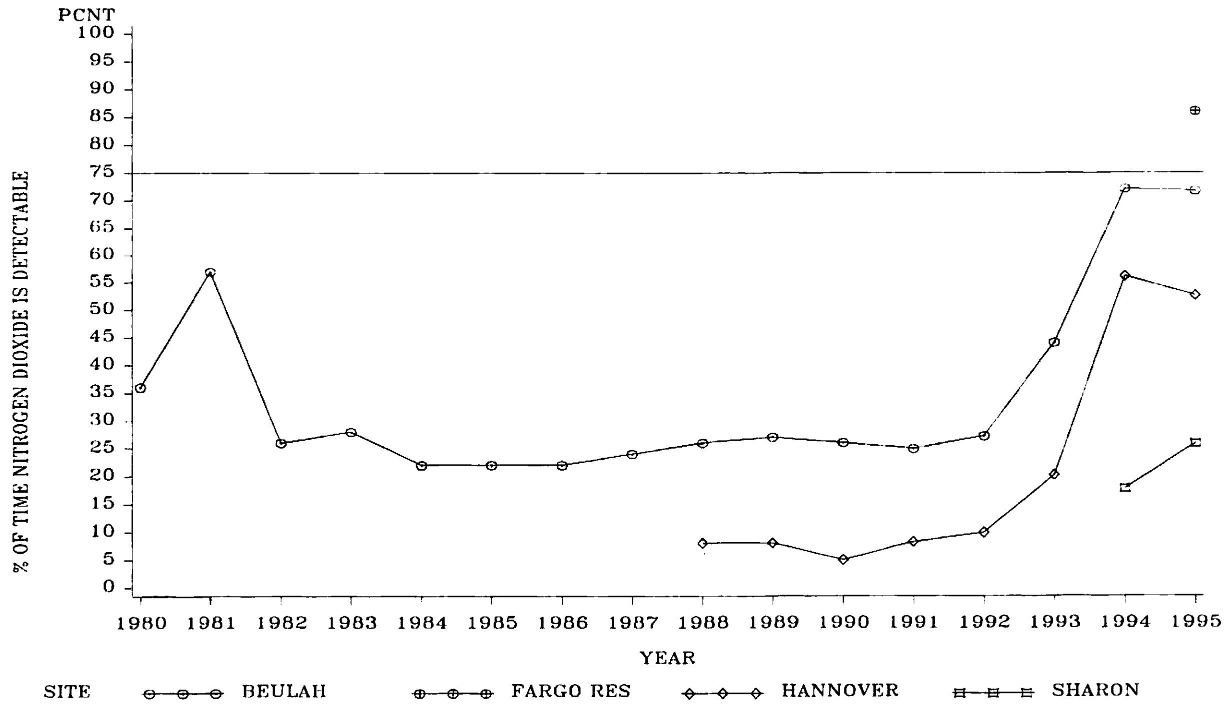

Figure 8 Percentage of Time NO_2 Detectable

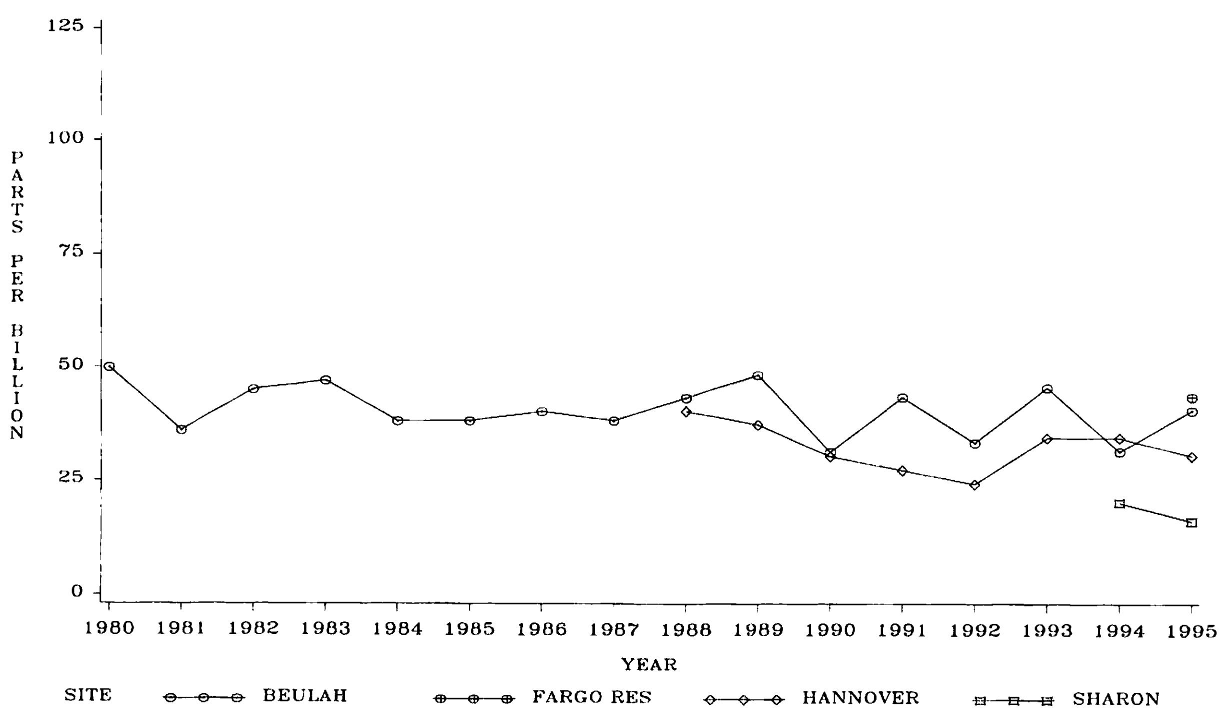

Figure 9 NO_2 Maximum 1-Hour Concentrations

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, at Beulah and TRNP - NU the O_3 analyzers are operated from April 1 through September 30 to collect two full quarters of data. The O_3 analyzers at Fargo, Hannover and Sharon collect data year round for use in NO_x dispersion models using the ozone limiting method.

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 as of May 1, 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 monitoring for ozone.

