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ENVIRONMENTAL HEALTH SECTION

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March 31, 1987

Mr. Bill Basbagill
Environmental Services Division
U.S. EPA, Region VIII
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Re: 1987 Annual Network Review

Dear Bill:

Enclosed is the Annual Network Review for 1987. If you have any questions, please feel free to contact this Department.

Sincerely,

Charles M. McDonald
Manager
Air Quality Services Section
Div. of Environmental Engineering

CMM:saj
Encl:

NORTH DAKOTA STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL ENGINEERING

AMBIENT AIR QUALITY MONITORING
ANNUAL NETWORK REVIEW
1987

March 1987

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1.0 INTRODUCTION

1.0.1 Background

The North Dakota State Department of Health, Division of Environmental Engineering, has the primary goal of protecting the health and welfare of North Dakotans from the detrimental effects of air pollution. As such, the Division of Environmental Engineering has the responsibility to ensure 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 some of the 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 (1) to determine if the system meets the monitoring objectives defined in Appendix D to 40 CFR 58, and (2) to identify needed modifications to the network such as termination or relocation of unnecessary stations or establishment of new stations 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 stations 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.

1.0.2 Goals and Objectives

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 moni-

toring objectives. These basic monitoring objectives are as follows:

1. To determine the highest pollutant[1/] 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.

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

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1/ "Pollutant" is used interchangeably with "air contaminant" in this document.

dimensions of the air parcel nearest a monitoring station throughout which actual pollutant concentrations are reasonably similar. The goal in siting stations 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 below:

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 tens to hundreds of km.

The relationship 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 (sometimes urban)
Population	Neighborhood, urban
Source Impact	Micro, middle, neighborhood
General/Background	Neighborhood, regional

Recommended scales of representativeness appropriate to the criteria pollutants are as shown below:

Criteria Pollutant	Spatial Scales
Total Suspended Particulate (TSP)	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

The use of this physical basis for locating stations allows for an objective approach, ensures compatibility among stations, and provides a physical basis for the interpretation and application of data. During the process of the first network review in 1979, existing stations were evaluated for their monitoring objectives and spatial scale and, if necessary, sites were deleted, added, or modified. These same criteria are used to evaluate the network during the annual review. Further details on network design can be found in Appendix D to 40 CFR 58.

1.0.3 Siting

As can be gathered from the prior discussion, each air contaminant has certain characteristics which must be taken into account when siting monitoring equipment. These characteristics may result from variations in the number and type of sources and emissions in question, reactivity of a particular pollutant with other constituents in the air, local site influences such as terrain and land use, and climatology. The State AAQM network is currently designed to provide air quality

data for two basic conditions: (1) population oriented monitoring and (2) background monitoring.

Population oriented monitoring comes into play primarily in regard to total suspended particulate (TSP) monitoring. The Department has determined that population areas on the order of 10,000 people or larger are likely candidates for monitoring for TSP. On the other hand, background stations are chosen to determine concentrations of air contaminants in areas remote from man-made sources and generally are sited according to a "regional" spatial scale. Once general locations are established, all monitoring stations are sited in accordance with the specific probe siting criteria specified in Appendix E to 40 CFR 58.

1.0.4 Monitoring Methods

All sampler/analyzers used by the North Dakota Department of Health for TSP, SO_2, NO_2 and O_3 monitoring are reference/equivalent equipment as listed below:

Parameter	Sampler/Analyzer
TSP	High-Volume sampler
PM_{10}	Size-Selective High-Volume Sampler
SO_2	EQSA-0276-009 "Thermo Electron Model 43 Pulsed Fluorescence SO_2 Analyzer"
NO_2	RFNA-0777-022 "Bendix Model 8101-C Oxides of Nitrogen Analyzer"
O_3	RFOA-1075-004 "Meloy Model OA350-2R Ozone Analyzer" or RFOA-1075-003 "Meloy Model OA325-2R Ozone Analyzer"

In addition to the parameters measured above, the Department also conducts monitoring for hydrogen sulfide (H_2S) as well as suspended sulfates (SO_4) and suspended nitrates (NO_3). The samplers/analyzers used for the determination of these parameters are noted below:

Parameter	Sampler/Analyzer
H_2S	Thermo Electron Model 43/340 converter - automated H_2S to SO_2 conversion with pulsed fluorescence analysis (Also known as Model 45)

SO_4	High volume method (40 CFR 50) for collection - ion chromatographic analysis
NO_3	High volume method (40 CFR 50) for collection - ion chromatographic analysis

1.0.5 PSD Class I Areas and Air Quality Maintenance Areas

On December 5, 1974, the U.S. EPA, promulgated the Prevention of Significant Deterioration of Air Quality (PSD) Regulations to prevent deterioration of air quality in areas of any state where the air is cleaner than the National Ambient Air Quality Standards. Subsequently, the entire State of North Dakota was designated a Class II PSD area.

With regard to the known and anticipated types of air contaminants and their predicted effects on specific geographical areas, however, special emphasis is placed on PSD Class I areas and Air Quality Maintenance Areas (AQMA).

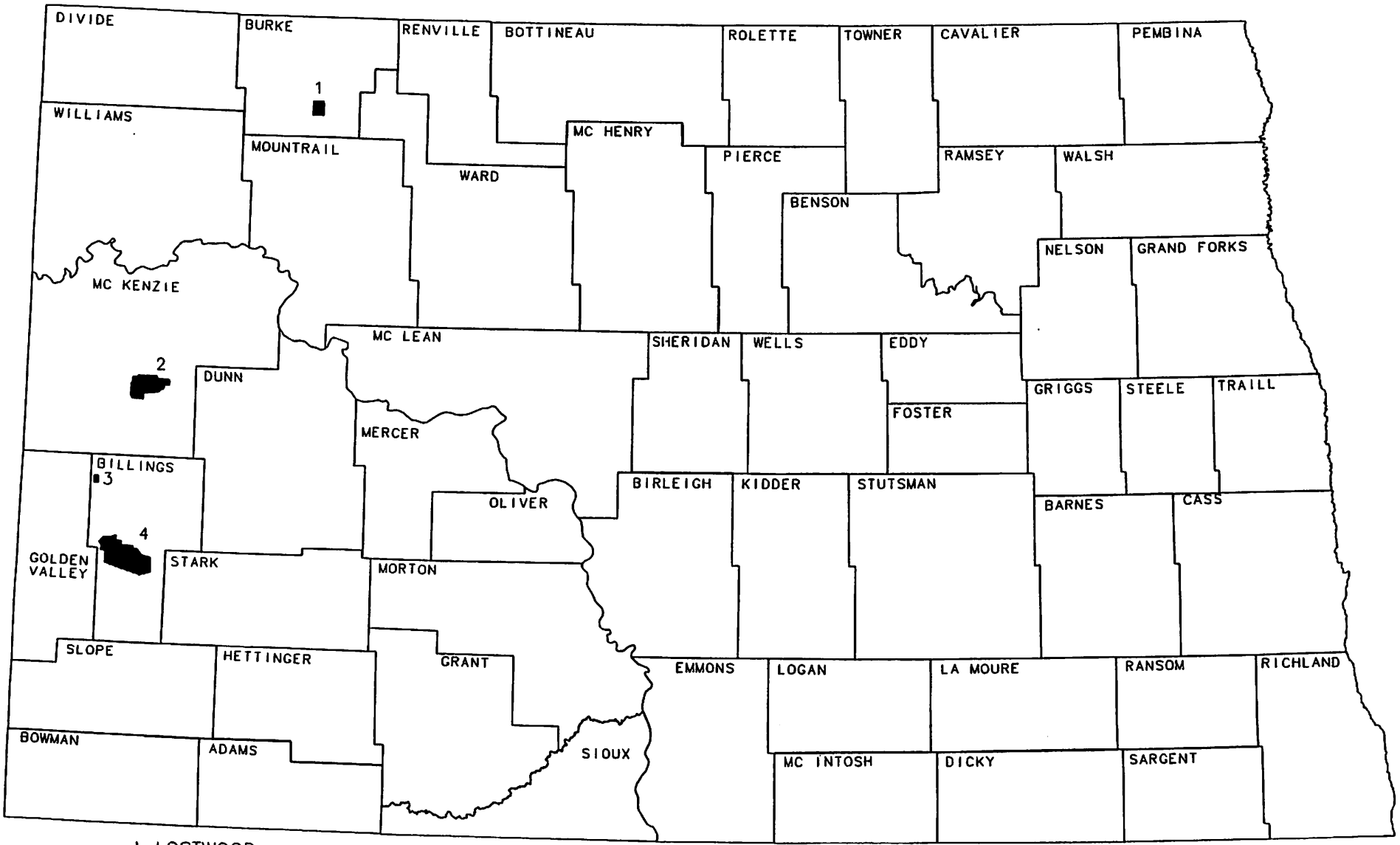
The Clean Air Act Amendments of 1977 established a list of Federally mandated Class I PSD areas. The areas in North Dakota which were included on this list were the Theodore Roosevelt National Park (TRNP) (North Unit, South Unit and Elkhorn Ranch) and the Lostwood National Wilderness Area. These areas are shown on Map 1.

The State Implementation Plan for North Dakota designated two air quality maintenance areas (AQMA). As shown on Map 2, the areas are the Cass County AQMA and the McLean-Mercer-Oliver County AQMA. Because of current air quality and projected population growth, Cass County was designated an AQMA for TSP only. The McLean-Mercer-Oliver County area was designated an AQMA for TSP, SO_2, NO_2 and O_3 because of the lignite coal related industrial growth for that area. (Note Study by PEDCO - EPA 908 1-76-009, June 1976: North Dakota Air Quality Maintenance Area Analysis.)

1.0.6 North Dakota AAQM Network

Currently, the Department operates and maintains 14 AAQM sites around the State. Twelve are fixed SLAMS/NAMS

PSD – CLASS I AREAS



1 LOSTWOOD

2 TRNP – NU

3 ELKHORN RANCH

4 TRNP – SU

MAP 1

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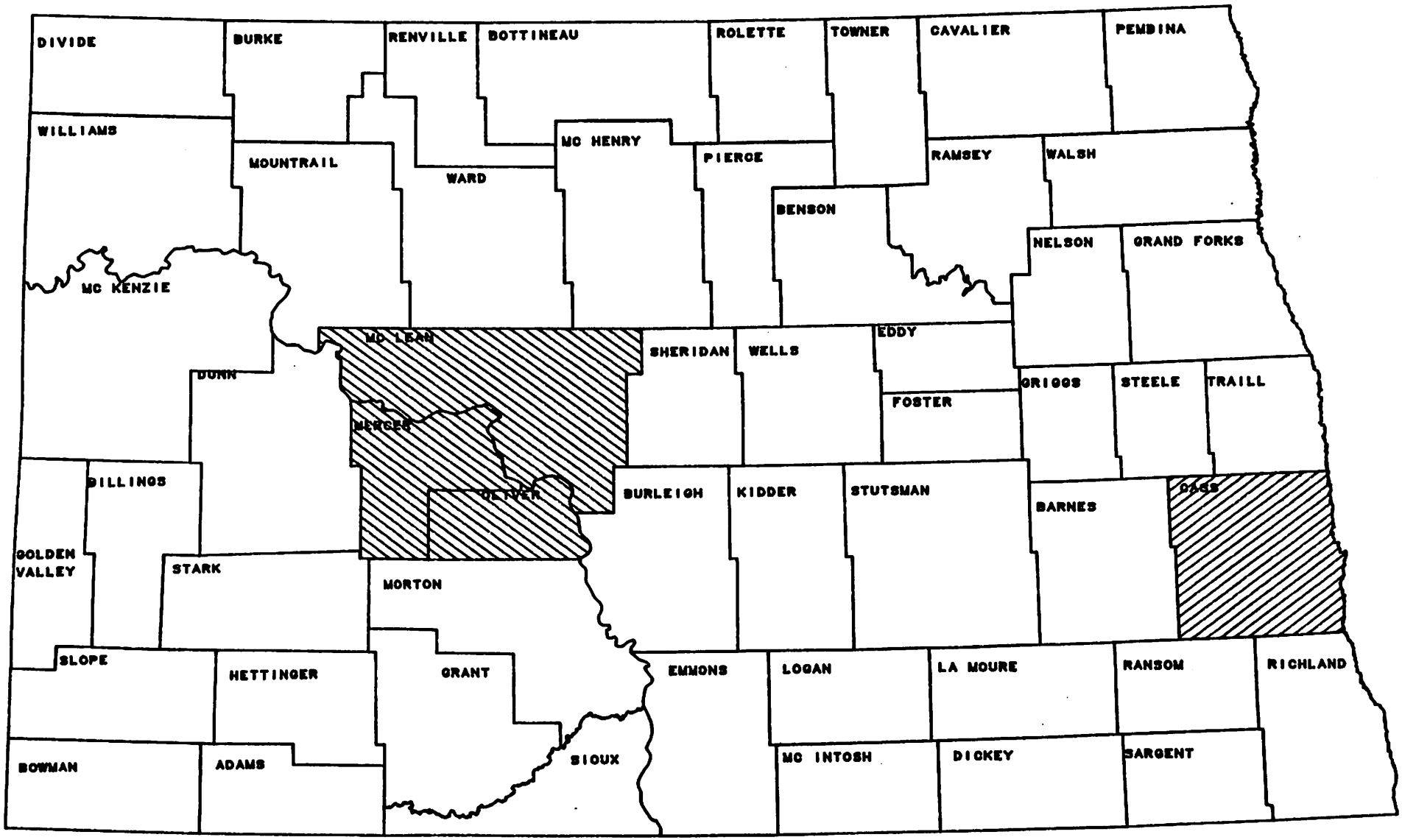
DESIGNATED AIR QUALITY MAINTENANCE AREAS (AQMA)



MAP 2

sites (5 rural and 7 urban sites). In addition, two short-term special purpose monitoring (SPM) sites are operated in western and central North Dakota. A third SPM site is being evaluated for the Little Knife Oil Field. Table 1 lists the types of stations and parameters monitored and Map 3 shows the approximate network site locations.

