



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
ONE DENVER PLACE — 999 18TH STREET — SUITE 1300
DENVER, COLORADO 80202-2413

JUL 15 1985

REF: 8ES-F0



Mr. Charles McDonald
North Dakota State Department
of Health
Air Pollution Control Program
1200 Missouri Avenue
Bismarck, North Dakota 58601

Dear Chuck:

I have reviewed your timely Annual Networks Review for 1985. The review is acceptable and I have only a few comments.

I particularly like your use of computer modeling to determine the location of a new monitoring site. This was evident in your discussion of the Hanover site. Your discussion indicates that the NO₂ data from the Hanover and Beulah sites will be evaluated and a judgement made regarding the acceptability of the Beulah site. This shows that the Networks Review process is working as intended. Keep up the good work.

There is a technical problem with your proposal to evaluate SO₄ and NO₃ artifact formation on glass fiber filters. The new quartz filters supplied by EPA were washed with phosphoric acid during the manufacturing process. The purpose was to lower the pH of the filter. The resulting high concentration of phosphate in the filter interferes with the colorimetric method used by your lab to measure SO₄ concentration. If you want to proceed with the glass fiber - quartz filter evaluation, your laboratory will have to switch to a (Dionex) basic ion chromatography procedure for the analysis of SO₄ and NO₃.

Be sure to notify me when there is a change in your SLAMS network. You can do this by sending an updated table 1 and a SAROAD site file I.D. form with changes or new site information.

Yours Truly,

Marlin D. Helming
Air Operations Section
Field Operation Branch
Environmental Services Division



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
1860 LINCOLN STREET
DENVER, COLORADO 80295

MAY 3 1985

Ref: 8ES-F0

Mr. Dana Mount, Director
Division of Environmental
Engineering
State Department of Health
1200 Missouri Avenue
Bismarck, North Dakota 58501

Dear Mr. Mount:

This letter is to acknowledge the receipt of your 1984 Annual SLAMS Air Quality Report. This submittal meets the requirements of 40 CFR 58.26 and the FY 85 North Dakota/SEA.

Your staff is to be commended for their timely submittal of the report.

Yours truly,

A handwritten signature in cursive script, appearing to read "J. Lehr".

James B. Lehr, Acting Director
Environmental Services Division



April 26, 1985

Mr. Marlin Helming
U.S. Environmental Protection
Agency
Region VIII
1860 Lincoln Street
Denver, CO 80295

Re: Annual Network Review

Dear Marlin:

Enclosed are the revisions to the Annual Network Review for 1985. Sections 2 and 3 were totally revised so those sections are included in their entirety.

We have tried to incorporate most of the comments in your letter of February 4, 1985. We anticipate further refinement as additional data are analyzed, but we are reasonably pleased with the network as it currently exists.

If you have any questions, please feel free to call me.

Sincerely,

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

CMM:saj
Encl:

NORTH DAKOTA STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL ENGINEERING

AMBIENT AIR QUALITY MONITORING
ANNUAL NETWORK REVIEW
1985

April 1985

TABLE OF CONTENTS

	<u>Page</u>
TABLE OF CONTENTS	i
LIST OF TABLES	iii
LIST OF MAPS	iv
1.0 INTRODUCTION	1
1.0.1 Background	1
1.0.2 Goals and Objectives	2
1.0.3 Siting	6
1.0.4 Monitoring Methods	7
1.0.5 PSD Class I Areas and Air Quality Maintenance Areas	9
1.0.6 North Dakota AAQM Network	10
1.0.7 Industrial Monitoring	13
2.0 MONITORED POLLUTANTS	1
2.0.1 Total Suspended Particulate	1
2.0.1.1 Population Centers	1
2.0.1.2 Point Sources	4
2.0.1.3 Area Sources	8
2.0.1.4 Background Monitoring	11
2.0.1.5 Collocated Sampling	11
2.0.1.6 Monitoring Network	12
2.0.2 Inhalable Particulates	12
2.0.2.1 Sources	13
2.0.2.2 Monitoring Network	13
2.0.3 Sulfur Dioxide	16
2.0.3.1 Major Point Sources	16
2.0.3.2 Other Sources	21
2.0.3.3 Monitoring Network	23
2.0.4 Hydrogen Sulfide	23
2.0.4.1 Monitoring Network	26

	<u>Page</u>
2.0.5 Nitrogen Oxides	26
2.0.5.1 Point Sources	27
2.0.5.2 Area Sources	32
2.0.5.3 Monitoring Network	32
2.0.6 Ozone	32
2.0.6.1 Point Sources	33
2.0.6.2 Area Sources	33
2.0.6.3 Monitoring Network	36
2.0.7 Carbon Monoxide	36
2.0.7.1 Monitoring Network	37
2.0.8 Lead	37
2.0.9 Suspended Sulfates and Nitrates	38
2.0.9.1 Monitoring Network	38
3.0. MONITORING SITE EVALUATION	1
3.0.1 Total Suspended Particulate Monitoring Sites	1
3.0.2 Inhalable Particulate (PM ₁₀) Monitoring Sites	3
3.0.3 Sulfur Dioxide Monitoring Sites	4
3.0.4 Hydrogen Sulfide Monitoring Sites	6
3.0.5 Nitrogen Oxides Monitoring Sites	7
3.0.6 Ozone Monitoring Sites	9
3.0.7 Suspended Sulfates and Nitrates Monitoring Sites	9
3.0.8 Summary	10
Appendix A - Industrial AAQM Network	1

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1 AAQM Network Description	1-15
2 Population Estimates for Major Cities	2- 2
3 Major TSP Sources	2- 5
4 Major Lignite Coal Mines	2- 9
5 PM ₁₀ Sites	2-14
6 Major Sources of SO ₂	2-17
7 Continuous Monitoring Sites	2-24
8 Major Sources of NO _x	2-28
9 Major HC Sources	2-34
10 Monitoring Site Evaluation	3-11
A Current Industrial AAQM Sites (Apr. 1985)	A- 2

LIST OF MAPS

<u>Map No.</u>		<u>Page</u>
1	PSD Class I Areas	1-11
2	Air Quality Maintenance Areas	1-12
3	North Dakota AAQM Network	1-14
4	Major North Dakota Cities	2- 3
5	Major Point Sources of TSP	2- 7
6	Lignite Coal Mines	2-10
7	PM ₁₀ Monitoring Locations	2-15
8	Major Sources of SO ₂	2-20
9	Major Oil/Gas Development Area	2-22
10	Continuous Monitoring Sites	2-25
11	Major Sources of Nitrogen Oxides	2-31
12	Major HC Emitting Facilities	2-35
A	Industrial Ambient Air Quality Monitoring Network	A- 5

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) Regulations. To carry out this responsibility, the Division of Environmental Engineering operates and maintains a network of ambient air quality monitors and requires 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 inadequancies indicated as a result of the annual review required by 40 CFR 58.20(d). This document satisfies that annual requirement.

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 monitoring 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 dimensions of the air parcel

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

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:

<u>Monitoring Objective</u>	<u>Appropriate Siting Scales</u>
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:

<u>Criteria Pollutant</u>	<u>Spatial Scales</u>
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) urban, population oriented monitoring and (2) background monitoring.

Population oriented monitoring comes into play primarily in regard to total suspended particulate (TSP) monitoring. We have determined that population areas on the order of 10,000 people or larger should be monitored for TSP. On the other hand, background stations are chosen to determine concentrations of air contaminants in areas remote from manmade 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, SO₂, NO₂ and O₃

monitoring are reference equivalent equipment as listed below:

<u>Parameter</u>	<u>Sampler/Analyzer</u>
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 "Meloyle Model OA350-2R Ozone Analyzer"
	<u>or</u>
	RFOA-1075-003 "Meloyle Model OA325-2R Ozone Analyzer"

In addition to the parameters measured above, the Department also conducts monitoring for hydrogen sulfide (H₂S) as well as suspended sulfates (SO₄) and suspended nitrates (NO₃). The samplers/analyzers used for the determination of these parameters are noted below:

<u>Parameter</u>	<u>Sampler/Analyzer</u>
H ₂ S	Thermo Electron Model 43/340 converter - automated H ₂ S to SO ₂ conversion with pulsed fluorescence analysis

<u>Parameter</u>	<u>Sampler/Analyzer</u>
	Meloy SA185-2A - automated flame photometric detection with sulfur oxides scrubber
SO ₄	High volume method (40 CFR 50) for collection - colorimetric automated methylthymol blue, auto analyzer II analysis
NO ₃	High volume method (40 CFR 50) for collection - colorimetric automated cadmium reduction, auto analyzer II 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.

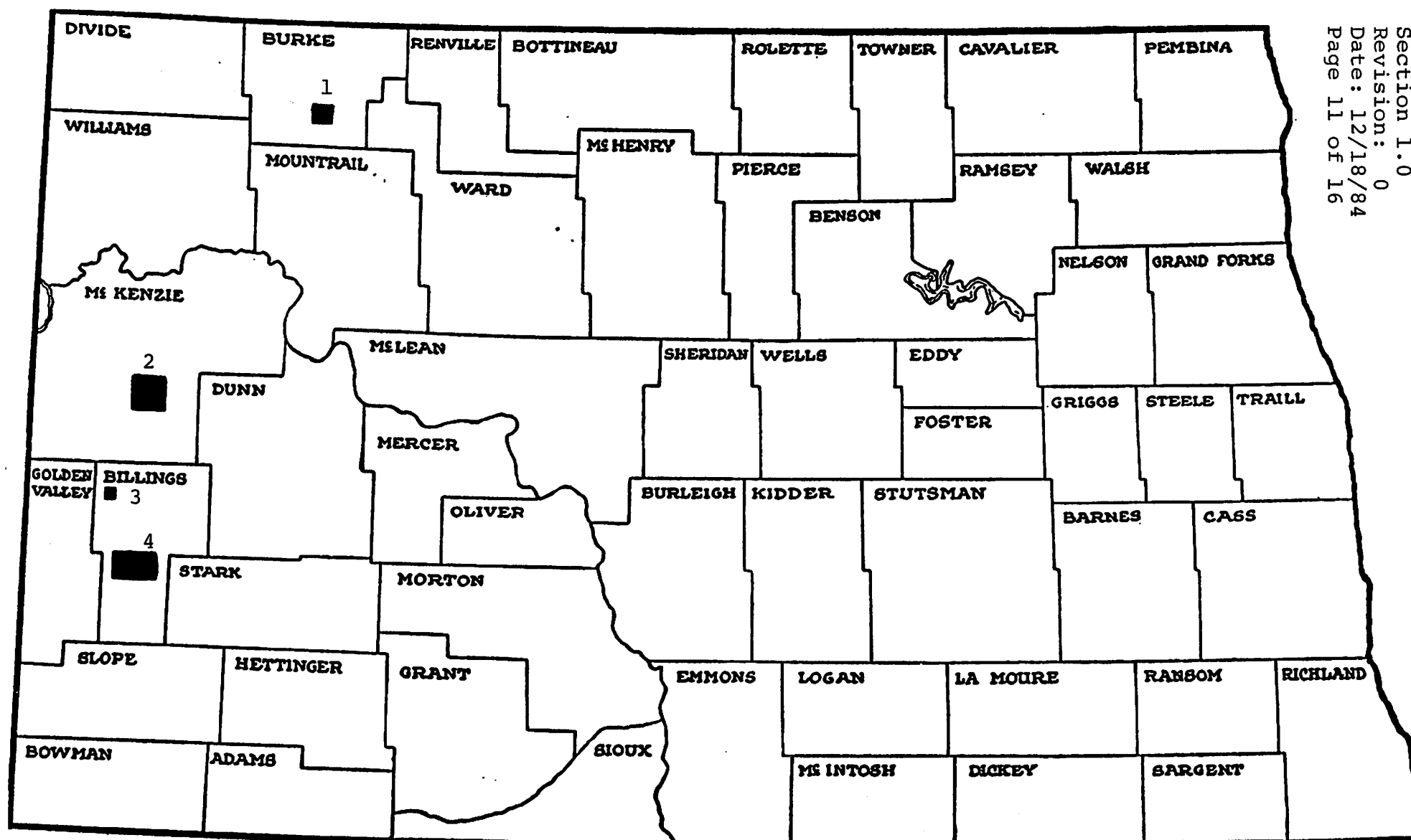
With regard to the known and anticipated types of air contaminants and their predicted effects on specific geographical areas, however, special emphasis is placed on PSD Class I areas and Air Quality Maintenance Areas (AQMA).