TABLE 7

Major VOC Sources
(> 100 TPY)

1995

#	Name of Company	Type of Source	Location	County	VOC Emissions Ton/Year
1	Midwest Processing Inc.	Oil Seed Crushing	Velva	McHenry	332
2	Dakota Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	268
3	CPA/UPA (Coal Creek)	Steam Electric Gen. Facility	Underwood	Mc Lean	218
4	Minnkota Power Coop.	Steam Electric Gen. Facility	Center	Oliver	217
5	Amoco Oil Company	Oil Refinery	Mandan	Morton	162
6	Cargill	Oil Seed Crushing	West Fargo	Cass	161
7	Basin Electric Power Cooperative (AVS)	Steam Electric Gen. Facility	Beulah	Mercer	155
8	Basin Electric Power Cooperative (Leland Olds)	Steam Electric Gen. Facility	Stanton	Mercer	135
9	Montana-Dakota Utilities (Coyote Station)	Steam Electric Gen. Facility	Beulah	Mercer	130

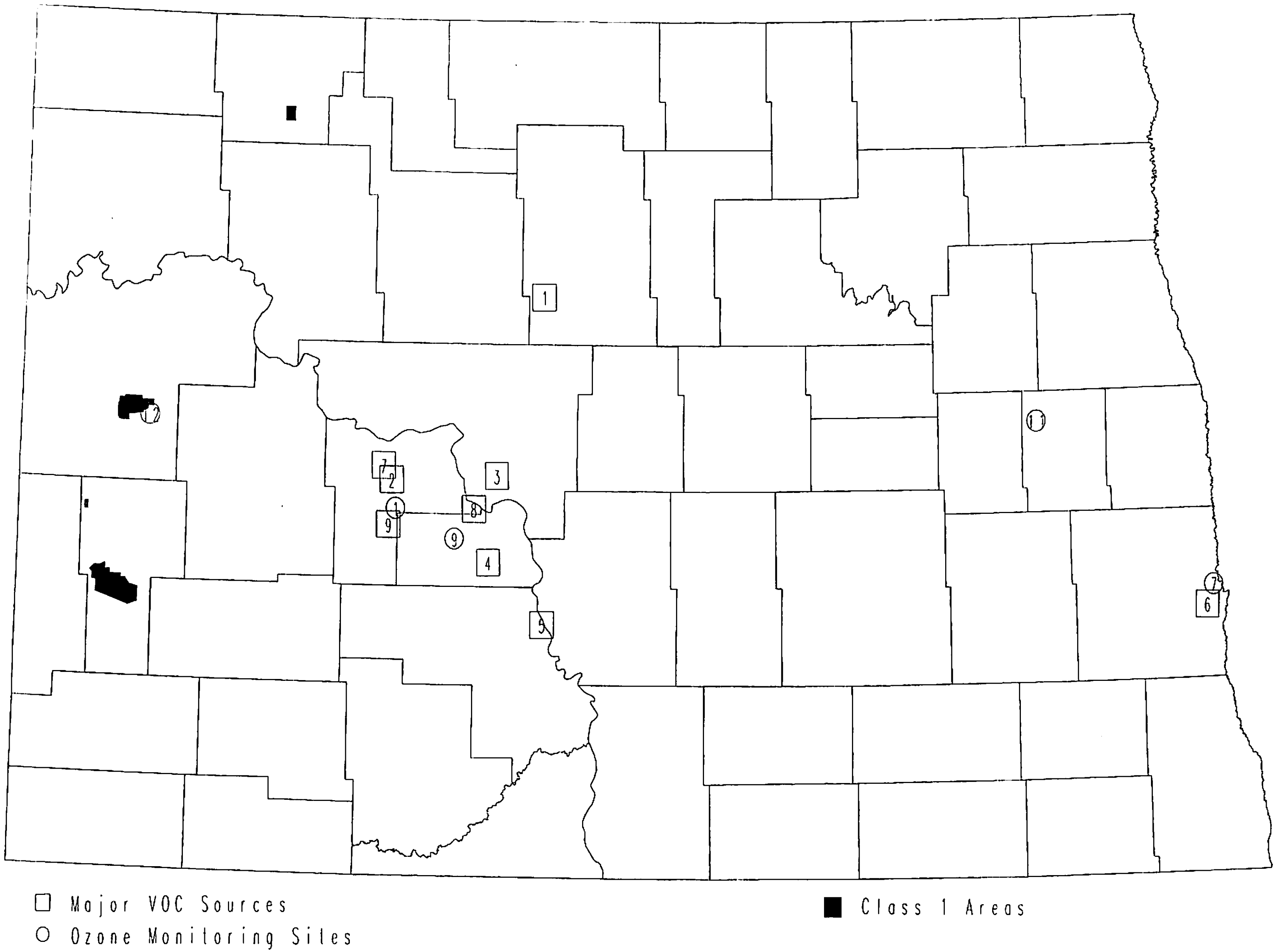

Figure 10 Major VOC Sources

TABLE 8

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

POLLUTANT : Ozone (PPB)

LOCATION	YEAR	SAMPLING PERIOD	DAYS SAMPLED	NUM OBS	1 - HOUR MAXIMA 1ST	DATE MM/DD/HH	2ND	DATE MM/DD/HH	3RD	DATE MM/DD/HH	# HOURS >120	% >MDV
BEULAH	1995	APR-SEP	183	4365	62	4/14/14	61	6/11/14	61	6/15/16	0	98.3
FARGO - RESIDENTIAL	1995	AUG-DEC	125	2445	46	9/25/15	44	9/28/13	42	9/27/14	0	90.8
HANNOVER	1995	JAN-DEC	365	8695	61	6/ 4/10	61	6/11/16	61	6/12/12	0	99.9
SHARON	1995	JAN-DEC	365	8655	73	6/ 3/11	67	6/13/17	67	6/16/15	0	100.0
TRNP - NU	1995	APR-SEP	183	4242	64	6/20/16	62	6/16/13	62	6/26/15	0	99.9

* The air quality standards for ozone are:

STATE - 120 ppb not to be exceeded more than once per year.