1.0.7 Industrial Monitoring

Industrial sources which are required to implement source specific monitoring programs must develop their monitoring program in cooperation with the Department. Parameters to be monitored are governed by expected pollutant emissions. Specific locations for the various monitors are based upon computer generated air dispersion modeling predictions, published guidelines and agency judgments. To ensure quality data, all industrial air quality monitoring networks in the State must meet the requirements of Appendix B of 40 CFR 58. As manpower and resources allow, performance audits are conducted by this Department on each industrial monitoring network to assure the quality of the data.

TABLE I
AAQM Network Description

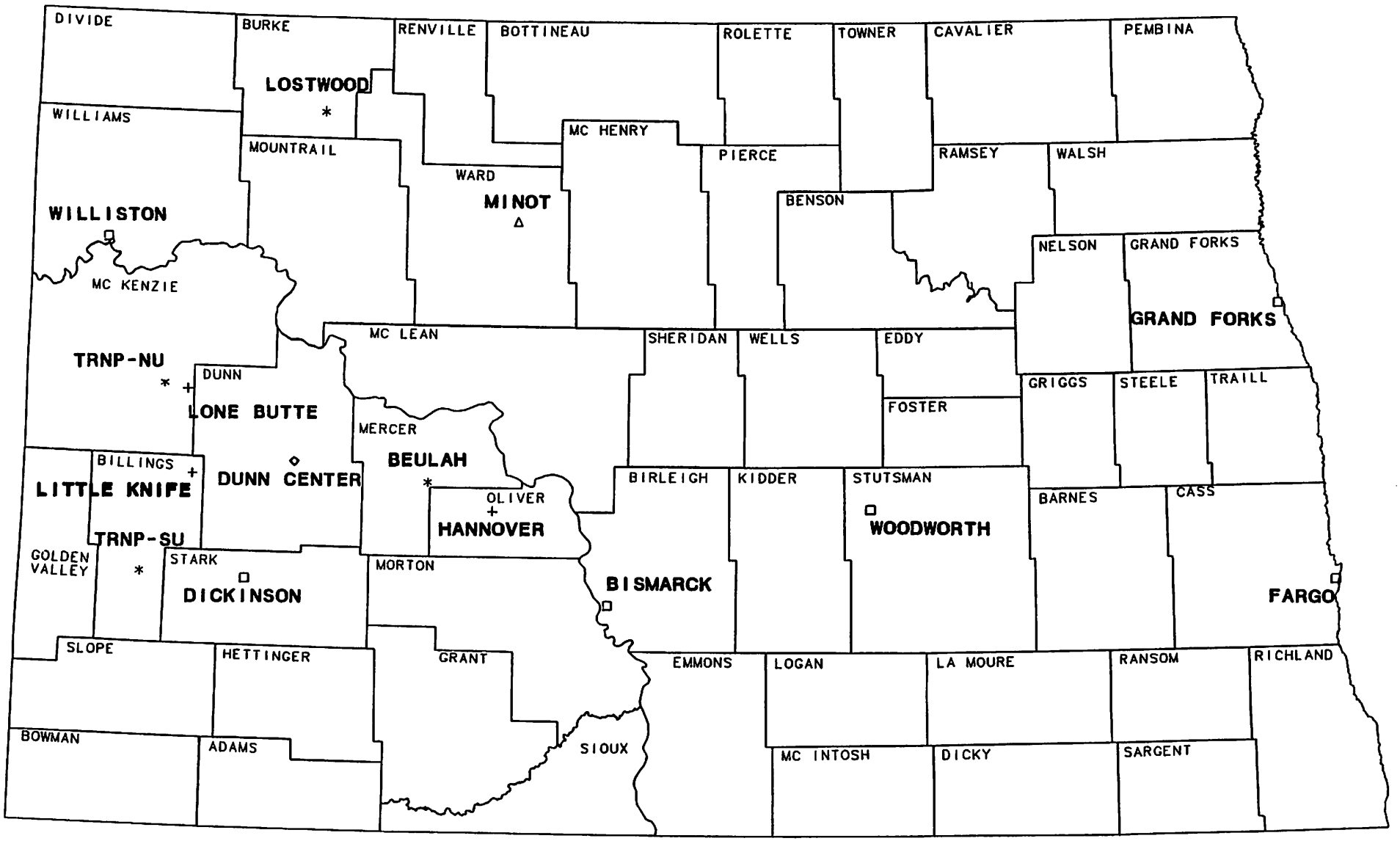
Site	Type Station	SAROAD I.D. No.	Parameter[1] Monitored	Ref/Equiv Method Designation No.	Operating Schedule	Monitoring Objective	Spatial Scale	Date Site Began	Date Q.A. Began
1 Fargo-Commercial	NAMS	350400001F01	TSP	Hi-Vol	6th Day	Population Exposure	Neighborhood	1/84	5/80
			PM_{10}	SSI	6th Day	Population Exposure	Neighborhood	6/85	6/85
Fargo-Commerical Dup.		350400001F09	TSP	Hi-Vol	6th Day	Collocated hi-vol	N/A	4/80	5/80
2 Beulah-Residential	SLAMS	350760001F01	PM_{10}	SSI	6th Day	Population Exposure	Neighborhood	1/87	1/87
			SO_2	EQSA-0276-009	cont.	Population Exposure	Neighborhood	4/80	7/80
			NO_2	RFNA-0777-022	cont.	Population Exposure	Neighborhood	6/80	7/80
			Met	N/A	cont.	N/A	N/A	4/80	7/80
3 Bismarck-Commercial	SLAMS	350100001F01	TSP	Hi-Vol	6th Day	Population Exposure	Neighborhood	1/57	5/80
			PM_{10}	SSI	6th Day	Population Exposure	Neighborhood	4/85	4/85
Bismarck-Commercial Dup.		350100003F09	TSP	Hi-Vol	6th Day	Collocated hi-vol	N/A	10/79	5/80
			PM_{10}	SSI	6th Day	Collocated SSI	N/A	4/85	4/85
4 Dickinson-Commercial	SLAMS	350300001F01	TSP	Hi-Vol	6th Day	Population Exposure	Neighborhood	1/70	5/80
			PM_{10}	SSI	6th Day	Population Exposure	Neighborhood	4/85	4/85
5 Dunn Center-Rural	SLAMS	350340003F03	TSP	Hi-Vol	6th Day	General Background	Regional	10/79	5/80
			PM_{10}	SSI	6th Day	General Background	Regional	3/85	3/85
			SO_2	EQSA-0276-009	cont.	General Background	Regional	10/79	5/80
			NO_2	RFNA-0777-022	cont.	General Background	Regional	10/79	5/80
			O_3	RFDA-1075-003	cont.	General Background	Regional	10/79	5/80
			Met	N/A	cont.	N/A	N/A	10/79	5/80
6 Grand Forks-Commercial	SLAMS	350480001F01	TSP	Hi-Vol	6th Day	Population Exposure	Neighborhood	1/70	5/80
			PM_{10}	SSI	6th Day	Population Exposure	Neighborhood	6/85	6/85
7 Lostwood-Rural	SLAMS	350180001F03	PM_{10}	SSI	6th Day	General Background	Regional	1/87	1/87
			SO_2	EQSA-0276-009	cont.	General Background	Regional	1/86	1/86
			H_2S	N/A	cont.	N/A	N/A	1/86	1/86
			Met	N/A	cont.	N/A	N/A	1/86	1/86
8 Minot-Commerical	SLAMS	350780001F01	PM_{10}	SSI	6th Day	Population Exposure	Neighborhood	12/86	12/86
9 TRNP(NU)-Rural	SLAMS	350700002F03	PM_{10}	SSI	6th Day	General Background	Regional	1/87	1/87
			SO_2	EQSA-0276-009	cont.	General Background	Regional	2/80	6/80
			O_3	RFDA-1075-003	cont.	General Background	Regional	11/82	11/82
			H_2S	N/A	cont.	N/A	N/A	5/80	6/80

TABLE I (Cont.)
AAQM Network Description

Site	Type Station	SAROAD I.D. No.	Parameter[1] Monitored	Ref/Equiv Method Designation No.	Operating Schedule	Monitoring Objective	Spatial Scale	Date Site Began	Date Q.A. Began
10 TRNP(SU)-Rural	SLAMS	350080001F03	PM_{10}	SSI	6th Day	General Background	Regional	10/86	10/86
			SO_2	EQSA-0276-009	cont.	General Background	Regional	2/80	6/80
			H_2S	N/A	cont.	N/A	N/A	10/85	10/85
			Met	N/A	cont.	N/A	N/A	3/80	6/80
11 Williston-Commercial	SLAMS	351360001F01	TSP	Hi-Vol	6th Day	Population Exposure	Neighborhood	5/70	5/80
			PM_{10}	SSI	6th Day	Population Exposure	Neighborhood	5/85	5/85
12 Woodworth-Rural	SLAMS	351180002F03	TSP	Hi-Vol	6th Day	General Background	Regional	3/82	3/82
			PM_{10}	SSI	6th Day	General Background	Regional	5/85	5/85
13 Hannover-Rural	SPM	350860002F05	SO_2	EQSA-0276-009	cont.	General Background	Regional	10/84	10/84
			NO_2	RFNA-0777-022	cont.	General Background	Regional	11/85	11/85
			O_3	RFDA-1075-003	cont.	General Background	Regional	5/85	5/85
			Met	N/A	cont.	N/A	N/A	10/84	10/84
14 Lone Butte-Rural	SPM	350700004F05	SO_2	EQSA-0276-009	cont.	Source Impact	Neighborhood	12/83	12/83
			H_2S	N/A	cont.	N/A	N/A	12/83	12/83
			Met	N/A	cont.	N/A	N/A	12/83	12/83

[1] Sulfate and nitrite analysis are performed on all hi-vol filters.

AMBIENT AIR QUALITY MONITORING SITES



+ CONTINUOUS ONLY
* CONTINUOUS W/ PM10
◇ CONTINUOUS W/ PM10 & TSP
△ PM10 ONLY
□ PM10 & TSP

MAP 3

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Specific information on industrial ambient air quality monitoring sites is included in Appendix A.

2.0 MONITORED POLLUTANTS

2.0.1 Total Suspended Particulate

To establish and maintain an effective total suspended particulate (TSP) monitoring program, consideration must be given to population centers, point sources, area sources, background monitoring, and collocated sampling.

2.0.1.1 Population Centers

A primary factor in establishing a TSP air monitoring network is to determine which urban areas may require air quality monitoring based on population size. The following table (Table 2) ranks the cities of largest population in the State. The approximate location of these cities is shown on Map 4.