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, SO₂, NO₂, and O₃ 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

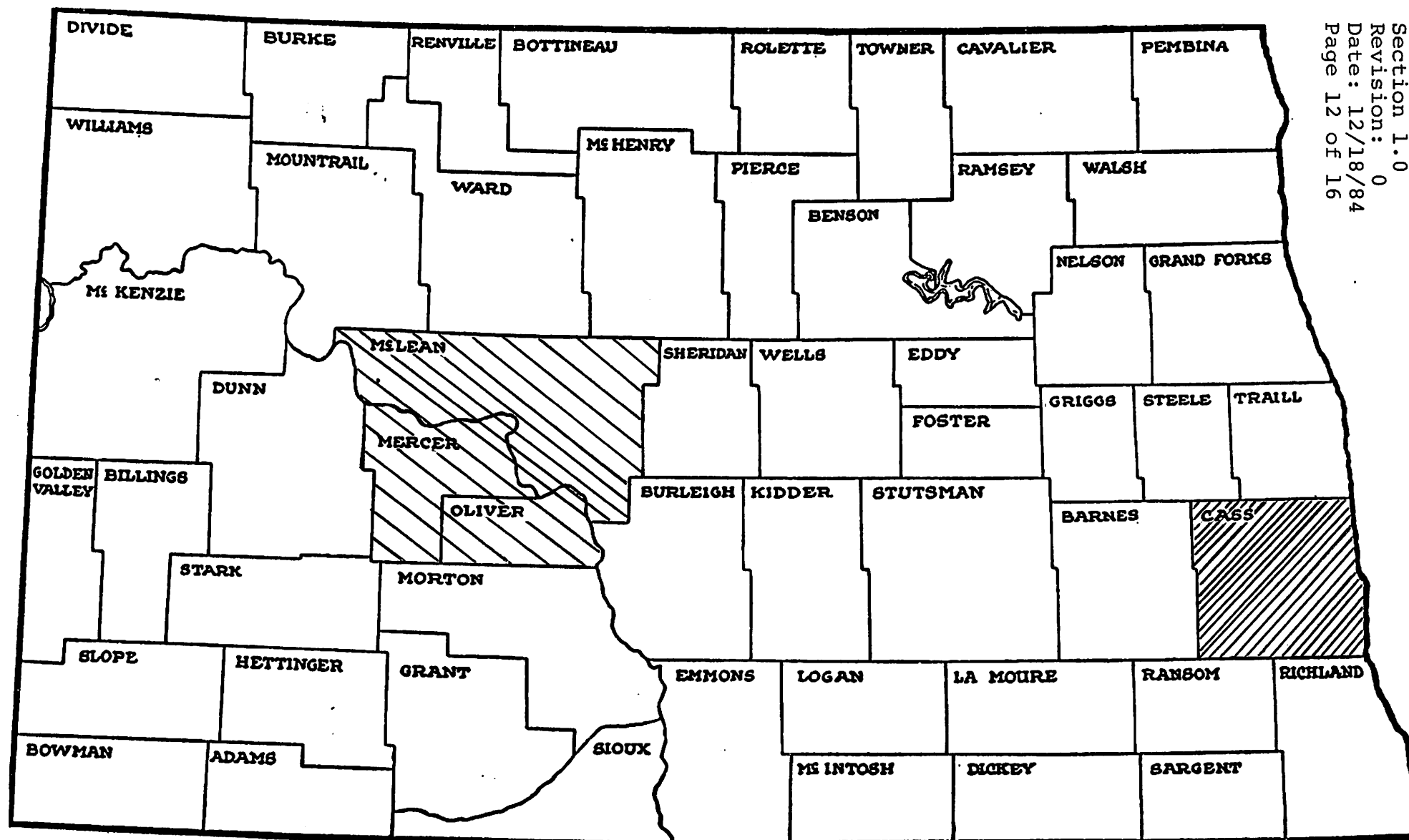
Currently, the Department operates and maintains 21 AAQM sites around the State. Seventeen are



MAP 1
Prevention of Significant Deterioration of Air Quality
Mandatory Class I Areas

- 1 Lostwood National Wilderness Area
- 2 Theodore Roosevelt National Park - North Unit

- 3 Theodore Roosevelt National Park - Elkhorn Ranch
- 4 Theodore Roosevelt National Park - South Unit



MAP 2
Designated Air Quality Maintenance Areas (AQMA)

Cass County AQMA



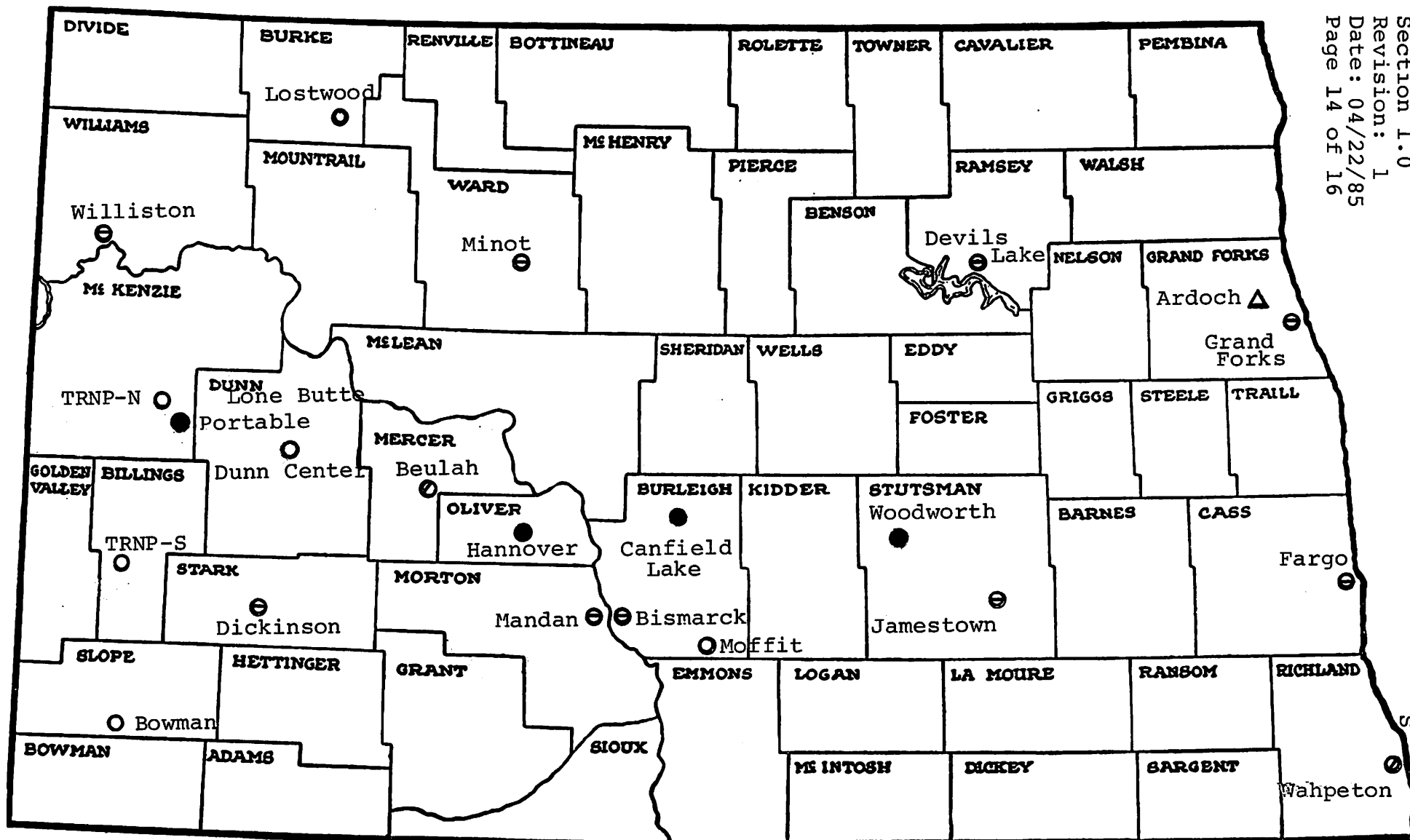
McLean-Mercer-Oliver County AQMA



fixed SLAMS/NAMS sites (6 rural and 11 urban sites). In addition, two short-term special purpose monitoring (SPM) sites are operated in western and central North Dakota and two SPM sites are devoted to research (one near Canfield Lake NWR near Regan, North Dakota and the other at the U.S. Fish and Wildlife Service field station near Woodworth, North Dakota). Map 3 shows the network site locations and Table 1 lists the type of stations and parameters monitored.

1.0.7 Industrial Monitoring

Industrial sources which are required to implement source specific monitoring programs must develop the scope of each 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



MAP: 3
North Dakota State Department of Health
Ambient Air Quality Monitoring Network (4/22/85)

- = Special Purpose Monitor(s)
- ⊙ = commercial } urban
- ⊗ = residential } locations
- = rural locations
- Δ = proposed rural location

TABLE 1

Site	Type Station	SARGAD I.D. No.	Parameters ^{1/} Monitored	Ref/Equiv Method Designation No.	Operating Schedule	Monitoring Objective	Spatial Scale	Date Site Began or is Expected to Begin Operation	Date O.A. Procedures Began or are Expected to Begin
1 Fargo-Commercial	NAMS	350400001F01	TSP	Hi-vol	6th day	Population Exposure	Neighborhood	1/84	5/80
			PM ₁₀	SSI	2nd day	Population Exposure	Neighborhood	6/85	6/85
Fargo-Commercial Dup.		350400001F09	TSP	Hi-vol	6th day	Co-located hi-vol		4/80	5/80
2 Beulah-Residential	SLAMS	350760001F01	TSP	Hi-vol	6th day	Population Exposure	Neighborhood	4/74	5/80
			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	2nd day	Population Exposure	Neighborhood	4/85	4/85
Bismarck-Commercial Dup.		350100003F09	TSP	Hi-vol	6th day	Co-located hi-vol		10/79	5/80
			PM ₁₀	SSI	6th day	Co-located SSI		4/85	4/85
4 Bowman-Rural	SLAMS	350160001F03	TSP	Hi-vol	6th day	General Background	Regional	9/74	5/80
5 Devils Lake-Commercial	SLAMS	350260001F01	TSP	Hi-vol	6th day	Population Exposure	Neighborhood	1/70	5/80
6 Dickinson-Commercial	SLAMS	350300001F01	TSP	Hi-vol	6th day	Population Exposure	Neighborhood	1/70	5/80
			PM ₁₀	SSI	2nd day	Population Exposure	Neighborhood	4/85	4/85
7 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
8 Grand Forks-Commercial	SLAMS	350480001F01	TSP	Hi-vol	6th day	Population Exposure	Neighborhood	1/70	5/80
			PM ₁₀	SSI	2nd day	Population Exposure	Neighborhood	6/85	6/85
9 Jamestown-Commercial	SLAMS	350580001F01	TSP	Hi-vol	6th day	Population Exposure	Neighborhood	1/72	5/80
10 Lostwood-Rural	SLAMS	350180001F03	TSP	Hi-vol	6th day	General Background	Regional	10/79	5/80
11 Mandan-Commercial	SLAMS	350740001F01	TSP	Hi-vol	6th day	Population Exposure	Neighborhood	10/70	5/80
12 Minot-Commercial	SLAMS	350780001F01	TSP	Hi-vol	6th day	Population Exposure	Neighborhood	4/67	5/80
13 Moffit-Rural	SLAMS	350200002F03	TSP	Hi-vol	6th day	General Background	Regional	7/80	7/80
14 TRNP (N)-Rural	SLAMS	350700002F03	TSP	Hi-vol	6th day	General Background	Regional	12/78	5/80
			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 ₂ S	N/A	cont	N/A	N/A	5/80	6/80
			Met	N/A	cont	N/A	N/A	3/80	6/80
15 TRNP (S)-Rural	SLAMS	350080001F03	TSP	Hi-vol	6th day	General Background	Regional	9/74	5/80
			SO ₂	EQSA-0276-009	cont	General Background	Regional	2/80	6/80
			Met	N/A	cont	N/A	N/A	3/80	6/80
16 Wahpeton-Residential	SLAMS	351260001F01	TSP	Hi-vol	6th day	Population Exposure	Neighborhood	10/70	5/80
17 Williston-Commercial	SLAMS	351360001F01	TSP	Hi-vol	6th day	Population Exposure	Neighborhood	5/70	5/80
			PM ₁₀	SSI	2nd day	Population Exposure	Neighborhood	5/85	5/85
18 Canfield Lake	SPM	350200003F05	TSP	Hi-vol	6th day	General Background	Regional	5/84	5/84
19 Hannover-Rural	SPM	350860002F05	TSP	Hi-vol	6th day	General Background	Regional	10/84	10/84
			SO ₂	EQSA-0276-009	cont	General Background	Regional	10/84	10/84
			NO ₂	RFNA-0777-022	cont	General Background	Regional	10/84	10/84
			O ₃	RFDA-1075-004	cont	General Background	Regional	5/85	5/85
			Met	N/A	cont	N/A	N/A	10/84	10/84
20 Portable Unit-	SPM	350700004F05	SO ₂	EQSA-0276-009	cont	Source Impact	Neighborhood	12/83	12/83
			H ₂ S	N/A	cont	N/A	N/A	12/83	12/83
			Met	N/A	cont	N/A	N/A	12/83	12/83
21 Woodworth-Rural	SPM	351180002F05	TSP	Hi-vol	6th day	General Background	Regional	3/82	3/82
			PM ₁₀	SSI	2nd day	General Background	Regional	5/85	5/85