FEDERAL - 120 ppb with no more than one expected exceedance per year

2.3.3 Monitoring Network

The State currently has five continuous ozone analyzers in operation. These are at Beulah, Fargo, Hannover, Sharon, and Theodore Roosevelt National Park -North Unit. Table 8 presents 1995 data summaries. Figure 11 shows that the monitoring network has a fairly uniform distribution. Most of the O_3 monitored seems to be unrelated to the major sources since the values are quite consistent regardless of the monitoring location and wind direction.

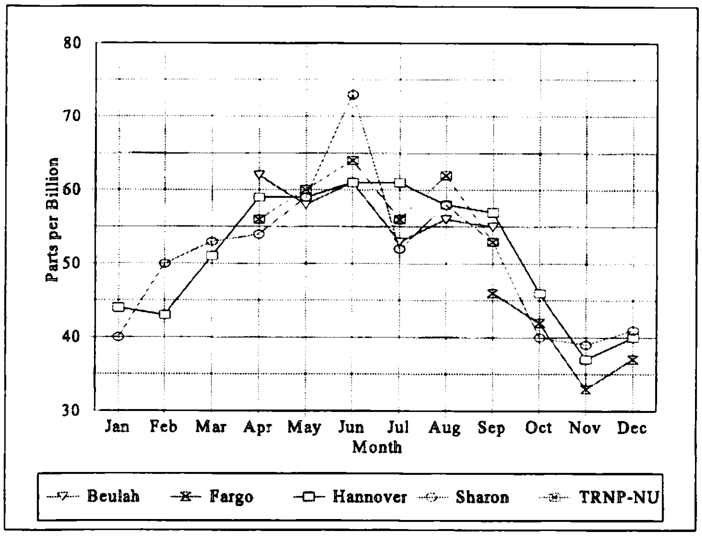

Figure 11 Maximum Ozone Concentrations

An urban population exposure site in Fargo began operation on August 24. The major sources in the Fargo-Moorhead, Minnesota, area are American Crystal Sugar (MN), Busch Agricultural Resources (MN), and North Dakota State University (ND). This data will be used to evaluate urban and suburban expansion projects in the eastern part of the State. This location is in the vicinity of the predicted maximum concentrations for major sources in the area. Since this site is on the edge of town, we will be able to separate the data into two categories: from a rural influence and from an urban influence. By separating the data into these two categories we should be able to identify the relative amounts of pollution added by the urban activities in Fargo-Moorhead area. The ambient data collected at this site may be used to evaluate permits to construct in or near eastern populations centers.

2.3.4 Network Analysis

Only one of the five state ozone monitoring sites is in an area not significantly influenced by VOC sources (see Figure 10). Beulah and Hannover are within 45 miles of seven of the nine major VOC sources in the state. TRNP- NU is located in a Class I area surrounded by oil fields. Fargo Residential is located in Fargo and influenced by city traffic as well as a major VOC source. Sharon is located in a rural community surrounded by crop land. With this diversity of site locations and influences, it would be expected 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 two hours of data collect higher than 80 ppb and neither of these exceeded 100 ppb.

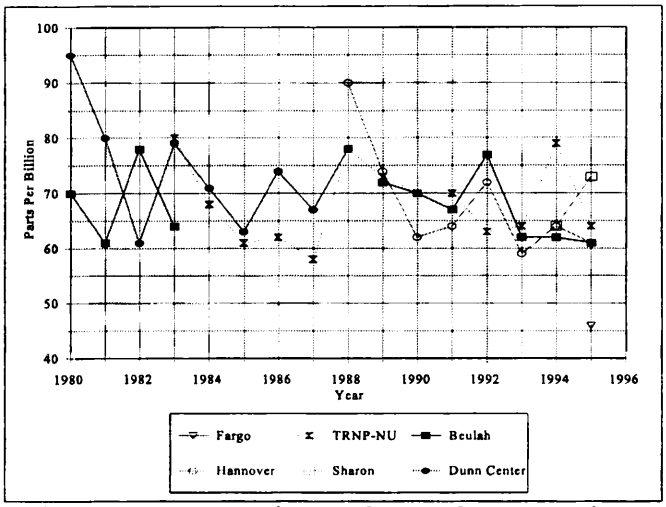

Figure 12 Maximum Ozone Concentrations

Each site has a unique sphere of influence. Beulah, a population oriented neighborhood scale site, is located in the city of Beulah and influenced by three nearby sources. Hannover, a background regional monitoring scale site, is located to be influenced by all seven of the major sources within the 45 mile radius. The data collected data at this site is used for dispersion modeling for sources located near this site. TRNP - NU, a background regional scale site, is located in a Class I area that is directly influenced by oil field activity. Fargo, a population exposure urban scale site, is located in the largest city in the state. With the high traffic flow, and related elevated NO_2 levels (see Figures 8 and 9), ozone concentrations higher than the other sites could be expected. The data collected at this site will be used for dispersion modeling for industry expansion projects in urban areas in the eastern part of the state. Sharon, a background regional scale site, is located in a rural community where there are no major sources for 70 miles (Cargil, Table 7, #6). The data collected at this site will be used as background data for dispersion modeling for industry expansion in the eastern part of the state.

2.4 Inhalable Particulates

The inhalable particulate standard is designed to protect against those particulates that can be inhaled deep into the lungs and cause respiratory problems. These particulates have an aerodynamic diameter less than or equal to a nominal 10 microns and are designated as PM_{10}. Also, this section addresses the $PM_{2.5}$ data the department began collecting on July 20 at the Bismarck Residential site.

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 inventories reported to the department as of May 1. Figure 13 shows the approximate locations of these facilities (the numbers correspond to the respective positions in 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

2.4.2 Monitoring Network

The State operates seven PM_{10} samplers at six sites; the Fargo site has collocated samplers. Since PM_{10} is of concern mainly because of its effects on people, monitoring efforts are concentrated in the state's population centers. There was one industry network located at the Coteau Mine in central Mercer County. Table 10 shows the inhalable PM_{10} particulate data summaries.