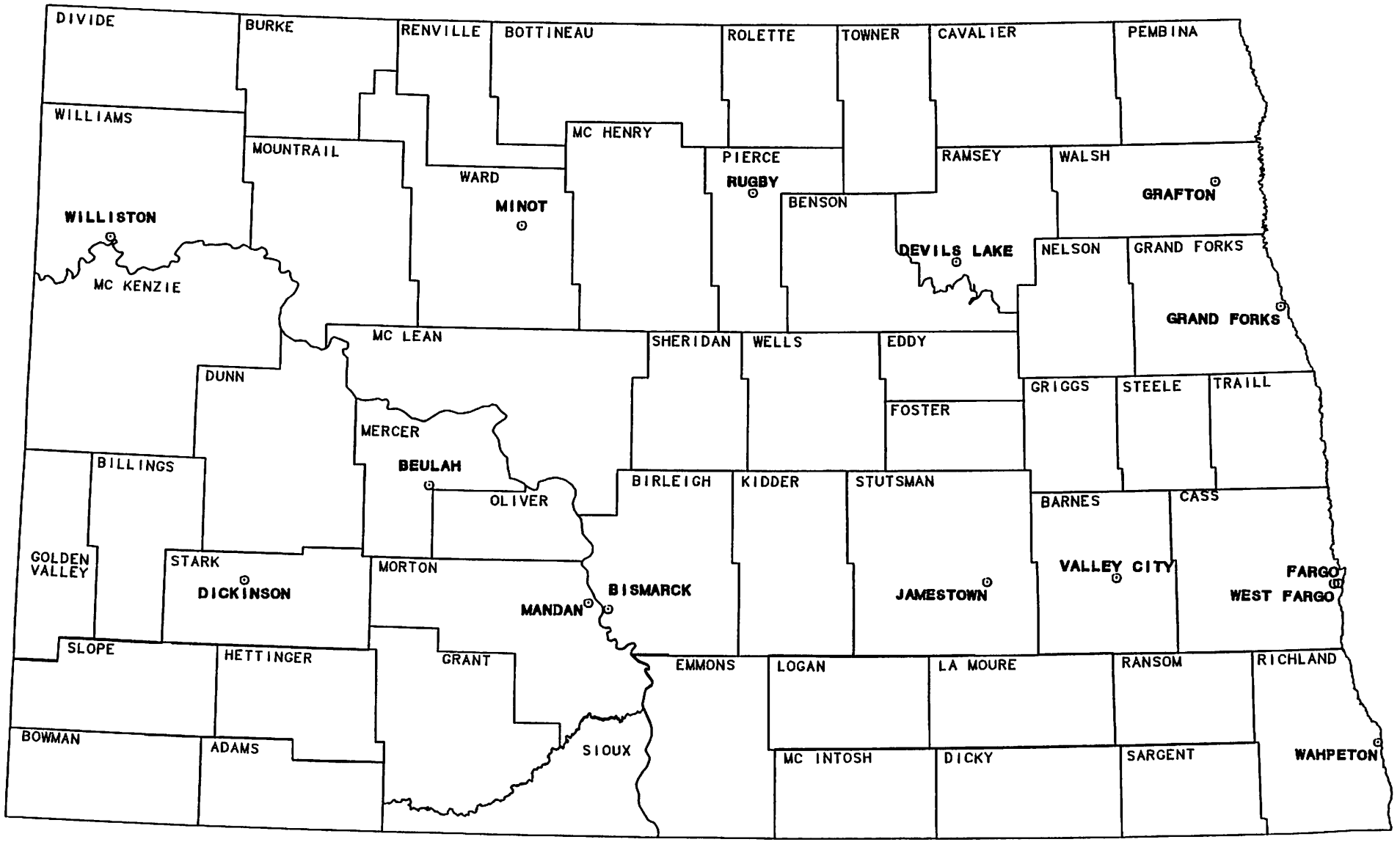
During the 1982 review, an air quality monitoring "population breakpoint" of 10,000 was established. Special emphasis was placed on conducting

TABLE 2
MAJOR NORTH DAKOTA CITIES

Rank	City	1970 Population	1980 Population	Monitoring Objective	Spatial Scale
1	Fargo	56,308	61,308	Population exposure	Neighborhood
2	Bismarck	38,379	44,485	Population exposure	Neighborhood
3	Grand Forks	41,909	43,765	Population exposure	Neighborhood
4	Minot	32,790	32,843	Population exposure	Neighborhood
5	Jamestown[1/]	15,330	16,280	N/A	N/A
6	Dickinson	12,492	15,924	Population Exposure	Neighborhood
7	Mandan[1/]	12,560	15,513	N/A	N/A
8	Williston	11,364	13,336	Population exposure	Neighborhood
9	West Fargo		10,099	N/A	N/A
10	Wahpeton[1/]	8,183	9,064	N/A	N/A
11	Valley City[1/]	6,939	7,774	N/A	N/A
12	Devils Lake[1/]	7,391	7,442	N/A	N/A
13	Grafton	-	5,293	N/A	N/A
14	Rugby	-	3,335	N/A	N/A
15	Beulah[2/]		2,878	Population exposure	Neighborhood

1/ TSP monitoring previously conducted at this site.
2/ A population-oriented TSP monitoring site was established at Beulah, despite its low population, due to the significant coal-related industrial development in that area.

MAJOR NORTH DAKOTA CITIES



MAP 4

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population exposure monitoring in urban areas approaching a population of 10,000. From the data that have been collected at these sites over the years, we have been able to remove several cities from the network because either they show TSP levels that are consistently below the State and Federal standards, or the data are not significantly different from those received from nearby reporting stations. Cities that have been removed as a result of these evaluations are Jamestown, Mandan, Wahpeton, Valley City, and Devils Lake. West Fargo never as included in the program because of the homogeneity of the Fargo area.

2.0.1.2 Point Sources

The major in-State point sources for TSP (emissions >100 TPY) are listed in Table 3 along with emission rates as calculated from the most recent (1985) emission inventory. Map 5 indicates the approximate location of these facilities.

TABLE 3

MAJOR TSP SOURCES

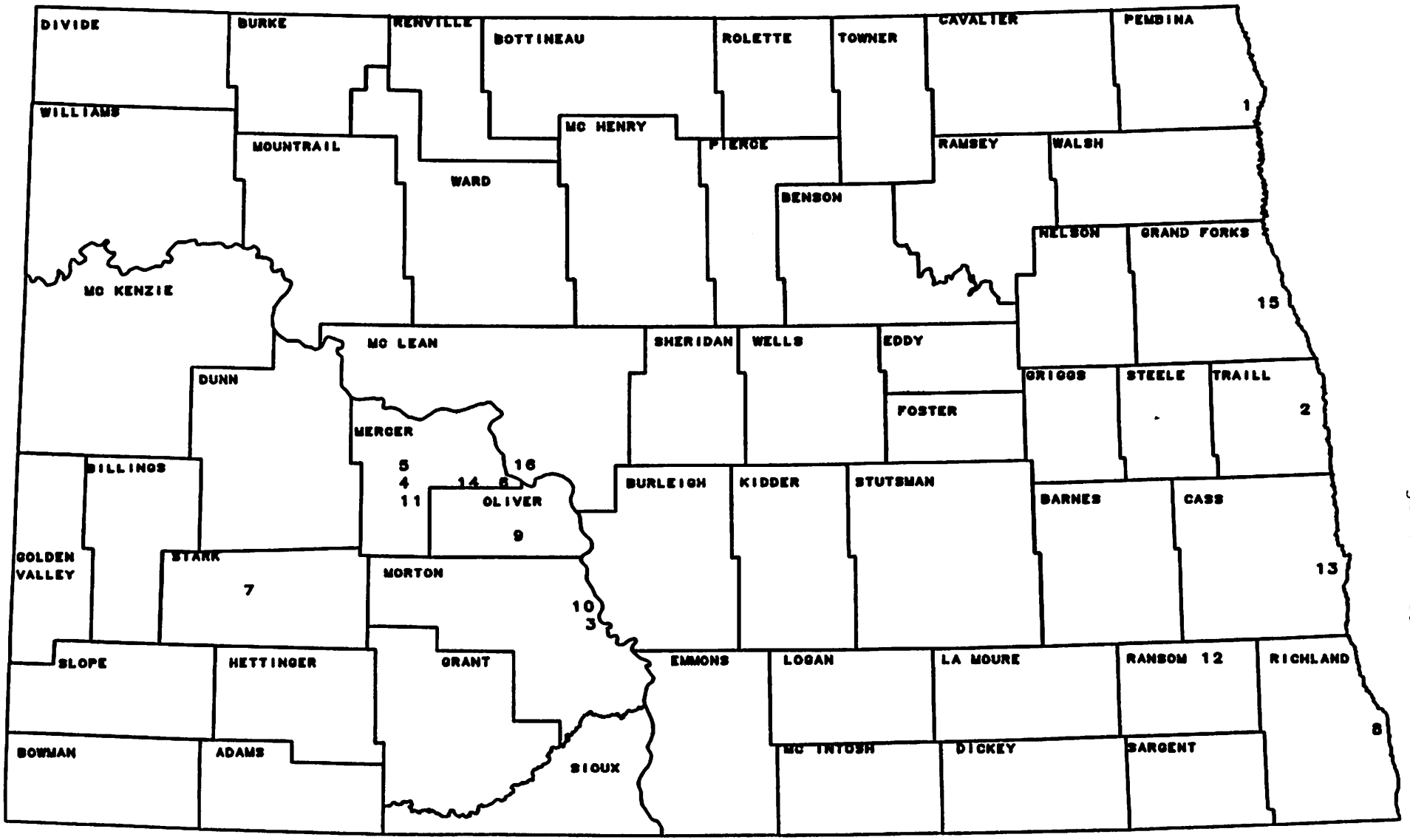
#	Name of Company	Type of Source	Location	County	Particulate Emis. Ton/Year
1	American Crystal Sugar Co.	Sugar Beet Processing Plant	Drayton	Pembina	186.4
2	American Crystal Sugar Co.	Sugar Beet Processing Plant	Hillsboro	Traill	113.0
3	Amoco Oil Company	Oil Refinery	Mandan	Morton	953.0
4	ANG Coal Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	523.0
5	Basin Electric Power Cooperative (AVS I) (AVS II)	Steam Electric Gen. Facility	Beulah	Mercer	190.0 28.0
6	Basin Electric Power Cooperative (Unit I) (Unit II)	Steam Electric Gen. Facility	Stanton	Mercer	53.0 324.0
7	Husky Industries	Charcoal Briquetting Plant	Dickinson	Stark	378.1
8	Minn-Dak Farmers Coop.	Sugar Beet Processing Plant	Wahpeton	Richland	185.0
9	Minnkota Power Cooperative (Unit I) (Unit II)	Steam Electric Gen. Facility	Center	Oliver	315.2 407.4

TABLE 3 cont.

MAJOR TSP SOURCES

#	Name of Company	Type of Source	Location	County	Particulate Emis. Ton/Year
10	Montana Dakota Utilities (Unit I) (Unit II)	Steam Electric Gen. Facility	Mandan	Morton	23.0 119.0
11	Montana Dakota Utilities (Coyote Station)	Steam Electric Gen. Facility	Beulah	Mercer	454.0
12	National Sun Ind., Inc.	Sunflower Seed Processing Plant	Enderlin	Ransom	460.5
13	North Dakota State University	Heating Plant	Fargo	Cass	191.9
14	United Power Association	Steam Electric Gen. Facility	Stanton	Mercer	763.0
15	University of North Dakota	Heating Plant	Grand Forks	Grand Forks	364.0
16	UPA/CPA (Unit I) (Unit (II)	Steam Electric Gen. Facility	Underwood	McLean	922.0 822.0

MAJOR TOTAL SUSPENDED PARTICULATE SOURCES



MAP 5

2.0.1.3 Area Sources

Apart from the point sources of TSP noted above, the development of large lignite coal reserves in west central North Dakota has created a number of strip mines that act as "area" sources of TSP.

Total suspended particulates (TSP) are the major pollutant associated with mining activity. Mining related TSP is attributed to such operations as blasting, top soil and overburden removal, coal removal, coal transfer and handling, vehicular travel on unpaved haul roads, and reclamation activities.

Major lignite coal mines are listed in Table 4. Map 6 shows the approximate locations of these mines.