1/ Sulfate and nitrate analysis are performed on all hi-vol filters.

of Appendix B of 40 CFR 58. As manpower and resources allow, systems and/or performance audits are conducted by this Department on each industrial monitoring network to assure the quality of the data.

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 will require air quality monitoring based on population size. The following table (Table 2) ranks the cities of largest population in the State. The location of these cities is shown on Map 4.

During the 1982 review, an air quality monitoring "population breakpoint" of 10,000 was established. As a result, special emphasis is placed on conducting population exposure

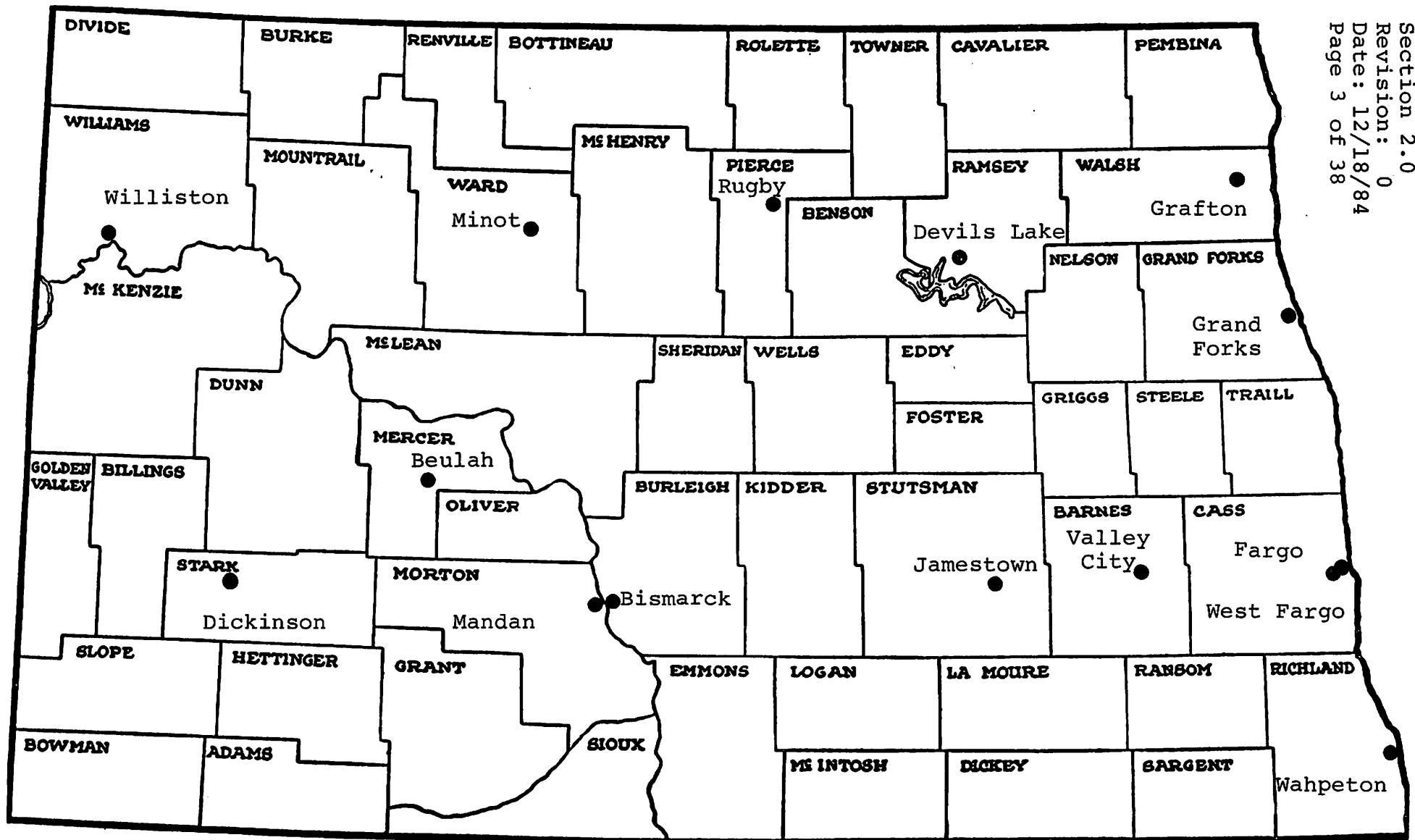
TABLE 2

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

^{1/} Population based on April 1, 1980, estimates as reported in Memorandum from U.S. Department of Commerce, Bureau of Census, to Office of Statistical Services, NDS DH.

^{2/} Valley City site was closed down effective July 30, 1984.

^{3/} A population-oriented TSP monitoring site was established at Beulah, despite its low population, due to growth associated with significant coal-related industrial development in that area.



MAP 4

Major North Dakota Cities

monitoring in urban areas approaching a population of 10,000. As can be seen from Tables 1 and 2, all cities meeting this criteria, with the exception of West Fargo, have TSP monitors. The Department has decided that the conditions at West Fargo are not significantly different enough from Fargo to warrant establishing a separate site at this time.

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 emission inventory. Map 5 indicates the approximate location of these facilities.

In addition to the point sources located within North Dakota, major TSP point sources located outside the State must also be considered. The only out-of-state TSP point

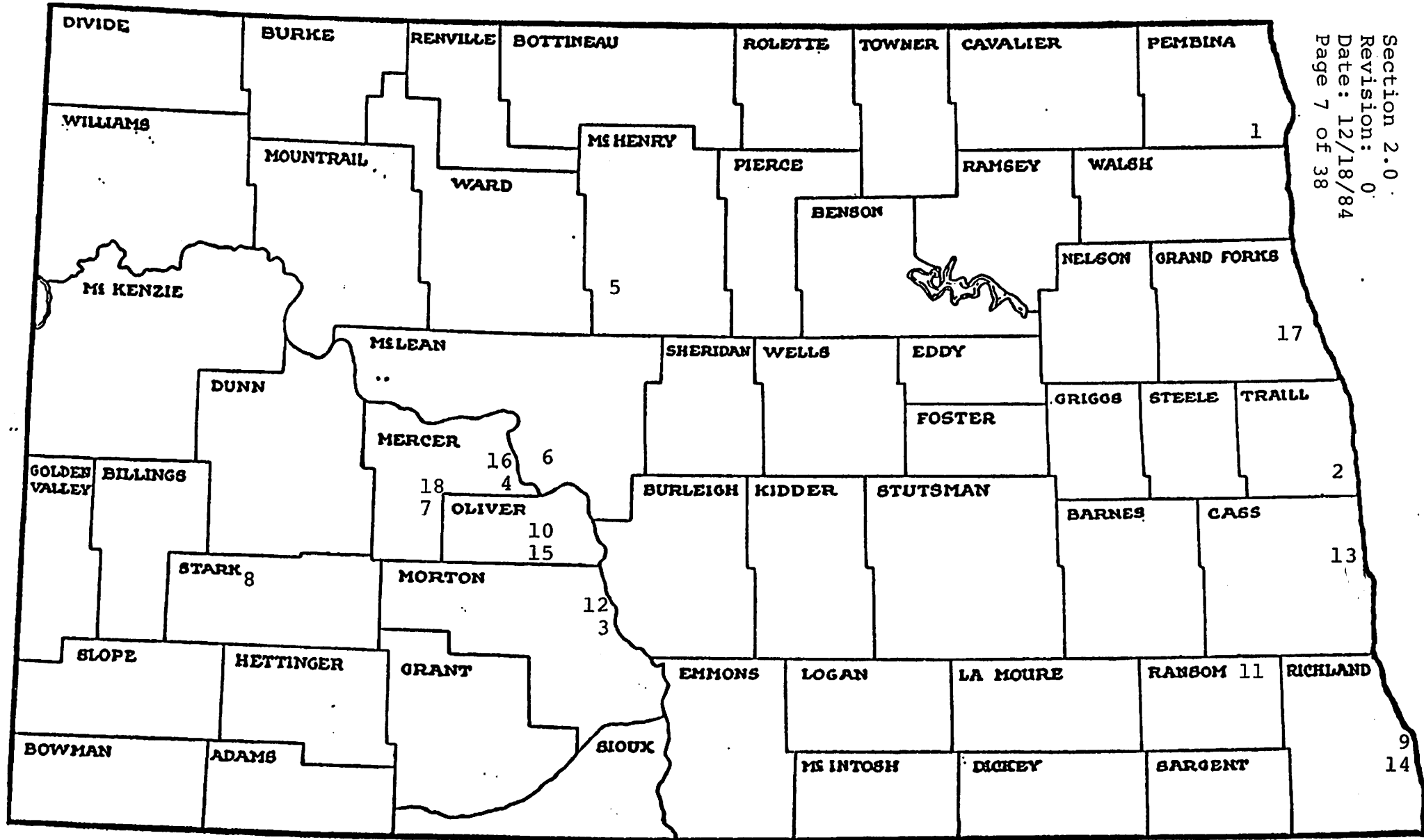
TABLE 3
MAJOR TSP SOURCES

#	Name of Company	Type of Source	Location	Particulate Emis. Ton/Year
1	American Crystal Sugar Company	Sugar Beet Processing	Drayton Pembina Co.	199.0
2	American Crystal Sugar Company	Sugar Beet Processing	Hillsboro Traill Co.	112.5
3	American Oil Co.	Oil Refinery	Mandan Morton Co.	266.0
4	Basin Electric Unit 1 & 2 (216mw/440mw)	Steam Elec. Gen. Facility	Stanton Mercer Co.	81/411 ^{1/}
5	Basin Electric Units 1 & 2 (25mw/25mw)	Steam Elec. Gen. Facility	Velva McHenry Co.	19/19 ^{1/}
6	UPA/CPA Units 1 & 2 (550mw/550mw)	Steam Elec. Gen. Facility	Underwood McLean Co.	781/861 ^{1/}
7	Coyote Station Unit 1 (440mw)	Steam Elec. Gen. Facility	Beulah Mercer Co.	464.0
8	Husky Industries	Charcoal Bri- quetting Plant	Dickinson Stark Co.	3842.7
9	Minn-Dak Farmers Coop	Sugar Beet Processing	Wahpeton Richland Co.	351.0

Table 3 Cont.