TABLE 9

Major PM_{10} Sources
(> 100 TPY)

1995

#	Name of Company	Type of Source	Location	County	PM_{10} Emissions Ton/Year
1	CPA/UPA (Coal Creek)	Steam Electric Gen. Facility	Underwood	Mc Lean	1349
2	Basin Electric Power Cooperative (AVS)	Steam Electric Gen. Facility	Beulah	Mercer	995
3	Minnkota Power Coop.	Steam Electric Gen. Facility	Center	Oliver	564
4	Amoco Oil Company	Oil Refinery	Mandan	Morton	508
5	Montana Dakota Utilities (Coyote Station)	Steam Electric Gen. Facility	Beulah	Mercer	501
6	Basin Electric Power Cooperative (Leland Olds)	Steam Electric Gen. Facility	Stanton	Mercer	410
7	Minn-Dak Farmers Coop.	Sugar Beet Processing Plant	Wahpeton	Richland	407
8	Dakota Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	250
9	American Crystal Sugar Co.	Sugar Beet Processing Plant	Drayton	Pembina	165
10	United Power Association	Steam Electric Gen. Facility	Stanton	Mercer	151
11	Northern Sun	Oil Seed Processing	Enderlin	Ransom	107

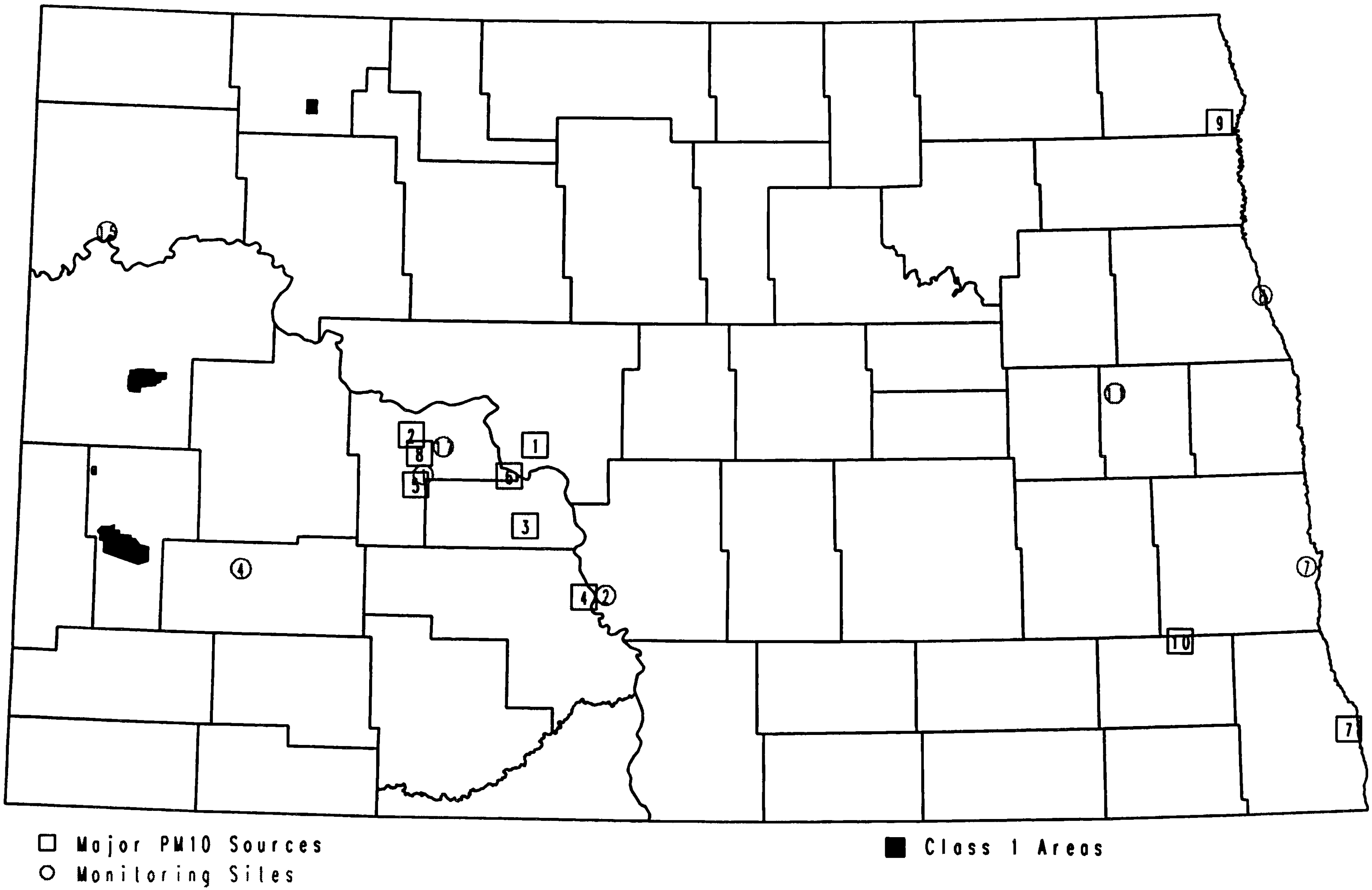

Figure 13 Major PM_{10} Sources

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 24 - HOUR 1ST MM/DD	2ND MM/DD	3RD MM/DD	ARITH MEAN	#>150	AM>50	% >MDV
BEULAH	1995	NOV-DEC	9 ***	0.9	18.1 11/17	17.2 12/29	14.5 12/05	12.2			88.8
BISMARCK	1995	JAN-JUL	33 ***	5.2	36.8 07/20	36.1 06/26	34.5 06/20	19.2			100.0
BISMARCK RESIDENTIAL	1995	JUL-DEC	26 ***	5.8	30.2 12/29	24.6 09/30	22.3 10/12	14.9			100.0
COTEAU #5	1995	JAN-JUN	29 ***	2.9	31.8 01/27	27.7 06/02	25.9 01/09	12.3			86.2
COTEAU #6	1995	JAN-JUN	28 ***	1.9	25.0 06/14	21.6 06/20	19.2 06/02	10.8			89.2
COTEAU #7	1995	JAN-JUN	30 ***	3.0	39.7 06/26	33.0 06/08	26.6 01/27	13.2			90.0
COTEAU #8	1995	JAN-JUN	25 ***	2.5	20.3 01/27	15.6 05/27	15.2 01/09	9.6			92.0
DICKINSON RES	1995	JAN-DEC	57	2.0	40.2 06/26	30.9 08/19	29.3 08/07	12.0			92.9
FARGO	1995	JAN-AUG	38 ***	3.4	56.1 07/20	40.4 01/27	38.2 06/14	18.9			97.3
FARGO - RESIDENTIAL	1995	AUG-DEC	21 ***	4.6	48.9 10/12	45.6 09/12	28.3 12/29	18.8			100.0
GRAND FORKS	1995	JAN-DEC	61	4.7	50.1 07/20	40.4 06/02	38.4 06/20	17.6			100.0
SHARON	1995	JAN-DEC	54	1.1	78.3 08/31	48.4 07/20	31.9 06/02	13.1			88.8
WILLISTON	1995	JAN-AUG	32 ***	5.8	42.4 06/26	33.2 07/20	25.9 08/07	16.1			100.0
WILLISTON RESIDENTIAL	1995	AUG-DEC	21 ***	6.0	27.7 09/30	23.6 12/17	23.0 08/31	13.5			100.0