2.0.1.4 Background Monitoring

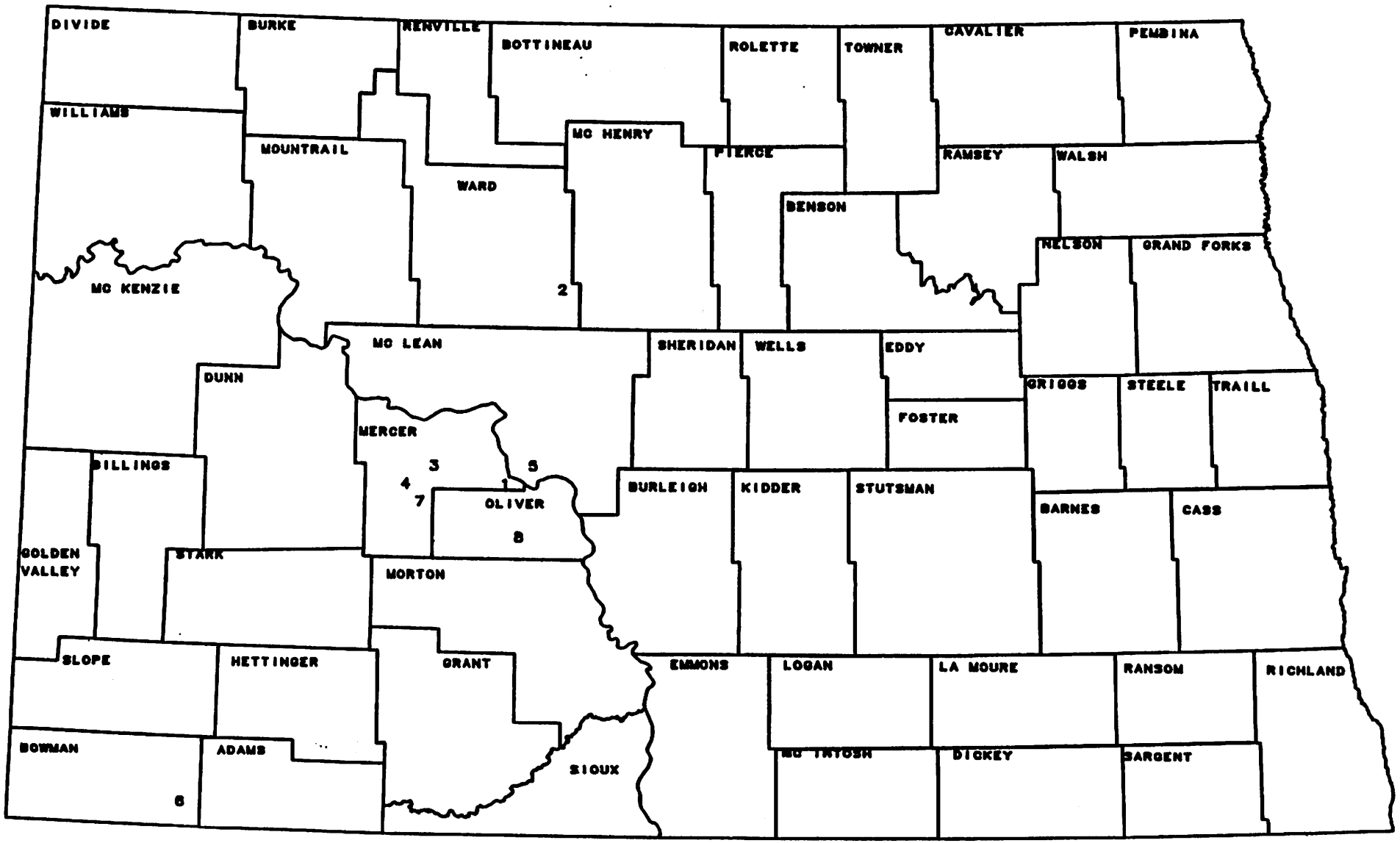
There are several distinct areas across the State of North Dakota from the standpoint of land

TABLE 4

MAJOR LIGNITE COAL MINES

#	Name of Company	Name of Source	Location	Permit #
1	Basin Co-op Services	Glenharold	Stanton Mercer Co.	081001
2	Consolidation Coal Co.	Velva Coal Mine	Velva Ward Co.	M76001
3	Coteau Properties Co.	Freedom Mine	Beulah Mercer Co.	Pending
4	North American Coal	Indian Head	Zap Mercer Co.	079013
5	Falkirk Mining Co.	Falkirk Mine	Underwood McLean Co.	079002
6	Knife River Coal Mining Co.	Peerless Coal Mine	Gascoyne Bowman Co.	079011
7	Knife River Coal Mining Co.	Knife River Coal Mine	Beulah Mercer/Oliver Co.	079012
8	Baukol-Noonan, Inc.	Baukol-Noonan Mine	Center Oliver Co.	079004

LIGNITE COAL MINES



MAP 6

usage. They are the predominantly agricultural (cropland) area in the eastern and east-central portion of the State, the farming/ranching mixed operations in the central and western portions of the State, and the coal development area in the west-central portion of the State. The State TSP network has been designed to be representative of these varying areas.

2.0.1.5 Collocated Sampling

In accordance with 40 CFR 58, at least two sites must be selected for duplicate (collocated) sampling. The two sampling sites with collocated samplers are located at Bismarck and Fargo.

2.0.1.6 Monitoring Network

The State TSP monitoring sites are listed in Table 1 and shown on Map 3.

2.0.2 Inhalable Particulates

Due to the potential health effects of fine, inhalable particulates (IP) and also because finer particulates cause a greater impairment to visibility, EPA recently proposed a fine particulate standard and sampling procedure. The Notice of Proposed Rule Making for Revision of the AAQ Standards for Particulate Matter (Ambient Air Quality Surveillance for Particulate Matter, and Ambient Air Monitoring Reference and Equivalent Methods) was presented in the Tuesday, March 20, 1984, Federal Register (Volume 49, No. 55 -10408). The proposal addresses only those particles that are 10 micrometers or smaller in size and are designated as PM_{10}.

2.0.2.1 Sources

The sources that produce inhalable particulates (IP) are essentially the same ones that produce TSP. However, because of a greater number of sources in the urban areas, the IP concentration is higher in the urban areas than in the rural areas.

2.0.2.2 Monitoring Network

The initial PM_{10} monitoring network was established at Bismarck, Dickinson, Dunn Center, Fargo, Grand Forks, Williston, and Woodworth. All but the Dunn Center and Woodworth sites were operated on an every second day schedule; those two were operated every sixth day. The requirement for the every second day scheduling was the result of a preliminary EPA study that ascribed exceedance probabilities of greater than or equal to 0.20 and less than 0.95 to the respective sites for a prospective PM_{10} average annual arithmetic mean standard of 50 $\mu g/m^3$ and a 24-hour PM_{10} standard of 150 $\mu g/m^3$. However, based on approximately 1-1/2 years of actual PM_{10} data, no exceedances were observed and it was determined that every second day sampling was not necessary. As a result of that determination, one sampler was taken from Bismarck, Dickinson, Grand Forks, and Williston to replace TSP (high-volume) samplers at Minot, TRNP-NU, Lostwood, and Beulah. A spare PM_{10} sampler replaced the TSP sampler at TRNP-SU in October 1986. Two PM_{10} samplers were

left at Fargo in anticipation of needing to establish a collocated PM_{10} site at that location after the final IP standards are promulgated.

The PM_{10} monitoring sites and the number of PM_{10} samplers located at those sites are listed in Table 5, and the approximate locations are shown on Map 7.

2.0.3 Sulfur Dioxide

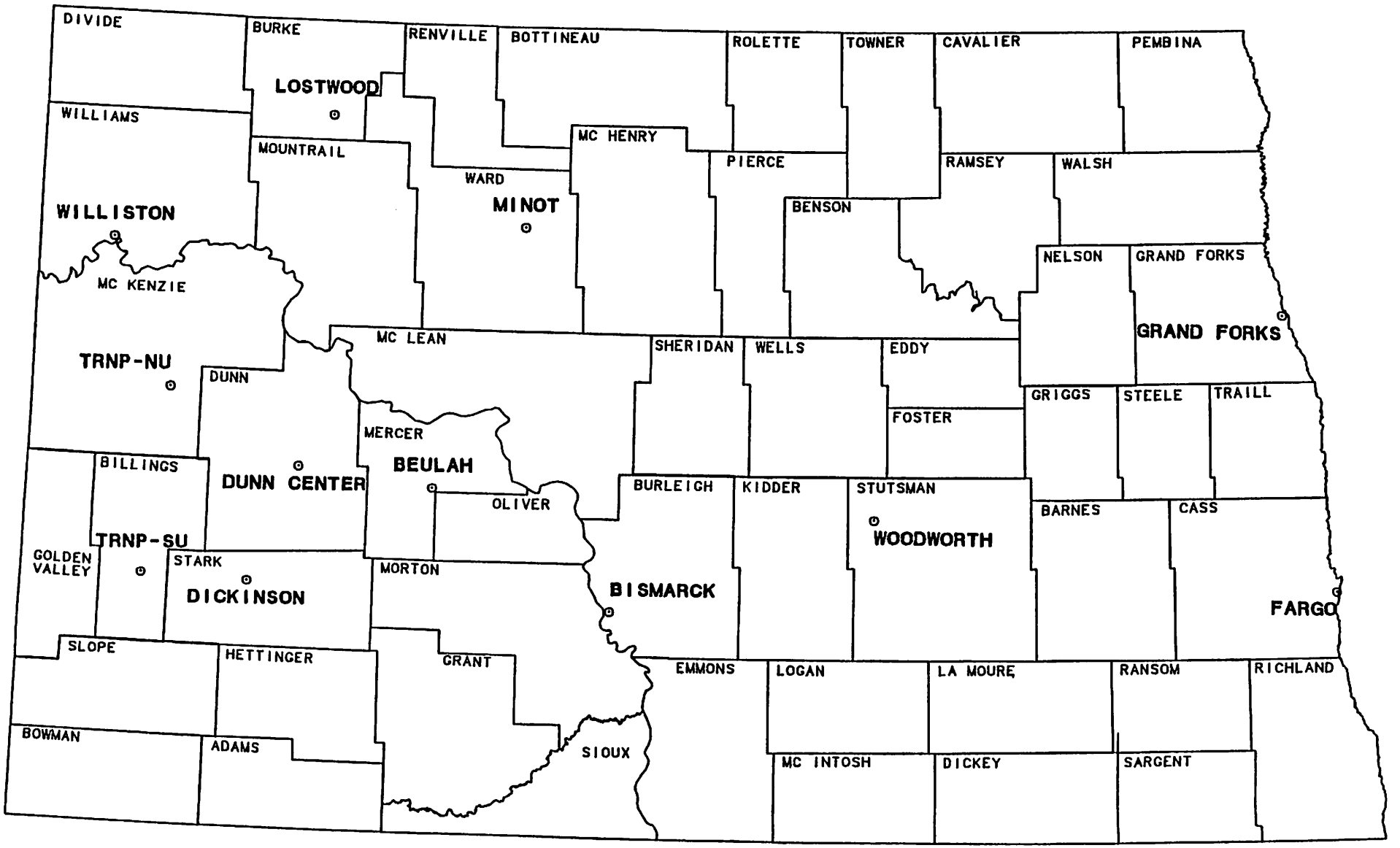
Coal, oil, and gas development in the west and west-central portions of North Dakota has produced a number of sources of sulfur dioxide (SO_2). These sources include coal-fired steam electrical generating facilities, natural gas processing plants, oil refineries, and flaring oil/ gas wells. As a result, SO_2 has become one of this Department's major concerns in regard to ambient air quality monitoring.

TABLE 5
PM_{10} SITES

Name	No. of Samplers	Operational Date
Beulah	1	January 20, 1987
Bismarck	2*	April 1, 1985
Dickinson	1	April 5, 1985
Dunn Center	1	April 7, 1985
Fargo	2*	August 27, 1985
Grand Forks	1	July 2, 1985
Lostwood	1	January 7, 1987
Minot	1	December 23, 1986
TRNP-NU	1	January 6, 1987
TRNP-SU	1	October 22, 1986
Williston	1	June 14, 1985
Woodworth	1	June 18, 1985

*These are or will be collocated.

PM10 MONITORING SITES



MAP 7

2.0.3.1 Major Point Sources

The major point sources of SO_2 (>100 TPY) are listed in Table 6 along with their emission rates as calculated from the most recent (1985) emissions inventory. Map 8 shows the approximate locations of these facilities.

2.0.3.2 Other Sources

The western part of the State has a number of additional sources of SO_2 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 create two potential problems. First, these sources may directly emit significant amounts of hydrogen sulfide (H_2S) to the ambient air (which will be addressed later); and second, flaring of H_2S can create significant concentrations of SO_2 in the ambient air. Map 9 indicates the area of primary concern for such sources in western North Dakota.

TABLE 6

MAJOR SO_2 SOURCES

#	Name of Company	Type of Source	Location	County	SO_2 Emissions Ton/Year
1	American Crystal Sugar Co.	Sugar Beet Processing Plant	Drayton	Pembina	693.7
2	American Crystal Sugar Co.	Sugar Beet Processing Plant	Hillsboro	Traill	1729.5
3	Amoco Oil Company	Oil Refinery	Mandan	Morton	4775.0
4	ANG Coal Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	29003.0
5	Basin Electric Power Cooperative (AVS I) (AVS II)	Steam Electric Gen. Facility	Beulah	Mercer	7400.0 1900.0
6	Basin Electric Power Cooperative (Unit I) (Unit II)	Steam Electric Gen. Facility	Stanton	Mercer	6100.0 28286.0
7	Basin Electric Power Cooperative (Unit I) (Unit II)	Steam Electric Gen. Facility	Velva	McHenry	250.0 250.0
8	Cities Service	Natural Gas Processing Plant	Lignite	Burke	657.0
9	Ecological Engineering	Natural Gas Processing Plant	McGregor	Williams	158.3

TABLE 6 cont.