#	<u>Name of Company</u>	<u>Type of Source</u>	<u>Location</u>	<u>Particulate Emis. Ton/Year</u>
10	Minnkota Power Coop Unit 1 (235mw)	Steam Elec. Gen. Facility	Center Oliver Co.	316.4
11	National Sun Ind., Inc.	Sunflower Processing	Enderlin Ransom Co.	884.8
12	MDU Units 1 & 2 (25mw/66mw) (Heskett Station)	Steam Elec. Gen. Facility	Mandan Morton Co.	36/45 ^{1/}
13	NDSU	Heating Plant	Fargo Cass Co.	153.5
14	NDSSS	Heating Plant	Wahpeton Richland Co.	74.9
15	Square Butte Unit 1 (440mw)	Steam Elec. Gen. Facility	Center Oliver Co.	511.5
16	UPA Stanton Units 1 & 2 (172mw)	Steam Elec. Gen. Facility	Stanton Mercer Co.	653.8
17	UND	Heating Plant	Grand Forks Grand Forks Co.	316.8
18	Montana Dakota Utilities	Steam Elec. Gen. Facility	Beulah Mercer Co.	233.1

^{1/} Emissions from Unit 1/Emissions from Unit 2



MAP 5

Major Point Sources of TSP

source that currently warrants attention is the Boundary Dam Power Plant complex located near Estevan, Saskatchewan.

2.0.1.3 Area Sources

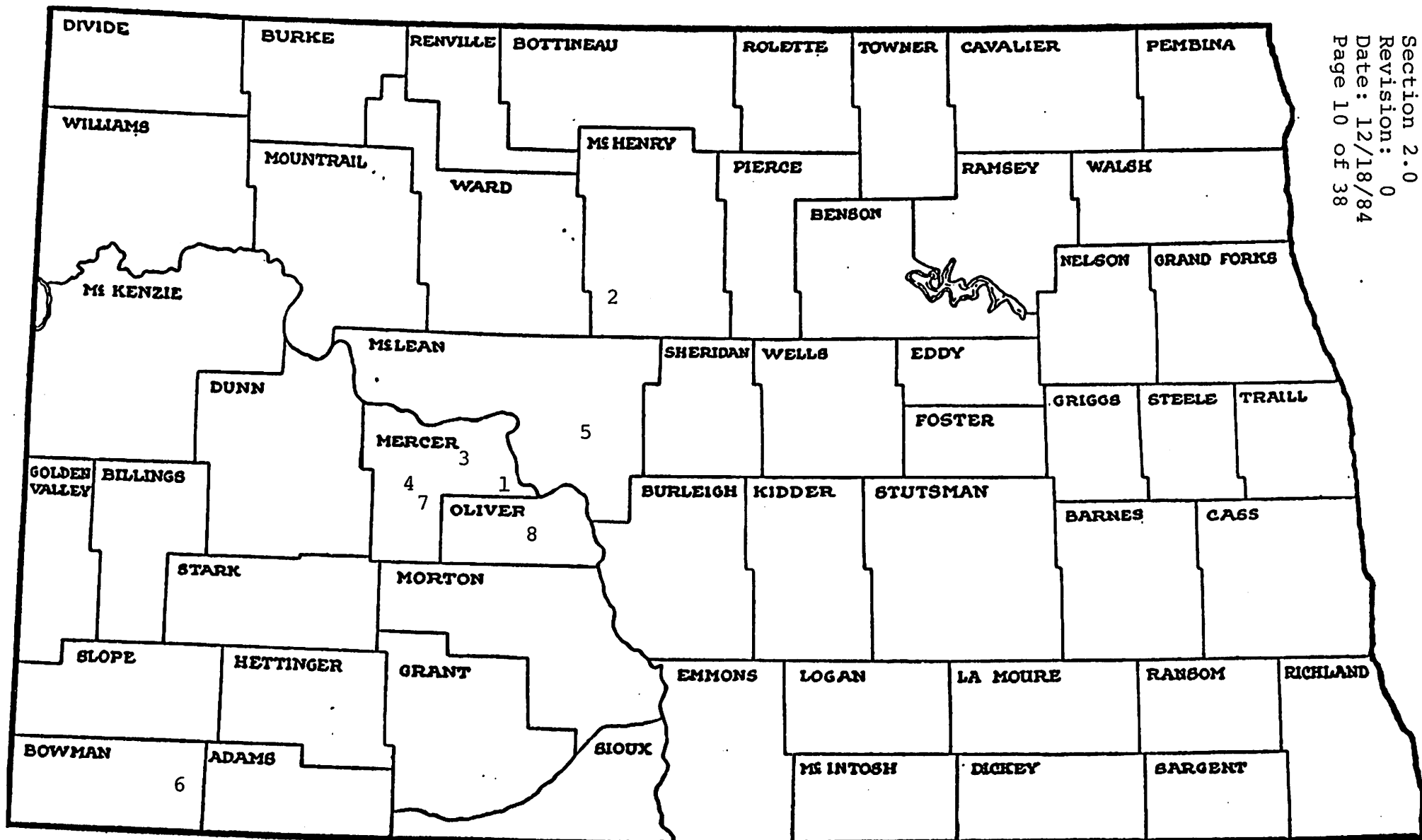
Apart from the point sources of TSP noted above, the development of large lignite coal reserves in west central North Dakota has created a number of large strip mines generally referred to as "area" sources of TSP.

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

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

TABLE 4
MAJOR LIGNITE COAL MINES

<u>#</u>	<u>Name of Company</u>	<u>Name of Source</u>	<u>Location</u>	<u>Permit #</u>
1	Basin Co-op Services	Glen Harold	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 Coal Mine	Zap Mercer Co.	079013
5	Falkirk Mining Co.	Falkirk Mine	Underwood McLean Co.	079002
6	Knife River Coal Mine	Peerless Coal Mine	Gascoyne Bowman Co.	079011
7	Knife River Coal Mine	Knife River Coal Mine	Beulah Mercer Co.	079012
8	Baukol-Noonan	Baukol-Noonan Mine	Center Oliver Co.	079004



MAP 6

Lignite Coal Mines

2.0.1.4 Background Monitoring

For TSP background monitoring purposes, the State of North Dakota has several distinct areas that require background measurements. These are the Red River Valley farming area in the easternmost portion of the State, the farming/ranching mixed operations in the central and western portion of the State, and the coal development area in the west-central portion of the State. Additional emphasis is also placed on the monitoring of TSP in Class I areas and AQM areas within the State.

2.0.1.5 Collocated Sampling

As per 40 CFR 58, at least two sites must be selected for duplicate sampling and two samplers must be collocated at each site. The two sampling sites with collocated samplers are located at Bismarck and Fargo.

2.0.1.6 Monitoring Network

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

2.0.2 Inhalable Particulates

Due to potential health effects of fine and 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 PM₁₀.

2.0.2.1 Sources

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

2.0.2.2 Monitoring Network

The Department has received 14 PM₁₀ samplers. These PM₁₀ samplers will all be located at existing TSP monitoring sites. The selected sites and the number of PM₁₀ samplers to be located at those sites are listed in Table 5, and the approximate locations are shown on Map 7. The network, as defined, will leave us with one extra PM₁₀ which will be used for training and as a spare.

The first site was established at Dunn Center. The Bismarck and Dickinson sites

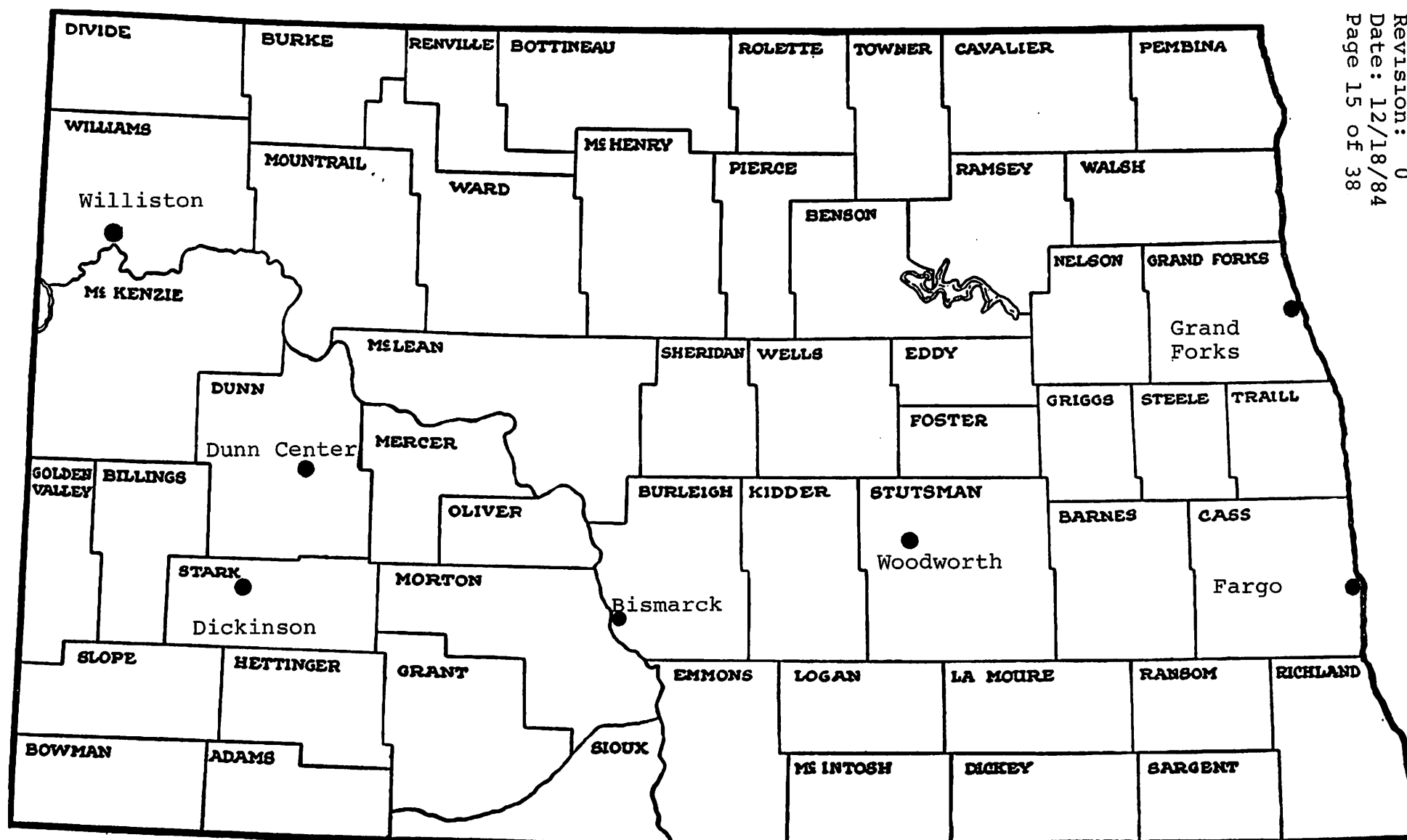
TABLE 5
PM₁₀ SITES

<u>Name</u>	<u>No. of Samplers</u>	<u>Operational Date</u>
Bismarck ^{1/}	3*	April 1, 1985
Dickinson ^{1/}	2	April 5, 1985
Dunn Center ^{2/}	1	March 26, 1985
Fargo ^{1/}	2	
Grand Forks ^{1/}	2	
Williston ^{1/}	2	
Woodworth ^{2/}	1	

*One of these is collocated.

1/ This site was selected on the basis of estimated exceedance probabilities greater than or equal to 0.20 and less than 0.95 for a prospective PM₁₀ average annual arithmetic mean standard of 50 µg/m³ and a 24-hour standard of 150 µg/m³.

2/ This site was selected as a background site on the basis of an estimated exceedance probability less than 0.20 for a prospective PM₁₀ average annual arithmetic mean standard of 50 µg/m³ and a 24-hour standard of 150 µg/m³.



MAP 7

PM₁₀ Monitoring Locations

were the next ones that went into operation.
The other sites should be operational by July
1, 1985.

2.0.3 Sulfur Dioxide

Recent coal, oil, and gas development in the west and west-central portions of North Dakota have 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.