* 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.

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

The samplers in Bismarck, Fargo, and Williston were moved to new locations that meet siting criteria for population exposure. Bismarck was moved July 24, Williston on August 16, and Fargo on August 24.

A sampler was added to the Beulah site and began operation on December 11. The sampler was added because the department is interested in the impact the power plants and gasification plant near Beulah has on the residents.

A Graseby Andersen Model 231-F $PM_{2.5}$ impactor was added to the Bismarck Residential site on July 20 when the site was established. Table 11 and Figure 14 present the data summary and ratio between the $PM_{2.5}$ and PM_{10} data collected. The average ratio for the 27 samples collected is 61.6%. The ratios ranged from 8.1% to 86.5%. For pairs with both samples above the delectable limit (4 $\mu g/m^3$), the ratios range from 46.7% to 86.5% with an average ratio of 65.4%

TABLE 11

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

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

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MIN	MAXIMA 24 - HOUR 1ST MM/DD	2ND MM/DD	3RD MM/DD	ARITH MEAN	% >MDV
Bismarck Residential	1995	JUL-DEC	27 ***	1.1	25.9 07/20	23.4 12/29	14.6 09/30	9.5	96.3

* No standard is currently in effect.

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

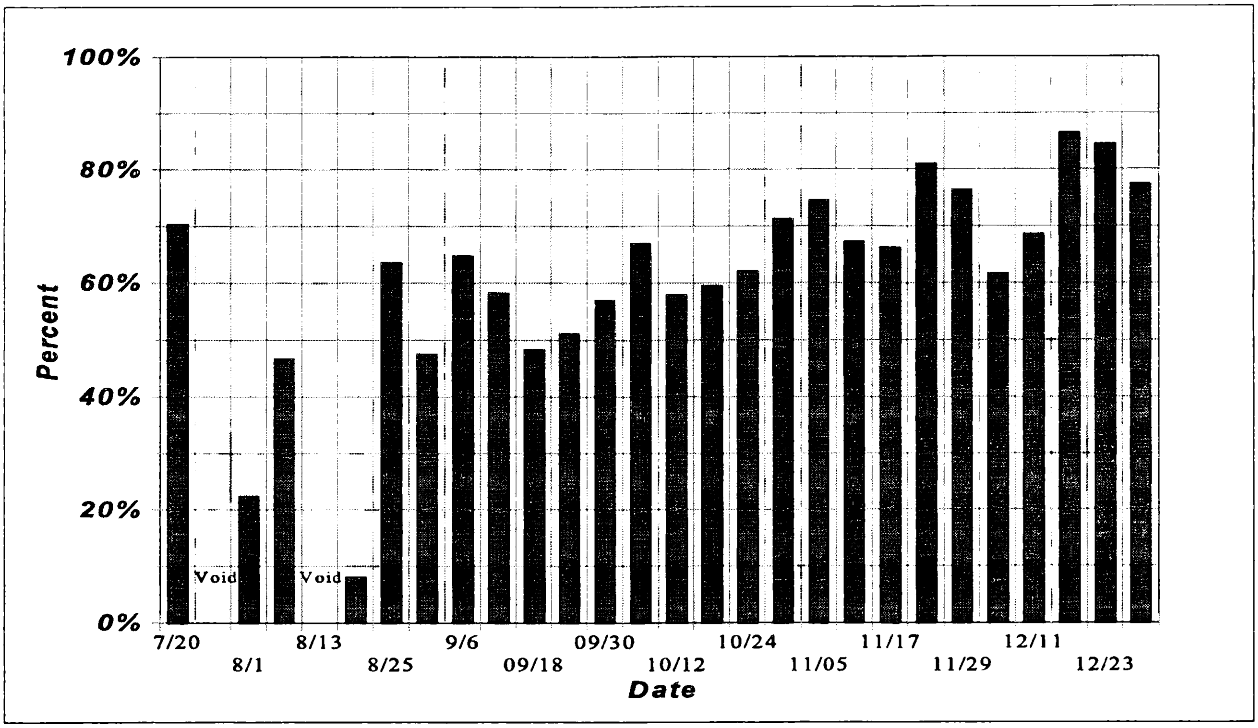

Figure 14 $PM_{2.5}/PM_{10}$ Ratio

2.4.3 Network Analysis

All sites, with the exception of Sharon, are population oriented urban scale sites: Sharon is a background regional scale site. Each site is located within the city limits of the respective cities. The population of the cities range from 119 (Sharon) to over 100,00 in the Fargo, ND-Moorhead, MN area. With this population range, it would be expected to see a wide range in both 24-hour and annual averages as well as a stratification following city population. Figure 15 and 16 show this is not the case. Figure 15 shows that Fargo maximums are about midrange while Bismarck, the third largest city, ranges from the highest ('87, '92, '93) to the lowest maximum ('95).