MAJOR SO_2 SOURCES

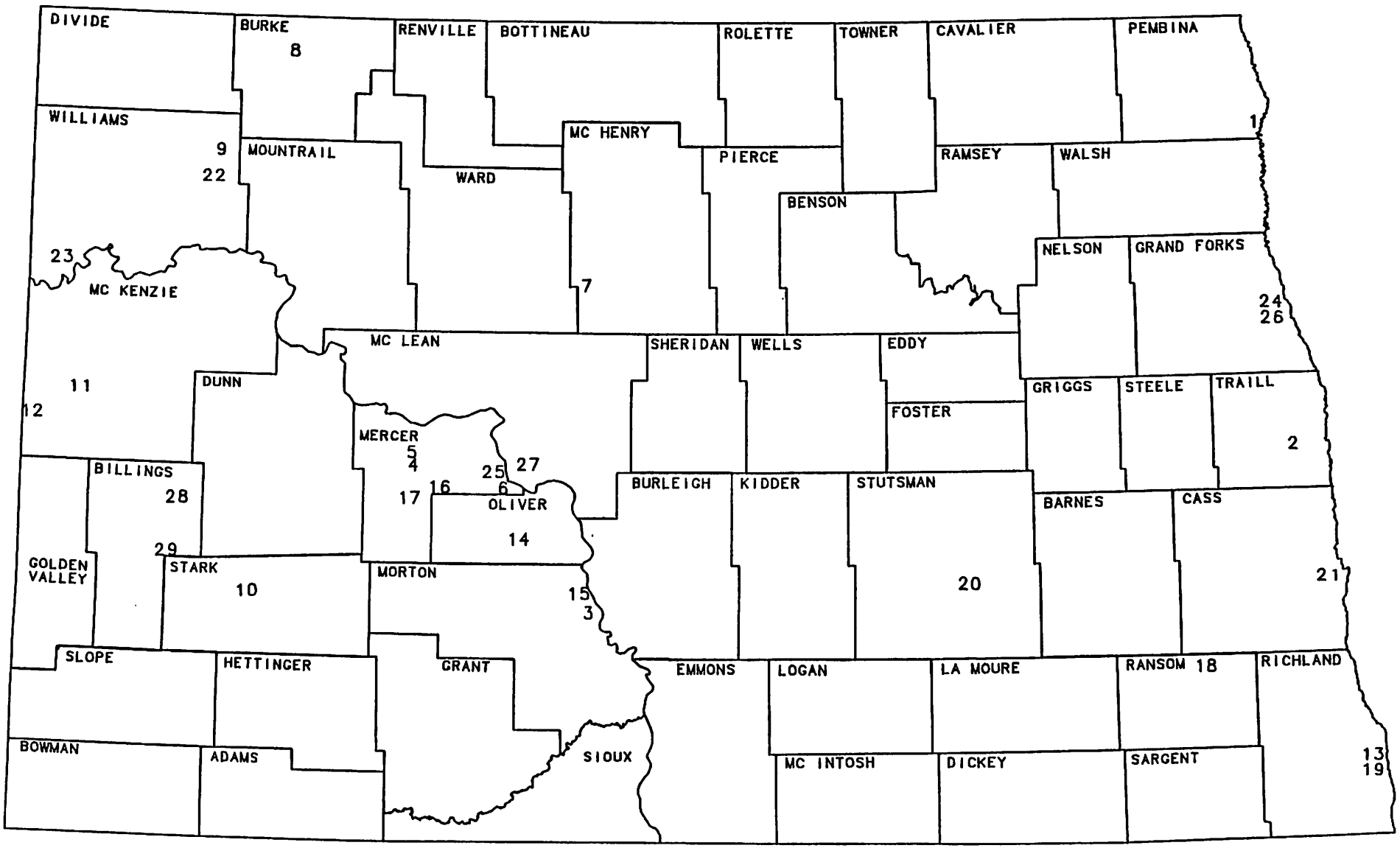
#	Name of Company	Type of Source	Location	County	SO_2 Emissions Ton/Year
10	Husky Industries	Charcoal Briquetting Plant	Dickinson	Stark	4247.6
11	Kerr-McGee Corporation	Natural Gas Processing Plant	Arnegard	McKenzie	287.0
12	Koch Hydrocarbon Company	Natural Gas Processing Plant	McKenzie Co.	McKenzie	3966.0
13	Minn-Dak Farmers Coop.	Sugar Beet Processing Plant	Wahpeton	Richland	329.0
14	Minnkota Power Coop. (Unit I) (Unit II)	Steam Electric Gen. Facility	Center	Oliver	 14175.9 15481.2
15	Montana Dakota Utilities (Unit I) (Unit II)	Steam Electric Gen. Facility	Mandan	Morton	 1285.0 4266.0
16	Montana Dakota Utilities (Units 1-5)	Steam Electric Gen. Facility	Beulah	Mercer	275.0
17	Montana Dakota Utilities (Coyote Station)	Steam Electric Gen. Facility	Beulah	Mercer	16020.0
18	National Sun Industries, Inc.	Sunflower Processing Plant	Enderlin	Ransom	105.2
19	ND State School of Science	Heating Plant	Wahpeton	Richland	140.8
20	North Dakota State Hospital		Jamestown	Stutsman	121.0

TABLE 6 cont.

MAJOR SO_2 SOURCES

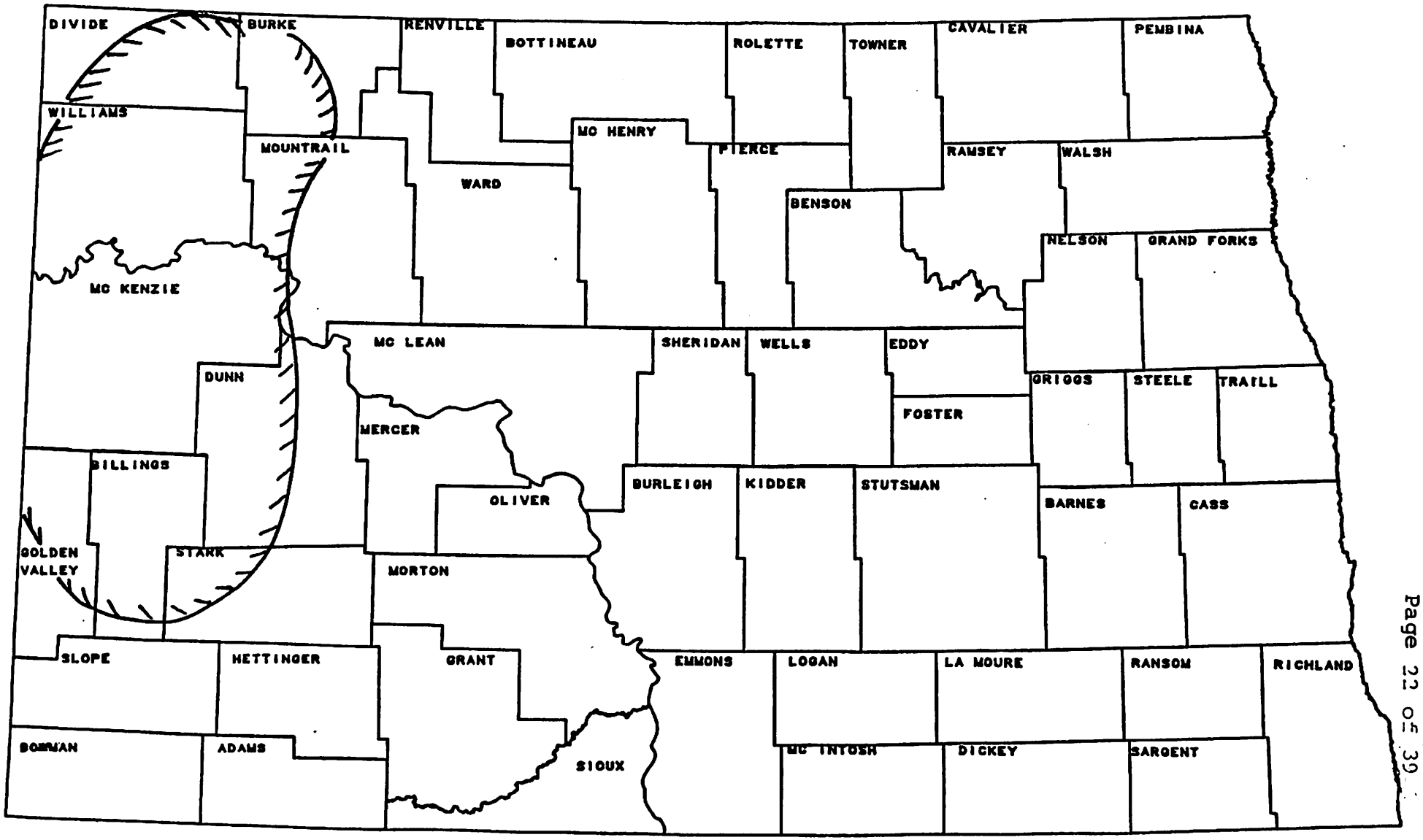
#	Name of Company	Type of Source	Location	County	SO_2 Emissions Ton/Year
21	North Dakota State University	Heating Plant	Fargo	Cass	302.0
22	Phillips Petroleum Co.	Natural Gas Processing Plant	Tioga	Williams	4341.2
23	Phillips Petroleum Co.	Natural Gas Processing Plant	Williston	Williams	463.1
24	Simplot, J.R.	Potato Processing Plant	Grand Forks	Grand Forks	190.8
25	United Power Association (Unit I) (Unit II)	Steam Electric Gen. Facility	Stanton	Mercer	 12225.0 1553.0
26	University of North Dakota	Heating Plant	Grand Forks	Grand Forks	262.4
27	UPA/CPA (Unit I) (Unit II)	Steam Electric Gen. Facility	Underwood	McLean	 20246.0 18048.0
28	Warren Petroleum Company	Natural Gas Processing Plant	Grassy Butte	McKenzie	3161.0
29	Western Gas Processors, Ltd.	Natural Gas Processing Plant	Fairfield	Billings	997.4

MAJOR SULFUR DIOXIDE SOURCES



MAP 8

MAJOR OIL/GAS DEVELOPMENT AREA



MAP 9

2.0.3.3 Monitoring Network

The SO_2 monitoring sites are listed in Table 7 and Map 10 shows their approximate location. As can be seen, these monitoring sites are concentrated in the vicinity of the oil and gas development in western North Dakota and the coal-fired steam electrical generating plants in the central part of the State. The SO_2 network does not address the multiple sources located in the Red River Valley of eastern North Dakota, but these sources are relatively small (the sum of their SO_2 emissions accounts for less than 2% of the total SO_2 emissions reported in Table 6).

2.0.4 Hydrogen Sulfide

Although no Federal Ambient Air Quality Standards exist for hydrogen sulfide (H_2S), the State of North Dakota has adopted half-hour H_2S standards.* H_2S emissions in

*A one-hour H_2S standard is being proposed to replace the two half-hour standards.