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 emissions inventory. Map 8 shows the approximate locations of these facilities. In

TABLE 6
MAJOR SOURCES OF SO₂

<u>#</u>	<u>Name of Company</u>	<u>Type of Source</u>	<u>Location</u>	<u>SO₂ Emissions Ton/Year</u>
1	American Crystal Sugar Company	Sugar Beet Processing	Drayton Pembina Co.	1591.2
2	American Crystal Sugar Company	Sugar Beet Processing	Hillsboro Traill Co.	1731.7
3	American Oil Co. (AMOCO)	Oil Refinery	Mandan Morton Co.	9516.0
4	Aminoil, USA	Natural Gas Processing	Tioga Williams	2920.7
5	Basin Electric Units 1&2 (215 mw/440 mw)	Steam Elec. Gen. Facility (Leland Olds)	Stanton Mercer Co.	8134/22140
6	Basin Electric Units 1&2 (25 mw/25 mw)	Steam Elec. Gen. Facility	Velva McHenry Co.	549/549
7	Grand Forks AFB	Heating Plant	Grand Forks Grand Forks Co.	112.0

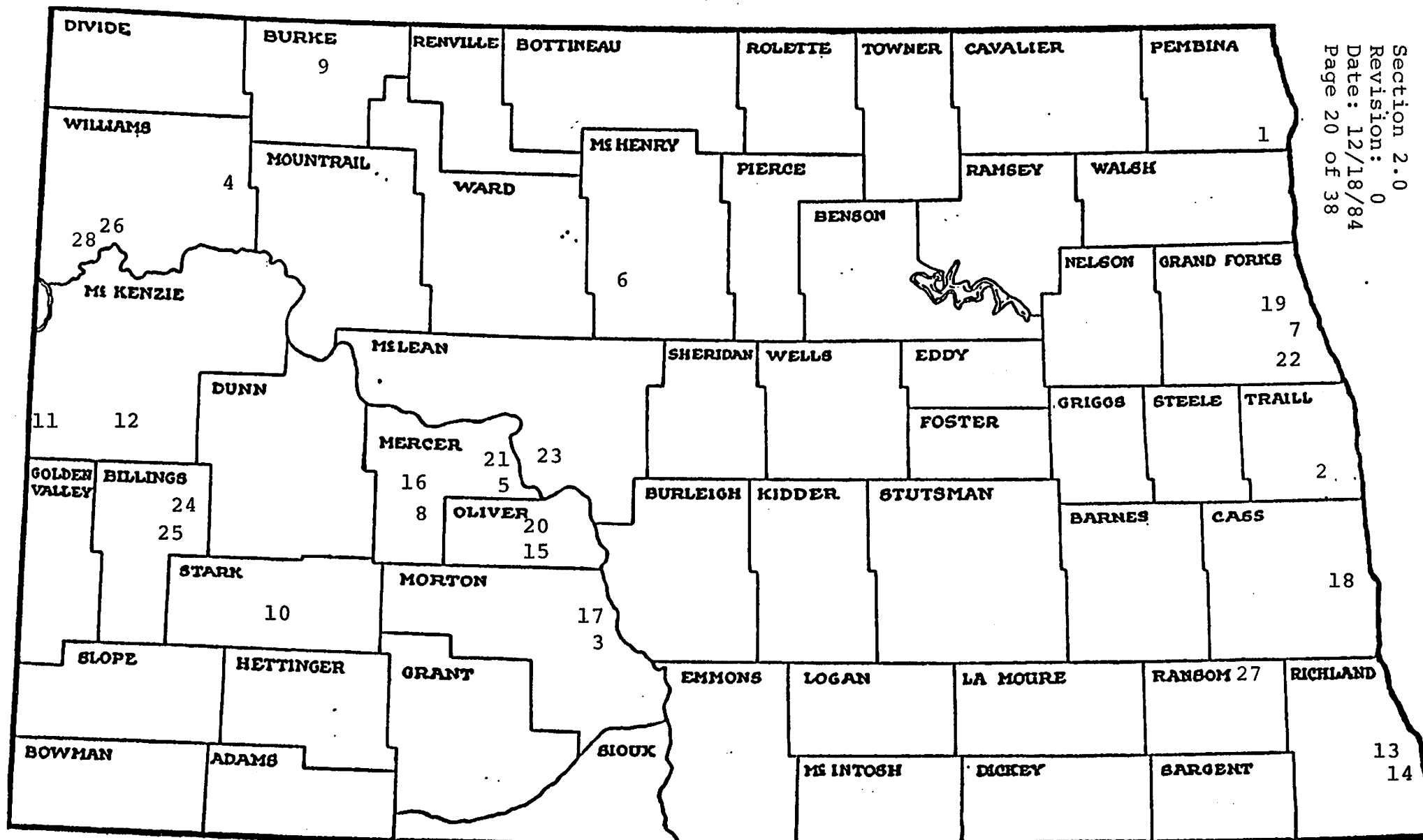
TABLE 6 (Cont.)

#	<u>Name of Company</u>	<u>Type of Source</u>	<u>Location</u>	<u>SO₂ Emissions Ton/Year</u>
8	Coyote Station Unit 1 (440 mw)	Steam Elec. Gen. Facility	Beulah Mercer Co.	16380
9	Cities Service	Natural Gas Processing	Lignite Burke Co.	3347
10	Husky Industries	Charcoal Bri- quetting Plant	Dickinson Stark Co.	1200.8
11	Koch Hydrocarbon	Natural Gas Processing	Sidney, MT McKenzie Co.	620.5
12	Kerr McGee	Gas Processing Plant	McKenzie Co.	141.1
13	ND State School of Science	Heating Plant	Wahpeton Richland Co.	199.2
14	Minn-Dak Farmers Co-op	Sugar Beet Processing	Wahpeton Richland	600.0
15	Minnkota Power Coop Unit 1 (235 mw)	Steam Elec. Gen. Facility	Center Oliver Co.	10780.0
16	Montana Dakota Utilities	Steam Elec. Gen. Facility	Beulah Mercer Co.	459.9
17	Montana Dakota Utilities Units 1&2 (25 mw/66 mw) (Heskett Station)	Steam Elec. Gen. Facility	Mandan Morton Co.	1694/3518.4 ^{1/}

TABLE 6 (Cont.)

#	<u>Name of Company</u>	<u>Type of Source</u>	<u>Location</u>	<u>SO₂ Emissions Ton/Year</u>
18	NDSU	Heating Plant	Fargo Cass Co.	388.6
19	Simplot Company	Potato Processing	Grand Forks Grand Forks Co.	440.0
20	Square Butte Unit 2 (440 mw)	Steam Elec. Gen. Facility	Center Oliver Co.	17389.6
21	United Power Assoc. Units 1&2 (172 mw)	Steam Elec. Gen. Facility	Stanton Mercer Co.	6261
22	UND	Heating Plant	Grand Forks Grand Forks Co.	412.5
23	UPA/CPA Units 1&2 (550 mw/550mw)	Steam Elec. Gen. Facility	Underwood McLean Co.	17201/18946 ^{1/}
24	Warren Petroleum	Natural Gas Processing	Little Knife Field Billings Co.	1057.5
25	Western Gas Processing	Natural Gas Processing	Fairfield Billings Co.	954.2
26	Westland Oil Co.	Oil Refinery	Williston Williams Co.	Not operated
27	National Sun, Ind., Inc.	Sunflower Processing	Enderlin Ransom	211.7
28	Phillips Petroleum	Natural Gas Processing	Williston Williams Co.	2519.1

^{1/}Emissions from Unit 1/emissions from Unit 2

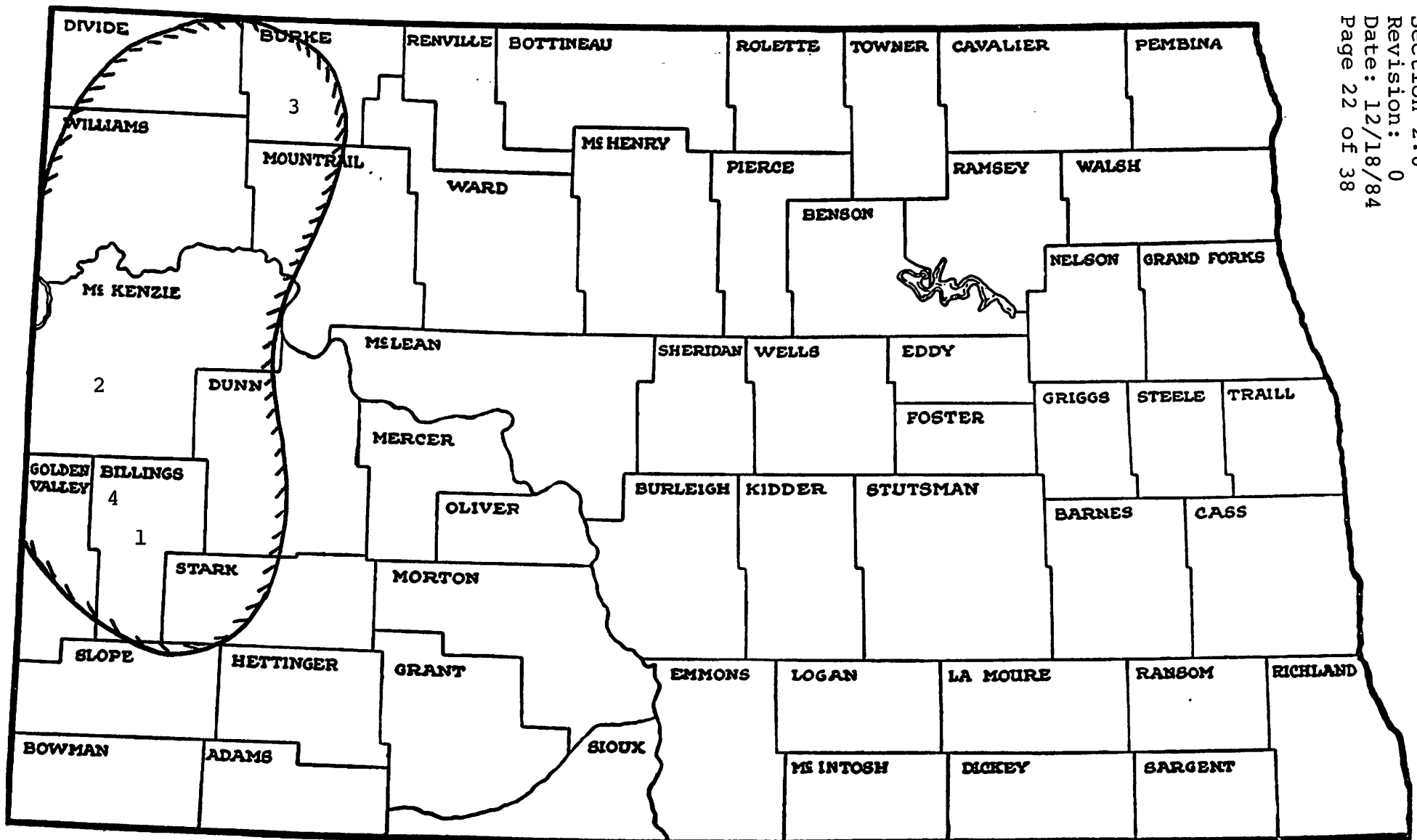


MAP 8
Major Sources of SO₂

addition to these facilities, there are several major SO₂ sources located near the borders with Montana and Saskatchewan that must be accounted for when considering background levels.

2.0.3.2 Other Sources

The western part of the State has a number of additional sources of SO₂ 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 (H₂S) to the ambient air (which will be addressed later); and second, flaring of H₂S can create significant concentrations of SO₂ in the ambient air. Map 9 indicates the area of primary concern for such sources in western North Dakota.



MAP 9

Major Oil/Gas Development Area :

- 1 Theodore Roosevelt National Park - South Unit
- 2 Theodore Roosevelt National Park - North Unit
- 3 Lostwood National Wilderness Area
- 4 Theodore Roosevelt National Park - Elkhorn Ranch Unit

2.0.3.3 Monitoring Network

The SO₂ 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 SO₂ 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 SO₂ emissions is approximately equal to the SO₂ output of the Heskett Station (source #17 - Table 6) which is one of the smallest coal-fired steam electrical generating plants in the state).