The annual means do demonstrate some stratification. Dickinson, Sharon and Williston are lower than Bismarck, Grand Forks, and Fargo. This stratification

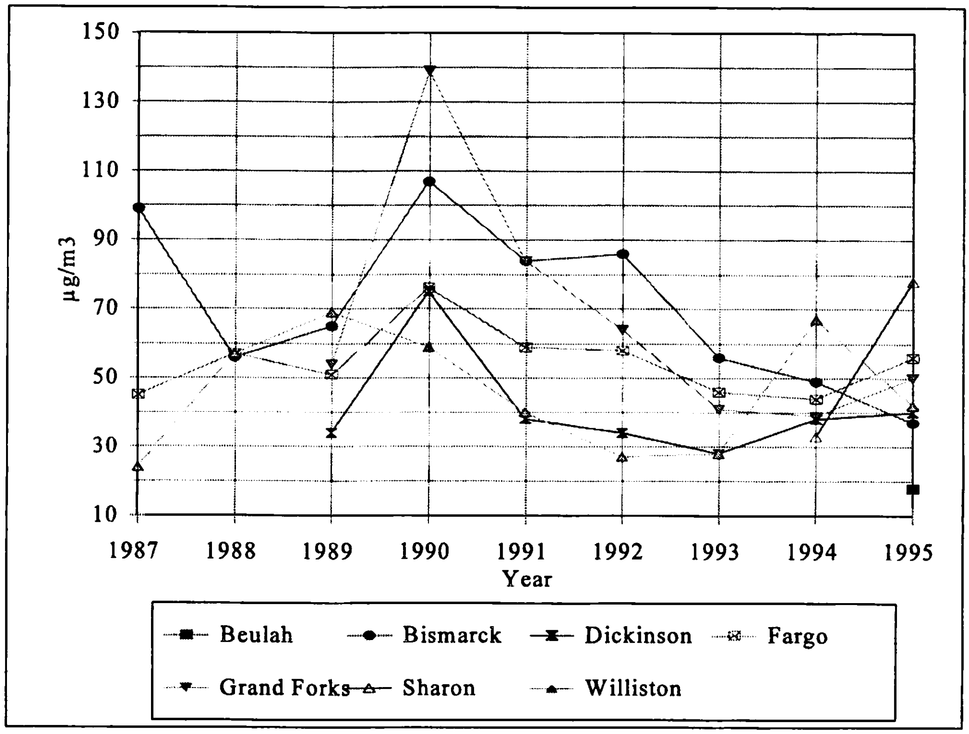

Figure 15 PM_{10} Maximum Concentrations

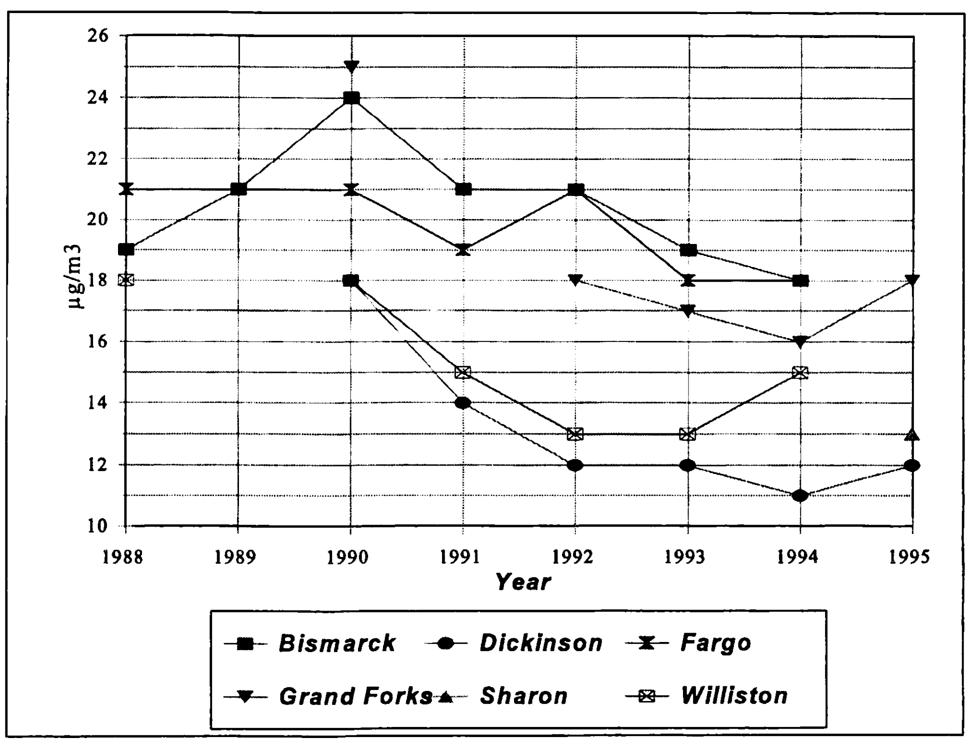

Figure 16 PM_{10} Annual Means

could be for two reasons. First, Dickinson, Sharon and Williston are in predominantly farmland areas. Second, the reason for the higher average concentrations in Bismarck, Grand Forks, and Fargo are primarily due to anthropogenic activities like furnaces, gasoline engines, and fine dust particles from roadway surfaces. To help resolve this question, a PM_{10} sampler was added to the Beulah site in December. Beulah is a small city (pop. 3363) with three major sources within 10 miles. Also, many of the houses in town use coal for either primary or supplemental heat. If elevated concentrations are found in Beulah, it would be a good indication that combustion sources are a bigger source for fine particulates than farmland. However, North Dakota has had three exceptional events since 1987, and all three have been associated with higher than normal winds. Since the PM10 heads are not efficient at rejecting particulates larger than 10 microns in aerodynamic diameter, these events were most likely caused by loading the filters with oversized particles.

In 1989, the department was asked to consider moving all the PM_{10} samplers within the two to seven meter range above ground. All the sites except Grand Forks and Dickinson have been moved to two meters above ground. Grand Forks will be moved this year. However, Dickinson will not be moved because of the oil activity within the city limits. Because of the drilling activity, no location that meets siting criteria could be assured any long term continuity. In addition, the sampler inlet is nine meters above ground but, the data shows the site is not statistically different from the Williston PM_{10} site.

2.5 Carbon Monoxide

Many large urban areas in the United States have problems attaining the AAQS 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 12 along with their emissions as calculated from the most recent emissions inventories reported to the department as of May 1. Figure 17 shows the approximate locations of these facilities (the numbers correspond to the respective positions in 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 was drafted for the Fargo-Moorhead Council of Governments for use in their traffic planning program.