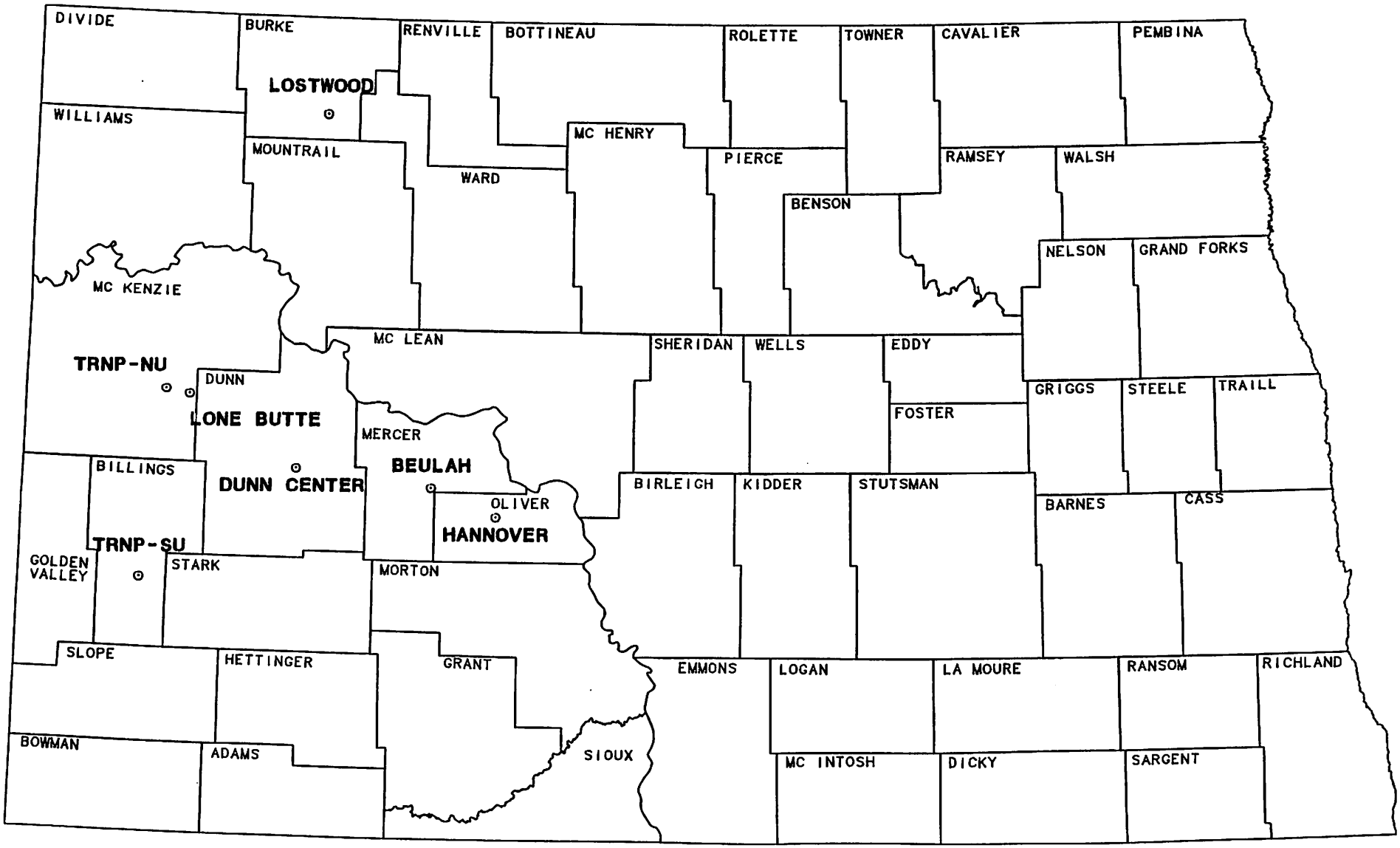
TABLE 7

CONTINUOUS MONITORING SITES*

Name	Pollutant Monitored	Type Station
1. Theodore Roosevelt National Park - North Unit	SO_2 H_2S O_3	SLAMS
2. Theodore Roosevelt National Park - South Unit	SO_2 H_2S	SLAMS
3. Dunn Center	SO_2 NO/NO_2 O_3	SLAMS
4. Beulah	SO_2 NO/NO_2	SLAMS
5. Lostwood Wilderness Area	SO_2 H_2S	SLAMS
6. Lone Butte (Portable)	SO_2 H_2S	SPM
7. Hannover	SO_2 NO/NO_2 O_3	SPM

*All continuous sites have wind measuring equipment.

CONTINUOUS MONITORING SITES



MAP 10

the State stem almost totally from the oil and gas operations in the western part of the State and principally from the area outlined on Map 9. Flares and treater stacks associated with oil/gas wells, oil storage tanks, compressor stations, pipeline risers, and natural gas processing plants are all potential sources of H_2S emissions.

2.0.4.1 Monitoring Network

There are four monitoring sites for H_2S emissions. These are the TRNP-NU and TRNP-SU sites, the Lostwood site, and the portable site at Lone Butte (locations 1, 2, 5, and 6 in Table 7).

2.0.5 Nitrogen Oxides

Nitrogen oxide (NO_x) is the term used to represent both nitric oxide (NO) and nitrogen dioxide (NO_2). In North Dakota the primary sources of NO_x are the coal-fired steam electrical generating plants, and automobiles and other internal combustion engine sources. NO_2 is formed when NO is oxidized in the ambient air.

2.0.5.1 Point Sources

Most major point sources of NO_x in North Dakota are associated with large coal burning steam 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. The major stationary point sources (>100 TPY) of NO_x, as calculated from the most recent (1985) emission inventory, are listed in Table 8. Map 11 shows the approximate locations of these facilities.

2.0.5.2 Area Sources

As indicated earlier, a second major source of oxides of nitrogen is attributed to sources in urban areas, specifically automobile emissions. The EPA has specified a design criteria requiring nitrogen dioxide NAMS monitoring in urbanized areas with populations greater than 1,000,000. North Dakota has no significant urbanized areas with

TABLE 8

MAJOR NO_x SOURCES

#	Name of Company	Type of Source	Location	County	NO_x Emissions Ton/Year
1	American Crystal Sugar Co.	Sugar Beet Processing Plant	Drayton	Pembina	341.9
2	American Crystal Sugar Co.	Sugar Beet Processing Plant	Hillsboro	Pembina	308.2
3	Amoco Oil Company	Oil Refinery	Mandan	Morton	933.0
4	ANG Coal Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	2696.0
5	Basin Electric Power Cooperative (AVS I) (AVS II)	Steam Electric Gen. Facility	Beulah	Mercer	6000.0 790.0
6	Basin Electric Power Cooperative (Unit I) (Unit II)	Steam Electric Gen. Facility	Stanton	Mercer	3308.0 18638.0
7	Basin Electric Power Cooperative (Unit I) (Unit II)	Steam Electric Gen. Facility	Velva	McHenry	335.0 335.0
8	Cities Service	Natural Gas Processing Plant	Lignite	Burke	383.7
9	Dawn Enterprises	Ethanol Plant	Walhalla	Pembina	172.8
10	Ecological Engineering	Natural Gas Processing Plant	McGregor	Williams	112.2

TABLE 8 cont.

MAJOR NO_x SOURCES

#	Name of Company	Type of Source	Location	County	NO_x Emissions Ton/Year
11	Koch Exploration Company	Compressor Station	31-155-95	Williams	226.0
12	Koch Hydrocarbon Company	Compressor Station	23-142-100	Billings	155.0
13	Koch Hydrocarbon Company	Compressor Station	33-145-101	McKenzie	133.8
14	Koch Hydrocarbon Company	Compressor Station	20-142-100	Billings	102.0
15	Minn-Dak Farmers Coop.	Sugar Beet Processing Plant	Wahpeton	Richland	666.0
16	Minnkota Power Coop. (Unit I) (Unit II)	Steam Electric Gen. Facility	Center	Oliver	 11006.9 17783.2
17	Montana Dakota Utilities (Unit I) (Unit II)	Steam Electric Gen. Facility	Mandan	Morton	 310.0 1039.0
18	Montana Dakota Utilities	Steam Electric Gen. Facility	Beulah	Mercer	64.7
19	Montana Dakota Utilities (Coyote Station)	Steam Electric Gen. Facility	Beulah	Mercer	10680.0
20	National Sun Ind., Inc.	Sunflower Processing Plant	Enderlin	Ransom	217.2

TABLE 8 cont.

MAJOR NO_x SOURCES

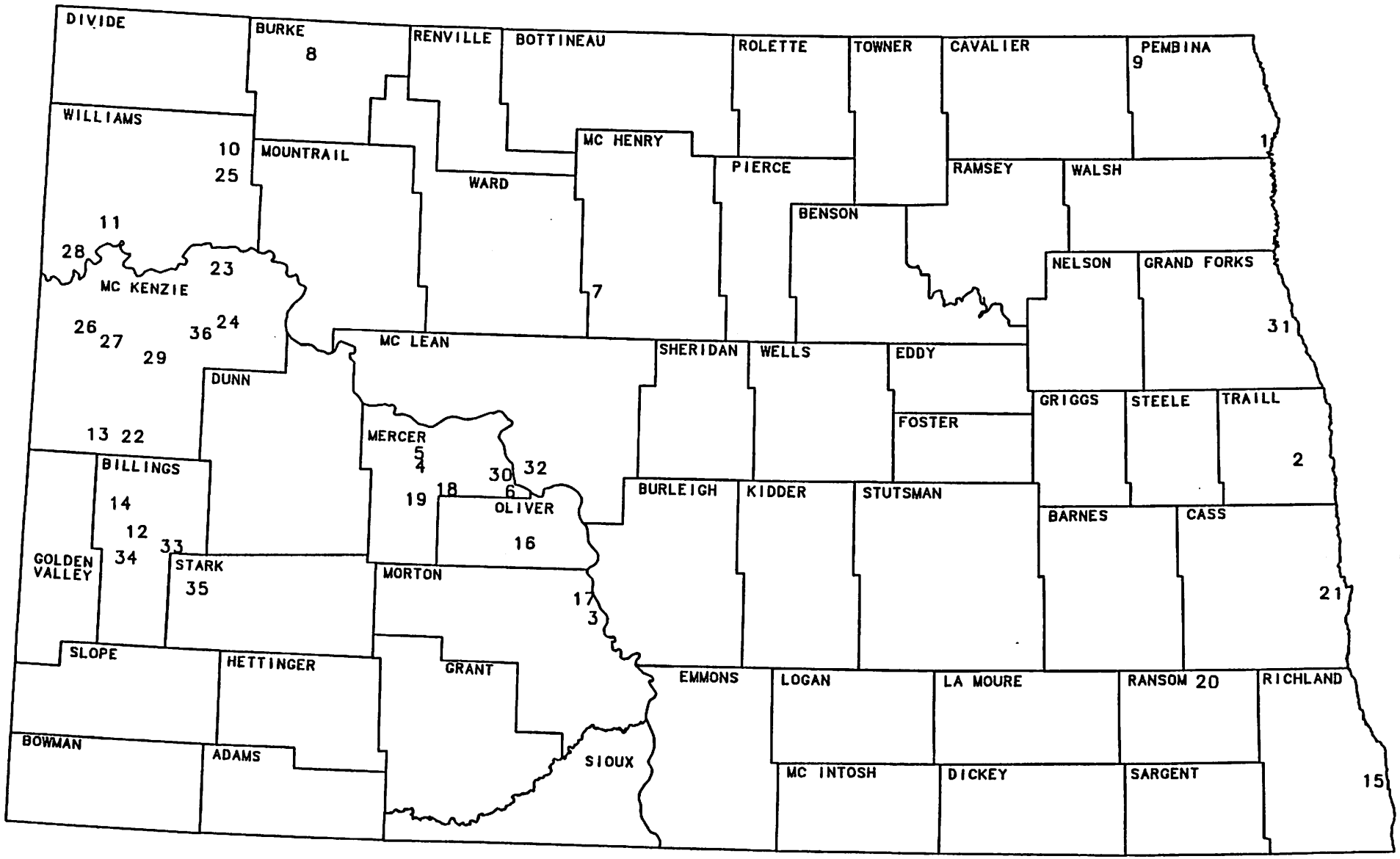
#	Name of Company	Type of Source	Location	County	NO_x Emissions Ton/Year
21	North Dakota State University	Heating Plant	Fargo	Cass	118.0
22	Phillips Petroleum Co.	Compressor Station	10-149-99	McKenzie	162.4
23	Phillips Petroleum Co.	Compressor Station	26-153-95	McKenzie	387.5
24	Phillips Petroleum Co.	Compressor Station	26-151-95	McKenzie	234.7
25	Phillips Petroleum Co.	Natural Gas Processing Plant	Tioga	Williams	2017.5
26	Phillips Petroleum Co.	Compressor Station	Alexander	McKenzie	196.7
27	Phillips Petroleum Co.	Compressor Station	Rawson	McKenzie	176.6
28	Phillips Petroleum Co.	Natural Gas Processing Plant	Williston	Williams	172.9
29	True Oil Company	Natural Gas Processing Plant	Watford City	McKenzie	206.2
30	United Power Association (Unit I) (Unit II)	Steam Electric Gen. Facility	Stanton	Mercer	 6803.0 1412.0

TABLE 8 cont.