2.0.4 Hydrogen Sulfide

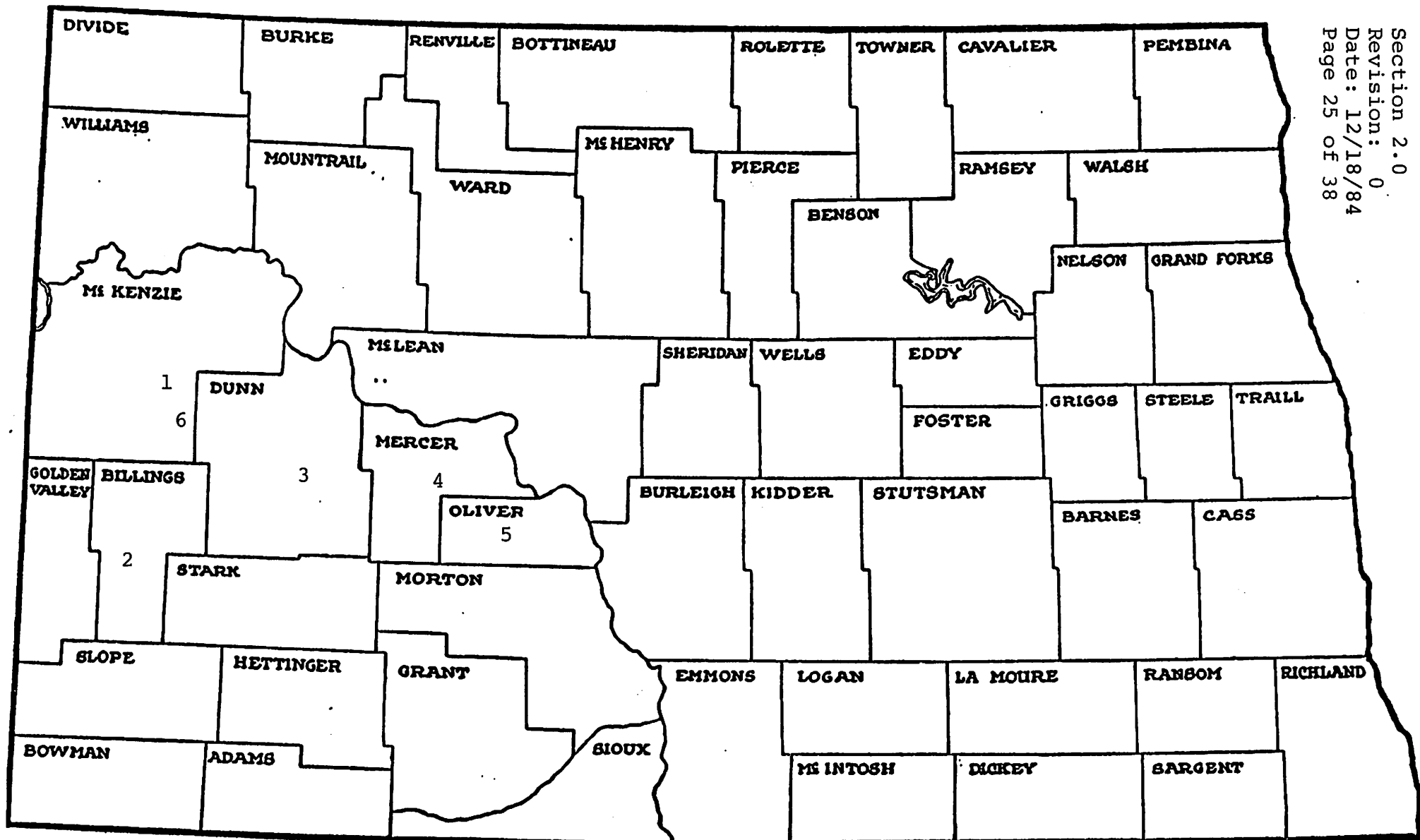
Although no Federal Ambient Air Quality Standards exist for hydrogen sulfide (H₂S), the State of

TABLE 7
CONTINUOUS MONITORING SITES*

<u>Name</u>	<u>Pollutant Monitored</u>	<u>Type Station</u>
1. Theodore Roosevelt National Park - North Unit	SO ₂ H ₂ S O ₃	SLAMS
2. Theodore Roosevelt National Park - South Unit	SO ₂	SLAMS
3. Dunn Center	SO ₂ NO/NO ₂ O ₃	SLAMS
4. Beulah	SO ₂ NO/NO ₂	SLAMS
5. Hannover**	SO ₂	SPM
6. Lone Butte (Portable)	SO ₂ H ₂ S	SPM

*All continuous sites have wind measuring equipment.

**Established 10/4/84.



MAP 10
Continuous Monitoring Sites

North Dakota has adopted half-hour H_2S standards. H_2S emissions in 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. Individual oil/gas wells, oil storage tanks, compressor stations, and natural gas processing plants are all potential sources of H_2S emissions.

2.0.4.1 Monitoring Network

There are only two monitoring sites for H_2S emissions. These are the TRNP-NU site and the portable site at Lone Butte (locations 1 and 6 in Table 7 and on Map 10).

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 the development of large reserves of lignite coal in the west-central portion of the State. The major stationary point sources (>100 TPY) of NO_x , as calculated from the most recent emission inventory, are listed in Table 8. Map 11 shows the approximate locations of these facilities.

In addition to the major sources of NO_x located within the State, impact on air quality from certain sources located outside the State have also drawn attention. The Boundary Dam power complex located near Estevan, Saskatchewan is one such source.

TABLE 8
MAJOR SOURCES OF NO_x

#	Name of Company	Type of Source	Location	NO _x Emissions Ton/Year
1	American Crystal Sugar Company	Sugarbeet Processing	Hillsboro Traill Co.	341.5
2	American Oil Company (Amoco)	Oil Refinery	Mandan Morton Co.	3876.0
3	Aminoil, USA	Natural Gas Processing	Tioga Williams Co.	2553.0
4	Basin Electric Units 1 & 2 (216mw/440mw)	Steam Elec. Gen. Facility	Stanton Mercer Co.	6544/9777 ^{1/}
5	Basin Electric Units 1 & 2 (25mw/25mw)	Steam Elec. Gen. Facility	Velva McHenry Co.	804/804
6	Coyote Station Unit 1 (440mw)	Steam Elec. Gen. Facility	Beulah Mercer Co.	10920
7	Minnkota Power Coop Unit 1 (235mw)	Steam Elec. Gen. Facility	Center Oliver Co.	10780.0
8	Montana Dakota Utilities Units 1 & 2 (25mw/66mw)	Steam Elec. Gen. Facility	Mandan Morton Co.	452/938.2 ^{1/}
9	Square Butte Unit 1 (440mw)	Steam Elec. Gen. Facility	Center Oliver Co.	17389.6

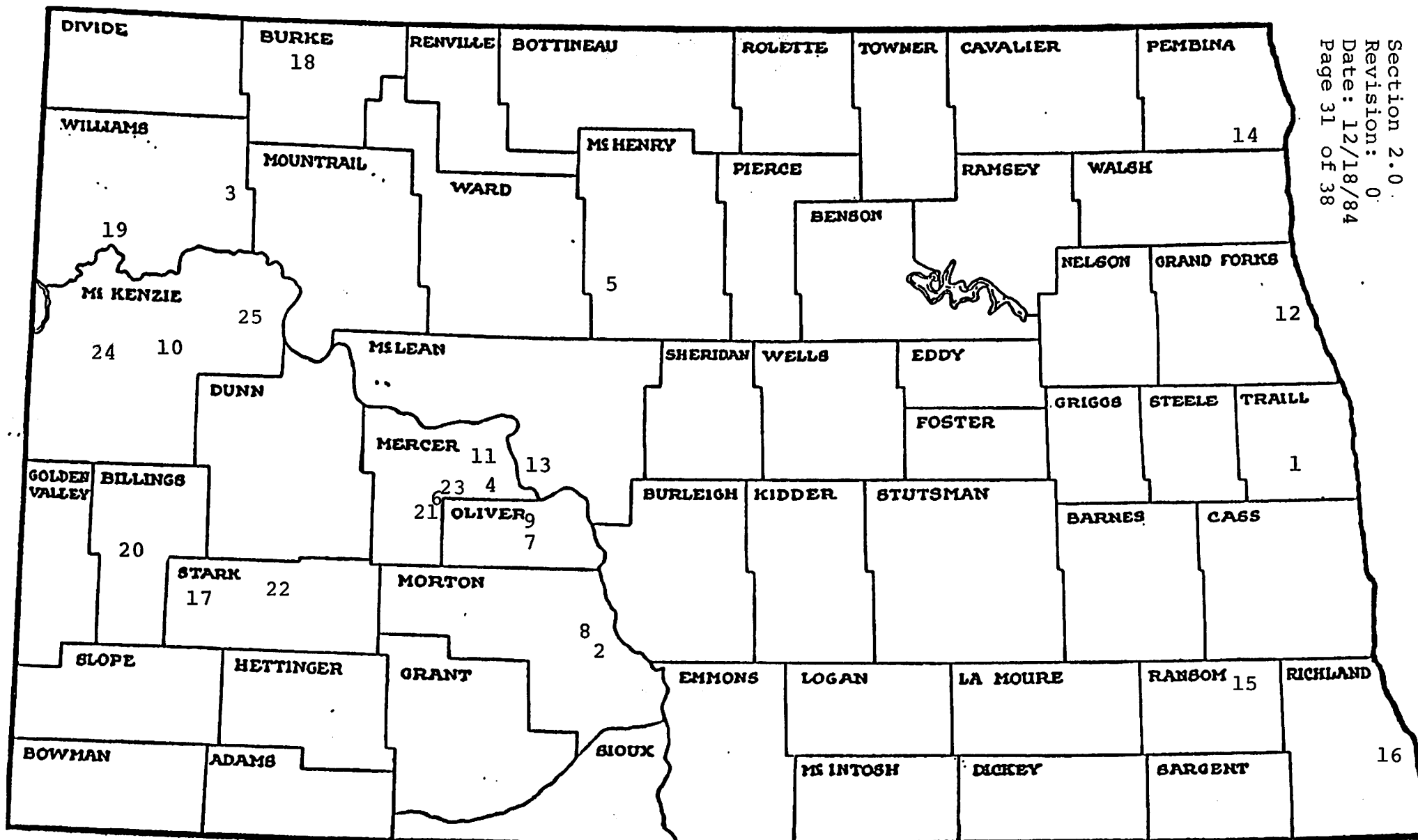
TABLE 8 Cont.

#	<u>Name of Company</u>	<u>Type of Source</u>	<u>Location</u>	<u>NO_x Emissions Ton/Year</u>
10	True Oil Company	Gas Processing Plant	Watford City McKenzie Co.	243.4
11	UPA Stanton Units 1 & 2 (172mw)	Steam Elec. Gen. Facility	Stanton Mercer Co.	10361
12	UND	Heating Plant	Grand Forks Grand Forks Co.	165
13	UPA/CPA Units 1 & 2 (550mw/550mw)	Steam Elec. Gen. Facility	Underwood McLean Co.	12509/13780 ^{1/}
14	American Crystal Sugar Company	Sugar Beet Processing	Drayton Pembina Co.	473.1
15	National Sun Industries, Inc.	Sunflower Processing	Enderlin Ransom Co.	432.7
16	Minn-Dak Farmers Coop	Sugar Beet Processing	Wahpeton Richland Co.	600.0
17	Montana Dakota Utilities Belfield (2-1100 hp station compressors)	Compressor Station	Stark Co.	228.2
18	Cities Service	Natural Gas Processing	Lignite Burke Co.	364.0
19	Phillips Petroleum	Natural Gas Processing	Trenton Williams Co.	172.3
20	Western Gas Processors, Ltd.	Mystery Creek Compressor Station	Billings Co.	280.7

TABLE 8 Cont.

<u>#</u>	<u>Name of Company</u>	<u>Type of Source</u>	<u>Location</u>	<u>NO_x Emissions Ton/Year</u>
21	Basin Electric Power Coop AVS Beulah Unit 1	Steam Elec. Gen. Facility	Beulah Mercer Co.	2757
22	Husky Industries	Charcoal Bri- quetting Plant	Dickinson Stark Co.	110.5
23	Montana Dakota Utilities	Steam Elec. Gen. Facility	Beulah Mercer Co.	122.6
24	Koch Hydrocarbon Company	12 Compressor Stations		750.1
25	Aminoil USA, Inc.	Compressor Stations:		
		Hawkeye		205.3
		Blue Butte		160.0
		Cherry Creek		174.2

1/Emissions from Unit 1/emissions from Unit 2



MAP 11
Major Sources of Nitrogen Oxides

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 monitoring in urbanized areas with populations greater than 100,000. North Dakota has no significant urbanized areas with regard to oxides of nitrogen.