TABLE 12

Major CO Sources
(> 100 TPY)

1995

#	Name of Company	Type of Source	Location	County	CO Emissions Ton/Year
1	Dakota Gasification Co.	Synthetic Fuel Gen. Plant	Beulah	Mercer	2124
2	Montana Dakota Utilities (Heskett Plant)	Steam Electric Gen. Plant	Mandan	Morton	1926
3	CPA/UPA (Coal Creek)	Steam Electric Gen. Facility	Underwood	Mc Lean	1818
4	Basin Electric Power Cooperative (AVS)	Steam Electric Gen. Facility	Beulah	Mercer	1294
5	Northern Sun	Oil Seed Processing	Enderlin	Ransom	1167
6	MINN-DAK Farmers	Sugar Beet Processing Plant	Wahpeton	Richland	1023
7	Minnkota Power Coop.	Steam Electric Gen. Facility	Center	Oliver	991
8	Montana Dakota Utilities (Coyote Station)	Steam Electric Gen. Plant	Beulah	Mercer	595
9	American Crystal Sugar Co.	Sugar Beet Processing Plant	Drayton	Pembina	369
10	American Crystal Sugar Co.	Sugar Beet Processing Plant	Hillsboro	Pembina	349
11	Basin Electric Power Coop. (Leland Olds)	Steam Electric Gen. Plant	Stanton	Mercer	348
12	Amerada Hess	Natural Gas Processing	Tioga	Williams	286
13	True Oil - Red Wing	Compressor Station	---	McKenzie	223

TABLE 12 (Cont.)

Major CO Sources
(> 100 TPY)

1995

#	Name of Company	Type of Source	Location	County	CO Emissions Ton/Year
14	Western Gas Resources - Temple Gas Plant	Natural Gas Processing Plant	McGregor	Williams	149
15	Interenergy Sheffield	Natural Gas Processing Plant	Lignite	Burke	139
16	Amoco Oil Co.	Oil refinery	Mandan	Morton	134
17	Koch Hydrocarbon - Tree Top	Compressor Station	---	Billings	130
18	University of North Dakota	Steam Heat	Grand Forks	Grand Forks	126
19	Koch Hydrocarbon - Demmik Lake	Compressor Station	---	McKenzie	123
20	Amerada Hess - Hawkeye Station	Compressor station	---	McKenzie	123
21	United Power Association	Steam Electric Gen. Facility	Stanton	Mercer	118
22	Koch Hydrocarbon - Alexander	Compressor Station	---	Billings	116
23	Koch Hydrocarbon - Mystry Creek	Compressor Station	---	Billings	107

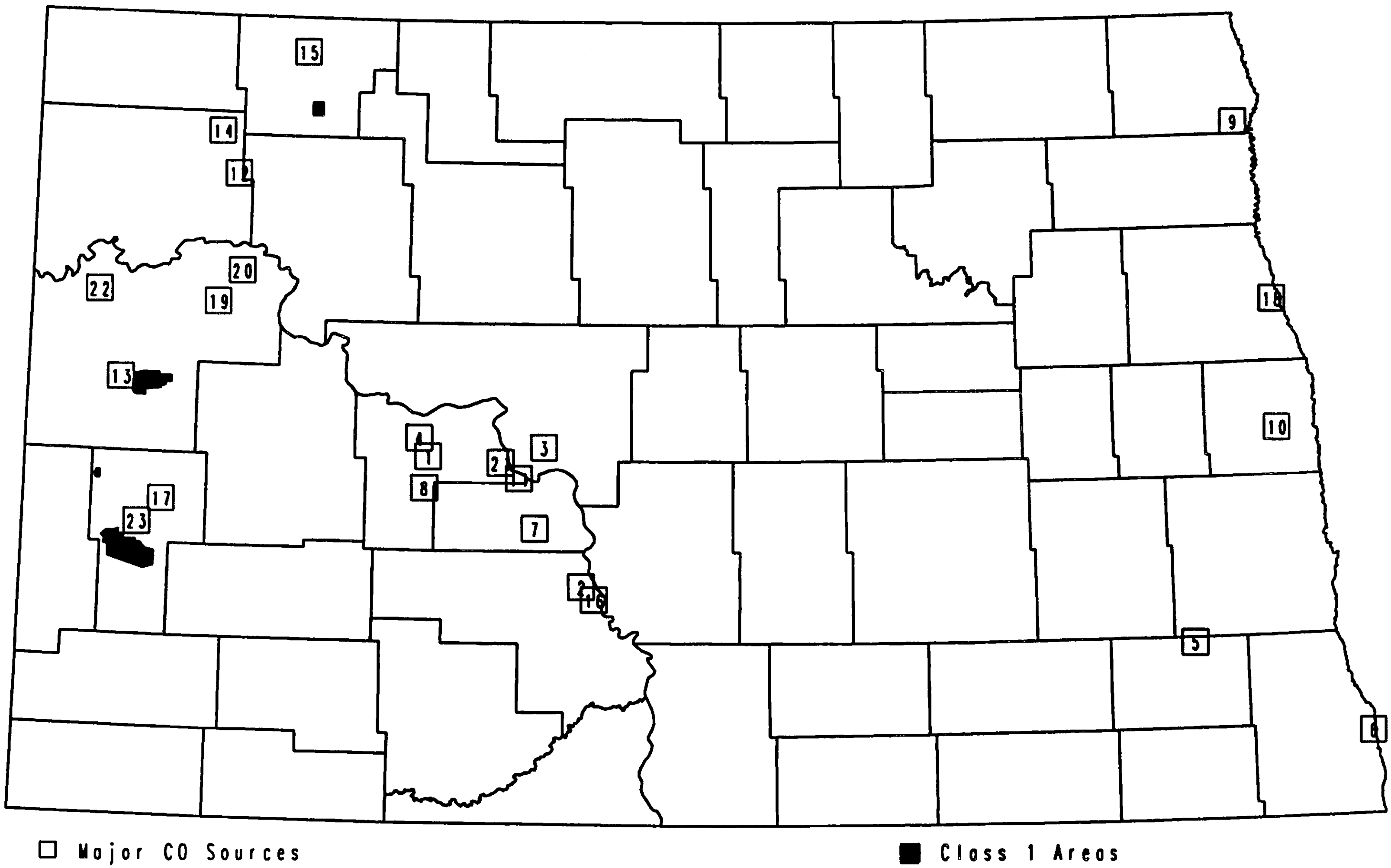

Figure 17   Major CO Sources

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 sources of H_2S emissions.