MAJOR NO_x SOURCES

#	Name of Company	Type of Source	Location	County	NO_x Emissions Ton/Year
31	University of North Dakota	Heating Plant	Grand Forks	Grand Forks	210.0
32	UPA/CPA (Unit I) (Unit II)	Steam Electric Gen. Facility	Underwood	McLean	 14724.0 13127.0
33	Western Gas Processors, Ltd.	Natural Gas Processing Plant	Fairfield	Billings	213.8
34	Western Gas Processors, Ltd.	Compressor Station	Mystery Creek	Billings	256.4
35	Williston Basin Interstate Pipeline	Compressor Station	19-139-98	Stark	189.6
36	Williston Gas Company	Compressor Station	Demicks Lake	McKenzie	103.0

MAJOR NITROGEN OXIDE SOURCES



MAP 11

12MAR87

regard to oxides of nitrogen; in fact, the entire population of the State is less than 1,000,000.

2.0.5.3 Monitoring Network

The Department currently operates three $NO/NO_2/NO_x$ analyzers in the State. These are located at Dunn Center, Beulah, and Hannover (sites 3, 4 and 7 in Table 7). An additional monitor is being purchased by the U.S. Fish and Wildlife Service for the Lostwood Site and will be installed later this year.

2.0.6 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 to September 30. However, we operate the O_3 analyzers from April 1 to September 30 in order to collect two full quarters of data.

2.0.6.1 Point Sources

Table 9 lists the major point sources of VOC emissions in the State (>100 TPY). Map 12 shows the approximate locations of these facilities.

2.0.6.2 Area Sources

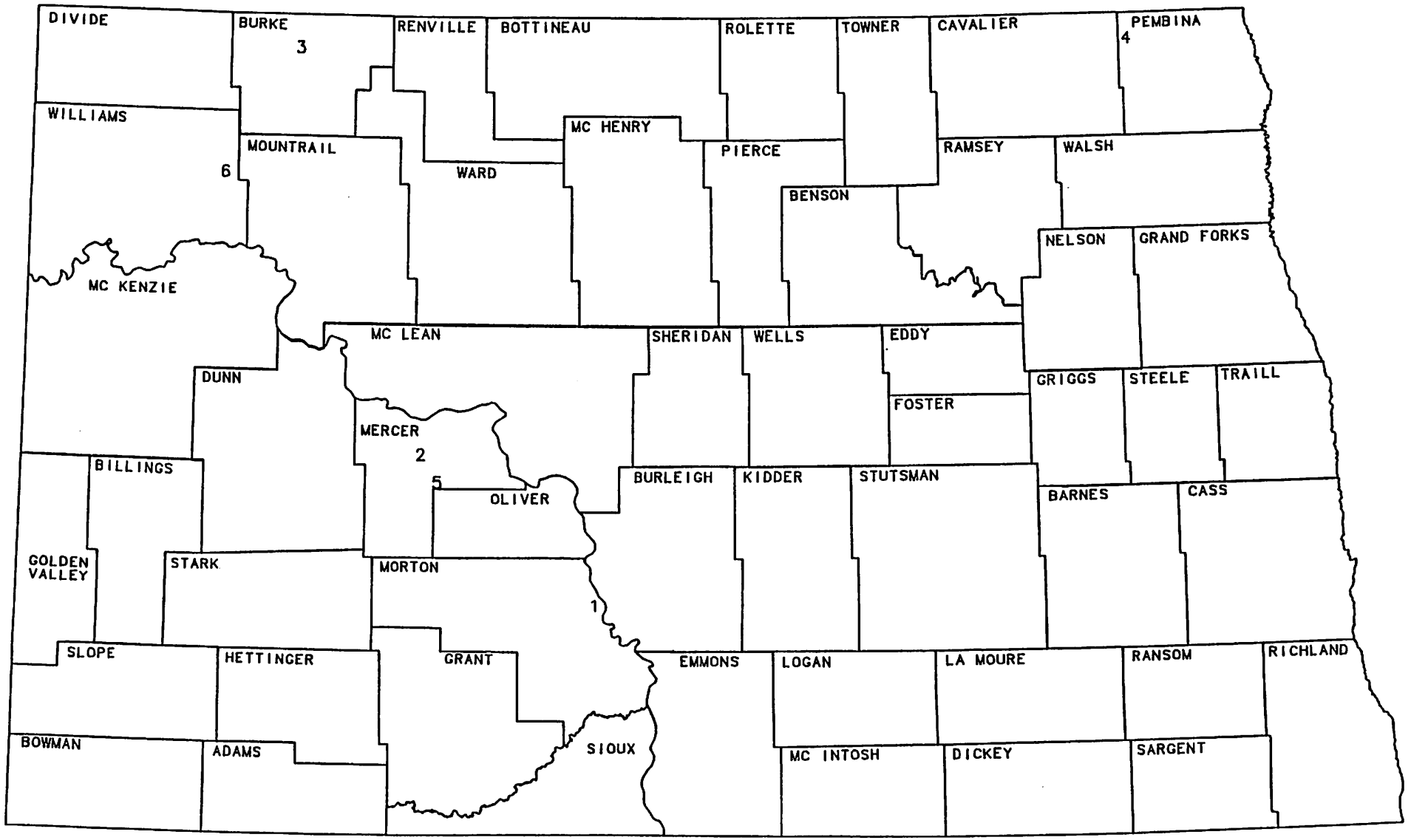
Point sources generally contribute only a fraction of the total VOC and NO_x emissions. The remaining emissions are attributed to mobile sources in urban areas. The EPA has specified a design criteria for selecting NAMS locations for O_3 as any urbanized area having a population of more than 200,000.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

TABLE 9

MAJOR VOC SOURCES

#	Name of Company	Type of Source	Location	County	VOC Emissions Ton/Year
1	Amoco Oil Company	Oil Refinery	Mandan	Morton	1099.0
2	ANG Coal Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	379.0
3	Cities Service	Natural Gas Processing Plant	Lignite	Burke	148.4
4	Dawn Enterprises	Ethanol Plant	Walhalla	Pembina	139.5
5	Montana Dakota Utilities	Steam Electric Gen. Facility	Beulah	Mercer	981.0
6	Phillips Petroleum Co.	Natural Gas Processing Plant	Tioga	Williams	216.7

MAJOR VOC SOURCES



MAP 12

12MAR87

2.0.6.3 Monitoring Network

The State currently has three continuous ozone analyzers in operation. These are at Dunn Center (#3 - Table 7), Hannover (#7 - Table 7) and at Theodore Roosevelt National Park - North Unit (#1 - Table 7).

2.0.7 Carbon Monoxide

Carbon monoxide (CO) has been determined to be generated chiefly by automotive sources. As such, high CO concentrations are generally found near major roadways and intersections which exhibit traffic flow problems and where atmospheric ventilation is poor.

2.0.7.1 Monitoring Network

Computer dispersion modeling and limited ambient air monitoring have shown no problems with regard to compliance with the Ambient Air Quality Standards. Additionally, the EPA has specified an urban area with a population density of 500,000 or

greater as the primary criteria for identifying and establishing a NAMS CO monitoring network. Therefore, no air quality monitoring for CO is currently being conducted in the State.

2.0.8 Lead

Through prior sampling efforts, the Department has determined that the State of North Dakota does not have any significant sources of lead. This determination, coupled with the Federal requirement for a NAMS network only in urbanized areas with populations greater than 500,000, resulted in the termination of the lead monitoring program effective January 1, 1984.

2.0.9 Suspended Sulfates and Nitrates

Although there are no Federal Ambient Air Quality Standards for either suspended sulfates (SO_4) or suspended nitrates (NO_3), both pollutants continue to be of concern to the Division of Hazardous Waste Management and Special Studies of the North Dakota State Health Department. Their concern primarily stems from the relation-

ship of these pollutants to precipitation chemistry. In addition, North Dakota currently has an ambient air quality standard for SO_4; although, that standard is being proposed for repeal.

2.0.9.1 Monitoring Network

Because SO_4 and NO_3 are analyzed from the same filters as are used for TSP monitoring, monitoring for both of these pollutants has been incorporated into the TSP monitoring schedule and is conducted at each of the TSP monitoring sites discussed in section 2.0.1. SO_4 and NO_3 analysis is also being conducted on the PM_{10} filters from Dickinson, Williston, and Bismarck Duplicate starting January 1, 1987. Since we also have SO_4 and NO_3 data collected on the high-volume samplers at these same locations, this will allow us to make some comparisons between the two sampling methods.

3.0 MONITORING SITE EVALUATION

As was stated in section 1.0.1, one of the purposes of this document is to identify needed modifications to the network. That purpose is achieved through this monitoring site evaluation.

3.0.1 Total Suspended Particulate Monitoring Sites

With the increased importance being placed on the inhalable particulate (PM_{10}) network and budgetary cutbacks at the State and Federal levels, a number of TSP samplers were replaced with PM_{10} samplers. In October 1986 the TSP sampler at TRNP-SU was replaced with a PM_{10} sampler. In December the hi-vol at Minot was replaced and in January 1987 the hi-vols at TRNP-NU, Lostwood, and Beulah were replaced with PM_{10} samplers. This leaves us with 7 TSP sampling sites which should give us a representative sample across the State.

3.0.2 Inhalable Particulate (PM_{10}) Monitoring Sites

The PM_{10} sites all meet the siting criteria as specified in the proposed PM_{10} regulation. As was discussed in the previous paragraph, a number of TSP (hi-vol) samplers were replaced with PM_{10} samplers at the end of 1986 and the beginning of 1987. As a result of that change, all the Class I areas in the State have a PM_{10} sampler which should prove more useful in visibility studies. All of the PM_{10} samplers are now operating on an every sixth day schedule. The placement of the PM_{10} samplers should give us a representative sample across the State.

3.0.3 Sulfur Dioxide Monitoring Sites

All SO_2 sites were reviewed for their representativeness, and found to be acceptable. The present sites are located in areas of multiple SO_2 sources; oil and gas development in the western part of the state and coal development in the central part.

The State Health Department has had its budget severely restricted and all State departments are under a hiring freeze. One technician terminated his employment in January 1987 and it is unknown at this time whether or not a replacement can be hired. An additional monitoring site in the Little Knife Oil Field has been identified, but can not be instituted under the current manning situation. In fact, without a replacement technician, additional sites will have to be closed. Hannover, which suffered electrical damage to almost all of its equipment in November 1986, is currently shut down because of the staffing problem. Dunn Center is also being looked at as a candidate for closure.

3.0.4 Hydrogen Sulfide Monitoring Sites

The Lone Butte Portable Monitoring Site was established, primarily, to monitor H_2S emissions in the Lone Butte Oil Field. Additional work has been done by the oil companies to reduce H_2S emissions in that area, such as the installation of an oil gathering pipeline and the replacement of hatch seals. The occurrence of violations of the H_2S standards appears to have been reduced,

but there is still a need for continued operation at that location.

3.0.5 Nitrogen Oxides Monitoring Sites

From the data, it is obvious that North Dakota does not have a large problem with nitrogen oxides. The Dunn Center site has very low hourly and annual values for both NO and NO_2. However, if one looks at the percentage of values being measured that are greater than the minimum detectable, one sees an increasing trend from one year to the next. Dunn Center is our baseline station for PSD considerations. Additionally, a major coal-to-methanol conversion plant is still under consideration for construction immediately adjacent to the monitoring site. If this construction comes to pass, data from the Dunn Center site will be invaluable for determining the concentration of emissions emanating from the plant and their effect on the ambient air quality. However, with the current staffing situation, Dunn Center may have to be closed.

The site at Beulah is interesting in that it is located in the heart of the coal-burning industry area. As such, one would expect to find the maximum concentrations of nitrogen oxides there. The full potential has not been realized for this site because construction of the plants in the area has not been completed. The Department believes that an NO_x analyzer should continue operating at Beulah at least for the near term.

The Hannover site is downwind for the prevailing winds from the major sources at Beulah and is also centrally located with respect to four other major NO_x sources located to the east of the Beulah area. Evaluation of the data from the Hannover site shows that both the NO_x and NO_2 levels are slightly lower than for Beulah, but higher than Dunn Center. The Hannover site is presently shut down because of the manning situation.

The U.S. Fish and Wildlife Service has ordered a NO_x analyzer for the Lostwood site. It is expected that measured levels of NO_x at that site will be comparable to Dunn Center. It will be interesting to see if any

influence from the power plant at Estavan, Saskatchewan can be measured.

3.0.6 Ozone Monitoring Sites

Ozone levels in the State are quite low with maximum observed values running slightly over half the standard. We are operating the O_3 analyzers only between April 1 and September 30. The Hannover site is closed and the Dunn Center site may have to be closed because of staffing problems.

3.0.7 Suspended Sulfates and Nitrates Monitoring Sites

The Department is proposing the repeal of the State suspended sulfate (SO_4) standard. This proposal has been approved by the State Air Pollution Control Advisory Council. Final action by the State Health Council is anticipated during the summer of 1987. Despite this action, analyses for suspended sulfates and nitrates will continue at least for the remainder of this year while we do some comparison on SO_4 and NO_3 data collected on collocated PM_{10}'s and hi-vols.