2.0.5.3 Monitoring Network

The Department currently operates two NO₂/NO_x analyzers in the State. These are located at Dunn Center and Beulah (sites 3 and 4 in Table 7 and on Map 10).

2.0.6 Ozone

Unlike most other pollutants, ozone (O₃) is not emitted directly into the atmosphere but results

from a complex photochemical reaction between organic compounds (HC), oxides of nitrogen (NO_x), and solar radiation. Both HC 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. Under proposed revisions to 40 CFR 58, the O_3 monitoring season for North Dakota would be May 1 to September 30.

2.0.6.1 Point Sources

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

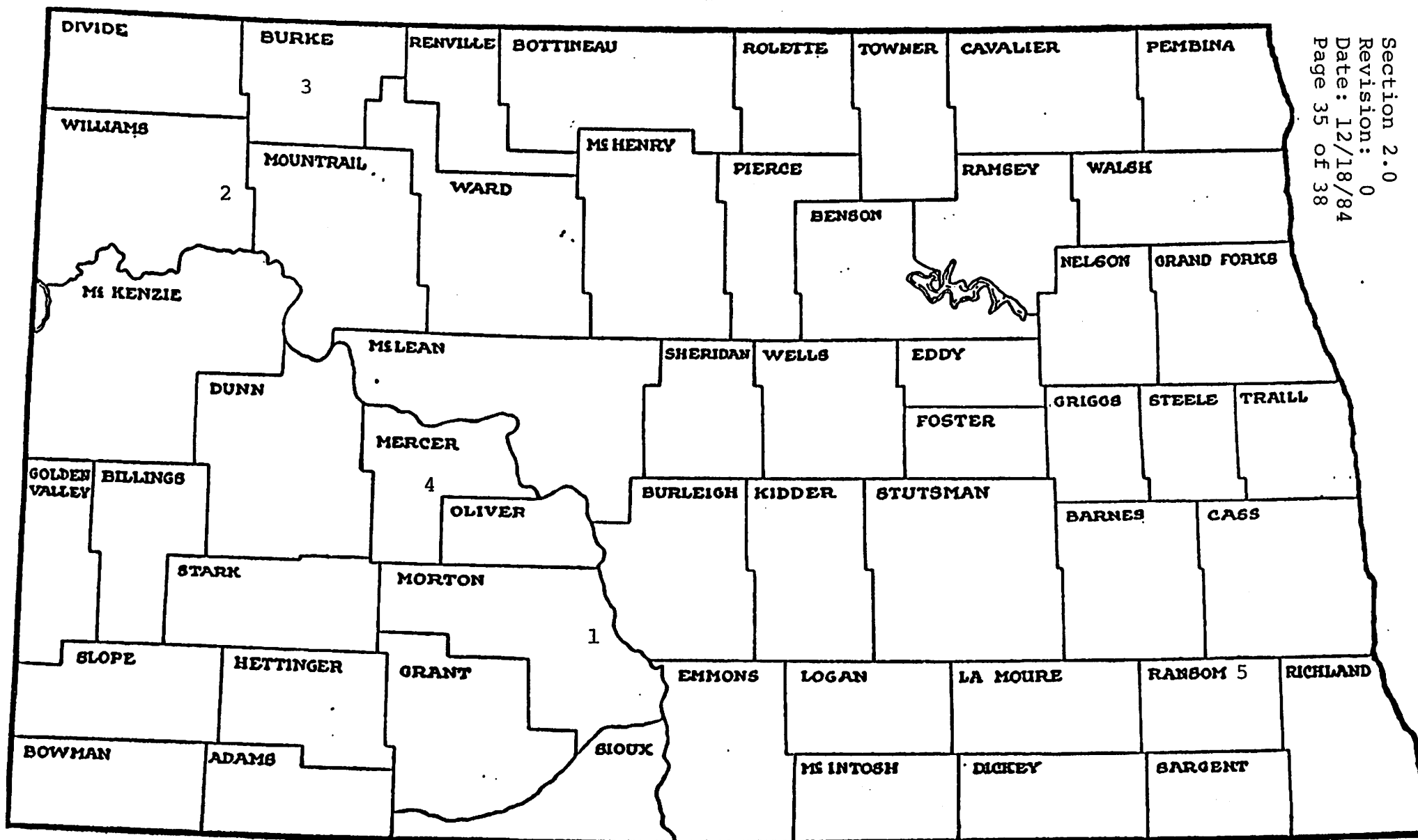
2.0.6.2 Area Sources

Point sources generally contribute only a fraction of the total HC and NO_x emissions.

TABLE 9
MAJOR HC SOURCES

<u>#</u>	<u>Name of Company</u>	<u>Type of Source</u>	<u>Location</u>	<u>HC Emissions Ton/Year</u>
1	American Oil Company (Amoco)	Oil Refinery	Mandan Morton Co.	21,695.0
2	Aminoil, USA	Natural Gas Processing	Tioga Williams Co.	811.8
3	Cities Service	Natural Gas Processing	Lignite Burke Co.	144.0
4	Montana Dakota Utilities Coyote Station	Steam Elec. Gen.	Beulah Mercer Co.	970.0
5	National Sun Industries, Inc.	Sunflower Processing	Enderlin Ransom Co.	461.7
	*Koch Hydrocarbon Company	12 Compressor Stations		309.0

*Not shown on map because of wide geographical distribution.



MAP 12

Major HC Emitting Facilities

The remaining emissions are attributed to mobile sources in urban areas. The EPA has specified a design criteria for selecting NAMS locations for O₃ 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.

2.0.6.3 Monitoring Network

The State currently has two continuous ozone analyzers in operation. One analyzer is at Dunn Center (#3 - Table 7) and the other is 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

Due to the fact that computer dispersion modeling has shown no problems with regard to compliance with the Ambient Air Quality Standards, and 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 CO monitoring network, no air quality monitoring for CO is currently being conducted.

2.0.8 Lead

The Federal Register provides regulatory guidelines for the establishment of NAMS/SLAMS ambient lead monitoring network for urbanized areas with a population of over 500,000 or greater, and we have determined that we do not have any significant point sources of lead. As a result, analysis of the TSP filters for lead was ceased 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 a concern to the Division of Hazardous Waste Management and Special Studies of the North Dakota State Health Department. Their concern primarily stems from the relationship of these pollutants to precipitation chemistry. In addition, North Dakota does have an ambient air quality standard for SO_4 .

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.

3.0 MONITORING SITE EVALUATION

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

3.0.1 Total Suspended Particulate Monitoring Sites

The minimum criteria established for TSP monitoring sites is that they must have had a maximum reported concentration of $100 \mu\text{g}/\text{m}^3$ or more and a geometric mean concentration $\geq 20 \mu\text{g}/\text{m}^3$ at some time in the last three years. With the exception of Dunn Center, which serves as a rural baseline station for the network, all the sites* were subjected to this evaluation. Two sites did not meet these criteria. They were TRNP-SU (Medora) and Moffit. The National Park Service has expressed a desire to keep a high-volume sampler at TRNP-SU. Moffit, however, will be closed this year.

*Woodworth and Canfield Lake were not evaluated because they are operated by the Division of Hazardous Waste Management and Special Studies.

The Division of Hazardous Waste Management and Special Studies of the North Dakota State Department of Health has established a precipitation chemistry site near Ardoch in Grand Forks County. A long-term goal of this Department, as discussed in paragraph 2.0.1.4, has been to establish a background (rural) monitoring site in the Red River Valley. To establish a TSP monitoring site near Ardoch would not only satisfy that long-term goal but also would benefit the precipitation chemistry study at Ardoch. We plan to establish such a site this fall with operation beginning in January 1986.

In last year's evaluation, the Jamestown site was identified as needing a new location. The Jamestown high-volume sampler was relocated to the roof of a downtown shopping mall. The new location is much easier to service. This will manifest itself, hopefully, in a much improved data recovery rate.

3.0.2 Inhalable Particulate (PM₁₀) Monitoring Sites

The PM₁₀ sites have all been inspected to certify that they meet the siting criteria as specified in the proposed regulations. The Bismarck, Dickinson, Dunn Center and Woodworth sites all meet the siting criteria.

The site at Williston will have to be relocated with respect to the current high-volume sampler site due to some recent construction on the courthouse roof. A suitable location on the northern portion of the courthouse roof has been identified, but access stairs will have to be built and power provided. This work should be completed by the end of May.

The Grand Forks site on the roof of the city water plant is minimally acceptable. The water plant is being expanded and a better location will be available by late 1985 or early 1986. Until then, we will use the present TSP sampler location.

The Fargo site will need to have some additional electrical outlets provided to enable us to operate the PM_{10} 's. This work should be completed by the end of June 1985.

3.0.3 Sulfur Dioxide Monitoring Sites

No objective criteria have been developed by which the SO_2 monitoring sites were evaluated. However, the present sites are operated 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 SO_2 site showing the lowest concentrations for any averaging period is TRNP-SU (Medora). This site was identified in the 1984 annual review as being in an unsatisfactory location. The National Park Service is establishing a new monitoring site at the Painted Canyon Visitor's Center area. That site should become operational this summer. The new site will be a cooperative effort between the

Department and the Park Service. We will operate and maintain the site and include it in our automated data acquisition system.

The above action by the National Park Service will make available the Department's monitoring trailer for use as a portable monitoring site. It is anticipated that it will be used to monitor new areas of oil and gas development in the vicinity of the Class I areas in the state.

The U.S. Fish and Wildlife Service has proposed a joint monitoring effort at the Lostwood National Wilderness Area, a PSD Class I area. The joint effort would be almost identical to the above arrangement with the Park Service. The Fish and Wildlife Service is very concerned about the impact that recent oil and gas development in the vicinity is having on the Wilderness Area. The operational date of the new site is uncertain at this time pending approval and receipt of the monitoring equipment. Installation could be effected as early as this summer.

3.0.4 Hydrogen Sulfide Monitoring Sites

The National Park Service is seriously pursuing the acquisition of an H₂S monitor for the Painted Canyon site. The major obstacle to overcome is funding. A number of options are being investigated at this time.

The U.S. Fish and Wildlife Service is seeking approval to procure an H₂S analyzer for the Lostwood Wilderness Area. The oil and gas in that area is relatively sour and H₂S emissions have been detected by personnel working in the area.

Both of the above proposed sites would be operated and maintained by the Department. Provisions have been made, as was discussed under the SO₂ monitoring revisions above, to include both sites in our automated data acquisition system.

The Lone Butte Portable Monitoring Site was established, primarily, to monitor H₂S emissions in the Lone Butte Oil Field. While we have seen

some decrease in the frequency and peak concentrations of the H_2S emissions as a result of enforcement action by the Department, the occurrence of violations of the H_2S standard is still of such a magnitude as to warrant continued operation at the 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. It has been likened to a canary in a coal mine. When the "bird" starts to react, it is time to investigate the causes of the problem. Additionally, a major coal-to-methanol conversion plant is being proposed immediately adjacent to the monitoring site.

If this construction comes to pass, data from the Dunn Center site will become invaluable for determining the concentration of emissions emanating from the plant and their effect on the ambient air quality.

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 we should continue operating an NO_x analyzer at Beulah at least until the Antelope Valley II power plant comes on line and phase two of the Great Plains Gasification Association's coal-gasification project is completed.

There is some concern that the Beulah site might actually be too close to the NO_x sources to accurately measure the effects on the ambient air quality. This is especially true for NO₂. With

that in mind, the Department intends to put an NO_x analyzer at the Hannover site which is downwind for the prevailing winds from the major sources at Beulah. The Hannover site is also centrally located with respect to four other major NO_x sources located to the east of the Beulah area.

3.0.6 Ozone Monitoring Sites

The ozone analyzer that was located at the Falkirk Monitoring site in 1983-1984 will be installed at the Hannover site. It will operate according to the proposed ozone monitoring season for North Dakota of May 1 to September 30. Because of the close relationship between the observed concentrations of O_3 and NO_x , location of an O_3 monitor at Hannover is warranted.