2.7.2 Monitoring Network

Currently two State-operated sites, TRNP-NU and Whiskey Joe - SPM, are monitoring for H_2S emissions. There are five industry-operated H_2S monitoring sites. Table 13 shows the 1995 H_2S data summaries..

TABLE 13

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

POLLUTANT : Hydrogen Sulfide (PPB)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMA 1 - HOUR 1ST MM/DD/HH	1 - HOUR 2ND MM/DD/HH	24 - HOUR 1ST MM/DD	24 - HOUR 2ND MM/DD	3 - MONTH 1ST MM	3 - MONTH 2ND MM	ARITH MEAN	1HR #>200	24HR #>100	% MDV
AMERADA HESS - TIOGA #2	1995	JAN-DEC	8450	172 04/11/22	79 01/25/23	14 04/11	11 05/01	3 04	3 06	1.9			18.3
DGC #13	1995	JAN-AUG	5593 ***	33 08/26/17	30 01/09/05	13 08/26	9 07/29	4 08	3 07	2.3			42.6
KOCH - MGP #4	1995	JAN-DEC	7176	147 11/07/11	98 11/07/10	16 11/07	7 11/02	2 08	2 12	1.6			18.5
LITTLE KNIFE #5	1995	JAN-DEC	8715	168 09/11/19	116 11/13/15	18 11/04	15 12/31	6 11	6 12	3.9			47.3
TRNP - NU	1995	JAN-DEC	8710	33 01/25/06	30 01/25/07	10 01/25	5 12/27	1 01	1 12	1.1			4.0
WHISKEY JOE - SPM	1995	JUL-DEC	3262 ***	192 10/29/19	187 09/21/19	45 09/13	35 09/01	7 10	6 11	5.2			20.3

* The State air quality standards are:

1) 10 ppm maximum instantaneous (ceiling) concentration not to be exceeded.
2) 200 ppb maximum 1-hour average concentration not to be exceeded more than once per month.
3) 100 ppb maximum 24-hour average concentration not to be exceeded more than once per year.
4) 20 ppb maximum arithmetic mean concentration averaged over three consecutive months.

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

Since there are four oil fields with relatively sour gas (1 - 8 % H_2S) just north of the park with some sour gas flaring, and considering some of the problems the department has encountered in these four oil fields, it was decided that a monitoring site was justified along the north boundary of the park. After reviewing oil well and tank battery locations, a site was established on July 27, in the Whiskey Joe oil field on the northeast TRNP - SU boundary. This H_2S data will aid in identifying sources emitting elevated H_2S concentrations. This site is expected to be active not more than three years.

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 - 146 ppb (53.5%); 3-hour - 101 ppb (20.2%); 24-hour - 35 ppb (35.4%); annual (partial year) - 11.8 ppb (48.3%); annual (full year) - 4.1 ppb (17.8%).

There is no SO_2 5-minute standard currently in effect. The maximum 5-minute average was 209 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 (partial year) - 7.4 ppb (14.8%); annual (full year) - 4.0 ppb (8.0%).

3.3 Ozone (O_3)

Neither the State nor Federal standard was exceeded during the year. The maximum concentration and the maximum concentration expressed as a percentage of the applicable standard is 73 ppb (60.8%).

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 - 78.3 $\mu g/m^3$ (52.2%); annual (partial year) - 19.2 $\mu g/m^3$ (38.4%); annual (full year) - 13.1 $\mu g/m^3$ (26.2%).

There is no $PM_{2.5}$ standard currently in effect. The maximum 24-hour average $PM_{2.5}$ concentration was 25.9 $\mu g/m^3$.

3.5 Carbon Monoxide (CO)

Neither State nor Federal standards were exceeded during the year. The maximum concentrations and the maximum concentrations expressed as a percentage of the applicable standards are as follows: 1-hour - 9.3 ppb (26.6%); 8-hour - 3.2 ppm (35.6%).

3.6 Hydrogen Sulfide (H_2S)

There were no exceedances of any of the standards. The maximum concentrations and the maximum concentrations expressed as a percentage of the applicable standard are as follows: 1-hour - 192 ppb (96%); 24-hour - 45 ppb (45%); 3-month - 7 ppb (32.6%).

Table 14 summarizes the evaluations for each of the sites in the State network.

TABLE 14
Monitoring Site Evaluation

Site	Parameter*	Meets Needs	Modification Needed	New Site Needed	Parameter Not Needed	Date Deleted
	SO_2	X				
Beulah Residential	NO_2	X				
	O_3	X				
	PM_{10}	X				
	MET	X				
Bismarck	PM_{10}			X		07/24
Bismarck Residential	PM_{25}	X				
Dickinson Residential	PM_{10}	X				
Dunn Center Rural	SO_2	X				
	MET	X				
Fargo Commercial	PM_{10}			X		08/24
Fargo Residential	PM_{10}	X				
	SO_2	X				
	NO_2	X				
	O_3	X				
	MET	X				
Sharon	SO_2	X				
	NO_2	X				
	O_3	X				
	MET	X				
	PM_{10}	X				
Grand Forks Commercial	PM_{10}			X		
Hannover Rural	SO_2	X				
	NO_2	X				
	O_3	X				
	MET	X				
Mandan Refinery (SPM)	SO_2	X				
	SO_2 (5-min)	X				
	MET	X				
TRNP-NU	SO_2	X				
	O_3	X				
	H_2S	X				
	MET	X				
TRNP-SU (Whiskey Joe - SPM)	SO_2	X				
	H_2S	X				
	MET	X				
Williston Commercial	PM_{10}			X		08/16
Williston Residential	PM_{10}	X				

* MET refers to meteorology and indicates wind speed and wind direction data are available from those sites.