3.0.8 Summary

The evaluation of the monitoring sites is summarized in the following Table 10.

TABLE 10

MONITORING SITE EVALUATION

Site	Parameter	Meets Needs	Modification Needed	New Site Needed	Parameter Not Needed
Beulah Residential	TSP				X
	SO_4				X
	NO_3				X
	PM_{10}	X			
	SO_2	X			
	NO_2	X			
	MET	X			
Bismarck Commercial	TSP	X			
	SO_4	X			
	NO_3	X			
	PM_{10}	X			
Canfield Lake (SPM) (Site closed 9/5/86)	TSP				X
	SO_4				X
	NO_3				X
Dickinson Commercial	TSP	X			
	SO_4	X			
	NO_3	X			
	PM_{10}	X			
Dunn Center Rural (May be closed because of shortage of personnel)	TSP	X			
	SO_4	X			
	NO_3	X			
	PM_{10}	X			
	SO_2	X			
	NO_2	X			
	O_3	X			
	MET	X			
Fargo Commercial	TSP	X			
	SO_4	X			
	NO_3	X			
	PM_{10}	X			

Site	Parameter	Meets Needs	Modification Needed	New Site Needed	Parameter Not Needed
Grand Forks Commercial	TSP	X			
	SO_4	X			
	NO_3	X			
	PM_{10}	X			
Hannover (SPM) (Temporarily closed due to shortage of personnel)	TSP				X
	SO_4				X
	NO_3				X
	SO_2	X			
	NO_2	X			
	O_3	X			
	MET	X			
Lostwood Rural	TSP				X
	SO_4				X
	NO_3				X
	PM_{10}	X			
	SO_2	X			
	H_2S	X			
	NO_2			X	
	MET	X			
Minot Commercial	TSP				X
	SO_4				X
	NO_3				X
	PM_{10}	X			
Portable Unit (SPM) (Western ND oil/gas Area Network)	SO_2	X		(Additional site being evaluated)	
	H_2S	X			
	MET	X			
TRNP-NU Rural	TSP				X
	SO_4				X
	NO_3				X
	PM_{10}	X			
	SO_2	X			
	O_3	X			
	H_2S	X			
	MET	X			

Site	Parameter	Meets Needs	Modification Needed	New Site Needed	Parameter Not Needed
TRNP-SU Rural	TSP				X
	SO_4				X
	NO_3				X
	PM_{10}	X			
	SO_2	X			
	H_2S	X			
	MET	X			
Williston Commercial	TSP	X			
	SO_4	X			
	NO_3	X			
	PM_{10}	X			
Woodworth (Rural)	TSP	X			
	SO_4	X			
	NO_3	X			
	PM_{10}	X			

APPENDIX A
Industrial AAQM Networks

As was previously mentioned, the State's air quality monitoring network presently does not include source specific monitoring. The Department, in issuing Permits to Construct and Permits to Operate to major sources, may require industry to establish air quality monitoring networks to assess each source's impact on air quality. The scope of each industrial monitoring plan is developed on a case-by-case basis between the operator of the source and the Department. Parameters to be measured are determined by analysis of expected/actual pollutant emissions. The location(s) of the various monitors are based on computer generated air dispersion modeling predictions of maximum (worst-case) ground level concentrations and a comparison of these values with the various Ambient Air Quality Standards and PSD increments.

A summary of each industrial monitoring program is provided in Table A. Map A shows the general locations of these industries.

TABLE A

CURRENT INDUSTRIAL AAQM SITES (MAR 1987)

Industry	Site No.	Comments	Parameters Monitored	Started Monitoring	Stopped Monitoring	Parameter/Analyzer	Representative
1 AMERICAN NATURAL GAS	1		H_2S	5-1-83	2-24-85	H_2S/TECO 45	Danny R. Guminski ANG Coal Gas. Co. Great Plains Gas. Associates P.O. Box 1149 Beulah, ND 58523 (701)873-6603
	2			3-4-85			
	1	(Contingency)	SO_2	7-7-84		SO_2/TECO 43	
	2	(Contingency)		7-7-84	10-18-86		
	3	(Contingency)		12-13-86			
2 COTEAU MINE (WEATHER MOD., INC.)[1]	1		TSP	2-21-80		TSP/Hi-Vol	Ms. Andrea Stomberg 2000 Schafer Street P.O. Box 5500 Bismarck, ND 58502 (701)258-2200
	2	(Collocated) (thru 1-31-83)	TSP	2-21-80	1-31-83		
(PSD)	2A		TSP	5-1-83			
	3	(Collocated) (Starting 5-1-83)	TSP	7-14-80			
3 FALKIRK MINE (WEATHER MOD., INC.)[1]	1	Collocated	TSP	9-79		TSP/Hi-Vol	Ms. Andrea Stomberg 2000 Schafer Street P.O. Box 5500 Bismarck, ND 58502 (701)258-2200
	2		TSP	9-79	1-31-83		
(PSD)	3		TSP	9-79	12-20-80		
	3A		TSP	3-1-81			
	4		TSP	9-79			
	5		TSP	9-1-81			
	6		TSP	5-1-83			
4 KNIFE RIVER MINE (WEATHER MOD., INC.)[1]	1	North-Collocated	TSP	6-20-80		TSP/Hi-Vol	Douglas Davison 1915 N. Kaveny Bismarck, ND 58501 (701)223-1771
	2	West	TSP	8-7-80	12-17-83		
(PSD Expansion)	3	East	TSP	6-20-80			
5 KOCH HYDROCARBON I (GR1)[1]	1		SO_2	7-29-81		SO_2/TECO 43	Robert Vialle Box 2256 Wichita, KS 67201 (316)832-5500
			H_2S	10-07-81		H_2S/TECO 43/340(45)	
			WS,WD,TEMP	7-14-81		MET/Climatronics	
		(Sites 2&3 terminated 7-82 to 4-83)					
	2		H_2S	12-02-81			
	3		SO_2	7-29-81	7-14-86		
	3A			7-15-86			
6 KOCH HYDROCARBON II FORMERLY PHILLIPS) (GR1)[1]	1	(At Plant)	H_2S	9-1-81		SO_2/TECO 43	Robert Vialle Box 2256 Wichita, KS 67201 (316)832-5500
			WS,WD,TEMP,DEW PT.			H_2S/TECO 45	
			Solor Rad,PRECIP, Bar. Press.	8-21-81		MET/Climatronics	
(PSD)	2		SO_2	8-21-81			
7 PHILLIPS PETROLEUM CO.	1		SO_2	Scheduled to Start April 1987		SO_2/Unknown	Mr. Tom Davis 11 D4 Phillips Bldg. Bartlesville, OK 74003 (918)661-1468
	2		H_2S,WS,WD			H_2S/Unknown	
	3		SO_2			MET/Unknown	

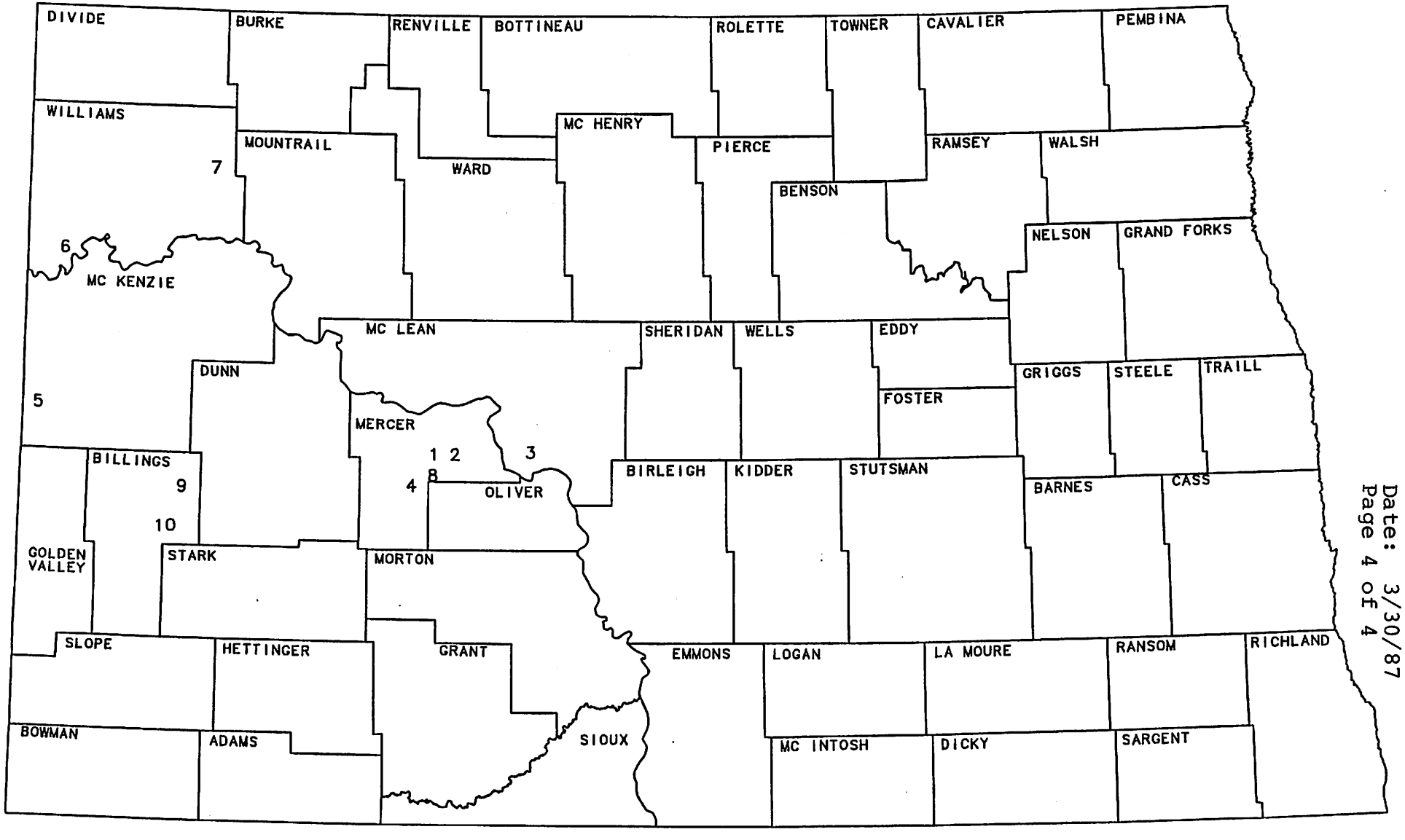
TABLE A

CURRENT INDUSTRIAL AAQM SITES (MAR 1987)

Industry	Site No.	Comments	Parameters Monitored	Started Monitoring	Stopped Monitoring	Parameter/Analyzer	Representative
8 RAMP - Antelope Valley Coyote ANG (GRI)[1]	1		TSP, Sulfates, Nitrates SO_2, NO/NO_2, O_3	8-1-79		TSP/Hi-Vol SO_2/TECO 43 NO/NO_x/Mon. Labs 8440 O_3/Mon. Labs 8410 MET/Climatronics	Keith Ganzer Basin Elec. Power Co-op. 1717 E. Interstate Avenue Bismarck, ND 58501 (701)223-0441
	2	Collocated	TSP, Sulfates, Nitrates SO_2, NO/NO_2, WD, WS TEMP, Bar. P., Solar Rad, T, SIGMA	8-1-79			
	3		TSP, Sulfates, Nitrates SO_2, NO/NO_2	8-1-79			
	4		TSP, Sulfates, Nitrates SO_2, NO/NO_2, O_3	8-1-79			
	5		TSP, Sulfates, Nitrates SO_2, NO/NO_2	8-1-79			
9 WARREN PETROLEUM (GRI)[1]	1		SO_2	9-28-78	1-5-87	SO_2/Meloy SA285E H_2S/Meloy SA285E MET/Weathertronics	Ms. Lynn Reed Box 1589 Tulsa, OK 74102 (918)560-4119
	2		SO_2	10-27-78			
	3	(MET moved from plant to Site 3 on 9-81)	SO_2, H_2S, WS, WD, Bar. P., TEMP	10-28-78 10-29-78			
10 WESTERN GAS PROCESSORS (GRI)[1] (PSD)	1	(MET moved from plant to Site 1 on 11-8-85)	SO_2 WS, WD, TEMP	7-29-81 7-14-81		SO_2/TECO 43 MET/MET ONE	Brion G. Wise 10701 Melody Drive Northglenn, CO 80234 (303)452-5603

[1] Consultant

INDUSTRIAL AMBIENT AIR QUALITY MONITORING NETWORK



MAP A

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