3.0.7 Suspended Sulfates and Nitrates Monitoring Sites

The same network changes that are discussed for the TSP monitoring sites in paragraph 3.0.1 above apply to SO_4 and NO_3 . Additionally, the Department does not intend to analyze the PM_{10} filters for SO_4 or NO_3 .

An artifact formation on glass fiber filters study using collocated high-volume samplers equipped with quartz fiber filters operating in conjunction with the high-volume samplers at Dunn Center, TRNP-NU, and Hannover is still planned. These sites were selected because they have continuous SO₂ analyzers. However, with the higher priority being given to the establishment of the PM₁₀ program, the artifact formation study probably won't be implemented until 1986.

3.0.8 Summary

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

TABLE 10

MONITORING SITE EVALUATION

Site	Parameter	Meets Needs	Modification Needed	New Site Needed	Parameter Not Needed
Ardoch Rural	TSP			X	
	SO ₄			X	
	NO ₃			X	
Beulah Residential	TSP	X			
	SO ₄	X			
	NO ₃	X			
	SO ₂	X			
	NO ₂	X			
	MET	X			
Bismarck Commerical	TSP	X			
	SO ₄	X			
	NO ₃	X			
	PM ₁₀	X			
Bowman Rural	TSP	X			
	SO ₄	X			
	NO ₃	X			
Canfield Lake (SPM)	TSP	X			
	SO ₄	X			
	NO ₃	X			
Devils Lake Commercial	TSP	X			
	SO ₄	X			
	NO ₃	X			
Dickinson Commerical	TSP	X			
	SO ₄	X			
	NO ₃	X			
	PM ₁₀	X			
Dunn Center Rural	TSP	X			
	SO ₄ *	X			
	NO ₃ *	X			
	PM ₁₀	X			
	SO ₂	X			
	NO ₂	X			
	O ₃	X			
	MET	X			

Site	Parameter	Meets Needs	Modification Needs	New Site Needed	Parameter Not Needed
Fargo Commercial	TSP	X			
	SO ₄	X			
	NO ₃	X			
	PM ₁₀	X			
Grand Forks Commercial	TSP		X		
	SO ₄		X		
	NO ₃		X		
	PM ₁₀		X		
Hannover (SPM)	TSP	X			
	SO ₄ *	X			
	NO ₃ *	X			
	SO ₂	X			
	NO ₂		X Add		
	O ₃		X Analyzers		
	MET	X			
Jamestown Commerical	TSP	X			
	SO ₄	X			
	NO ₃	X			
Lostwood Rural	TSP	X			
	SO ₄	X			
	NO ₃	X			
	SO ₂		X Add		
	H ₂ S		X Analyzers		
	MET		X		
Mandan Commercial	TSP	X			
	SO ₄	X			
	NO ₃	X			
Minot Commercial	TSP	X			
	SO ₄	X			
	NO ₃	X			
Moffit Rural	TSP				X
	SO ₄				X
	NO ₃				X

*Artifact study using collocated sampler with quartz filter.

Site	Parameter	Meets Needs	Modification Needed	New Site Needed	Parameter Not Needed
Portable Unit (SPM) (Western ND oil/gas Area Network)	SO ₂ H ₂ S MET		X Additional X Sites Needed X		
TRNP-NU Rural	TSP SO ₄ * NO ₃ * SO ₂ O ₃ H ₂ S MET	X X X X X X X			
TRNP-SU Rural	TSP SO ₄ NO ₃ SO ₂ H ₂ S MET			X X X X X Add Analyzer X	
Wahpeton Residential	TSP SO ₄ NO ₃	X X X			
Williston Commercial	TSP SO ₄ NO ₃ PM ₁₀		X X X X		
Woodworth (SPM)	TSP SO ₄ NO ₃ PM ₁₀	X X X X			

*Artifact study using collocated sampler with quartz filter.

APPENDIX A

Industrial AAQM Network

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 new major sources, requires 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 source and the Department. Parameters to be measured are determined by analysis of expected 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 detailed description 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 (APR 1985)

Industry	Site No.	Comments	Parameters Monitored	Started Monitoring	Stopped Monitoring	Ref./Equiv. Method Designation	Representative
WARREN PETROLEUM (GRI) ^{1/}	1		SO ₂	9-28-78		SO ₂ - Meloy SA285E	Ms. Lynn Reed
	2		SO ₂	10-27-78		H ₂ S - Meloy SA285E	Box 1589
	3	(MET moved to Site 3 on 9-81 from Plant)	SO ₂ , H ₂ S, WS, WD, Bar.P., TEMP	10-28-78 10-29-78		MET - Weathertronics	Tulsa, OK 74102 (918)560-4119
(PSD)							
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	Keith Ganzer Basin Elec. Power
	2	Collocated	TSP, Sulfates, Nitrates SO ₂ , NO/NO ₂ , WD, WS, TEMP, Bar.P., Solar Rad, ΔT, SIGMA WD	8-1-79		NO/NO _x -Mon.Labs 8440 O ₃ -Mon.Labs 8410 MET-Climatronics	Co-op. 1717 E. Interstate Ave.
	3		TSP, Sulfates, Nitrates SO ₂ , NO/NO ₂	8-1-79		NOTE: Fluorides, Part.ΔPh, Sulfuric Acid mist, & Sulfa- tion Rate Stopped on 6-30-81	Bismarck, ND 58501 (701)223-0441
	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			
FALKIRK MINE (Roach Entr) ^{1/}	1	Collocated	TSP	9-79	6-29-85	TSP-Hi-Vol	Ms. Andrea Stomberg
	2		TSP	9-79	1-31-83		Kirkwood Office
	3		TSP	9-79	12-20-80		Tower
	3A		TSP	3-1-81		Dustfall terminated 9-30-81	Bismarck, ND 58501 (701)258-2200
	4	Collocated	TSP	7-1-84 9-79			
	5		TSP	9-1-81			
	6		TSP	5-1-83			
(PSD)							
	7		TSP	7-11-84			
	8		TSP	7-11-84			

TABLE A
CURRENT INDUSTRIAL AAQM SITES (APR 1985)

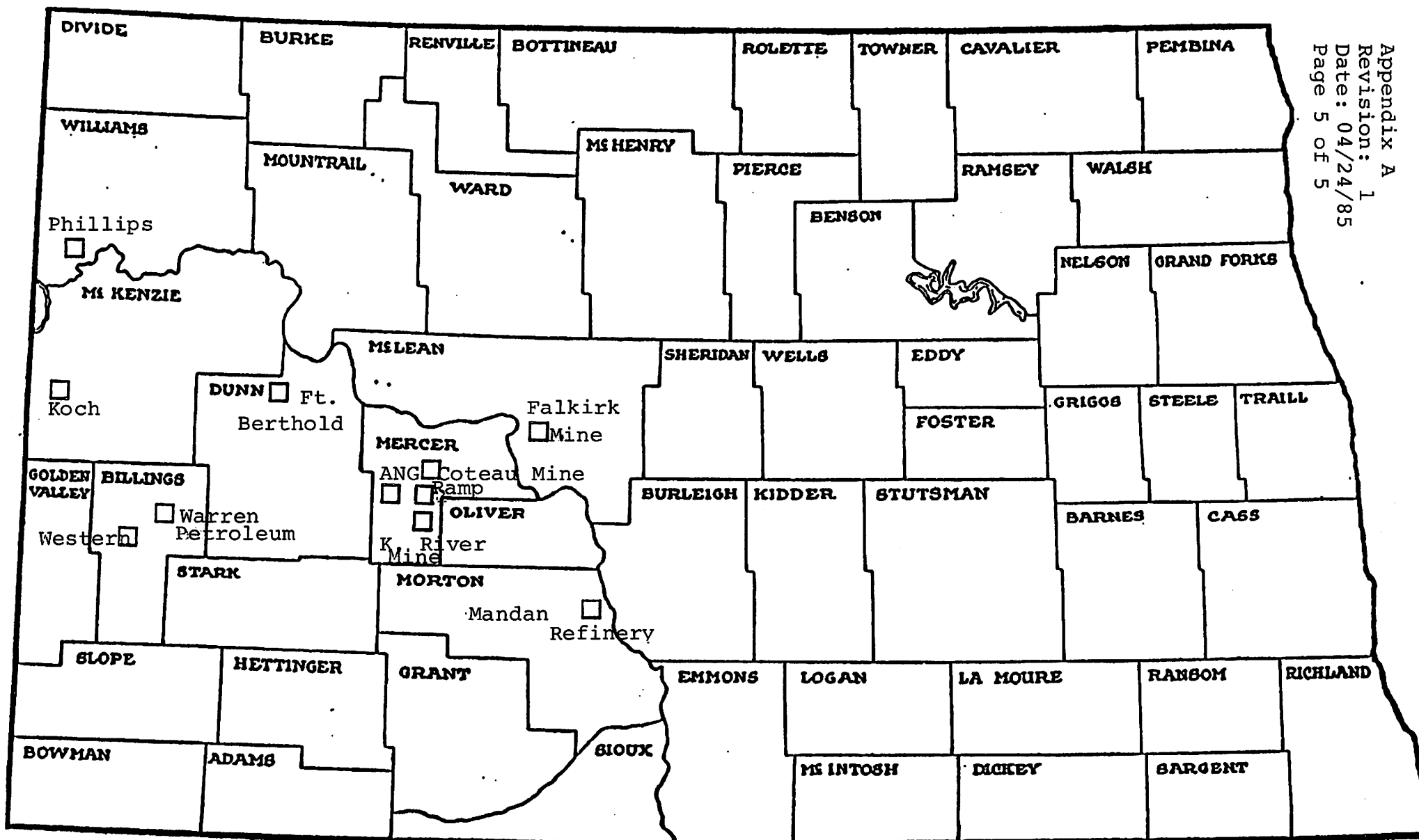
Industry	Site No.	Comments	Parameters Monitored	Started Monitoring	Stopped Monitoring	Ref./Equiv. Method Designation	Representative
COTEAU MINE (Roach Entr) ^{1/} (PSD)	1		TSP	2-21-80		TSP-Hi-Vol -----	Ms. Andrea Stomberg Kirkwood Office Tower Bismarck, ND 58501 (701)258-2200
	2	(Collocated) (thru 1-31-83)	TSP	2-21-80	1-31-83	dustfall from 4-1-80 to 6-30-81	
	2A		TSP	5-1-83			
	3	(Collocated) (Starting 5-1-83)	TSP	7-14-80			
KNIFE RIVER MINE (WEATHER MOD. INC.) ^{1/} (PSD Expansion)	1	North- Collocated	TSP	6-20-80		TSP-Hi-Vol	Douglas Davison 1915 N. Kavaney Bismarck, ND 58501 (701)223-1771
	2	West	TSP	8-7-80	12-27-83		
	3	East	TSP	6-20-80			
WESTERN GAS PROCESSORS (GRI) ^{1/} (PSD)	1		SO ₂	7-29-81		SO ₂ -TECO 43 MET-	Brion G. Wise 10701 Melody Northglen, CO 80234 (303)452-5603
	2	(At Plant)	WS,WD,TEMP	7-14-81			
KOCH HYDROCARBON (GRI) ^{1/} (PSD)	1		SO ₂ H ₂ S WS,WD,TEMP	7-29-81 10-07-81 7-14-81		SO ₂ -TECO 43 H ₂ S-TECO 43/340(45) MET-Climatronics	Robert Viaille Box 2256 Wichita, KS 67201 (316)832-5500
	2	(Sites 2&3 terminated 7-82 to	H ₂ S	12-02-81			
	3	4-83)	SO ₂	7-29-81			
PHILLIPS (PSD)	1	(At Plant)	H ₂ S WS,WD,TEMP,DEW PT. Solar Rad,PRECIP,Bar. Press.	9-1-81 8-21-81		SO ₂ -TECO 43 H ₂ S-TECO 45 MET-Climatronics	Tom Davis Bartlesville, OK (918)661-3088
	2		SO ₂	8-21-81			

TABLE A
CURRENT INDUSTRIAL AAQM SITES (APR 1985)

Industry	Site No.	Comments	Parameters Monitored	Started Monitoring	Stopped Monitoring	Ref./Equiv. Method Designation	Representative
AMOCO REFINERY MANDAN (INTERPOLL) <u>1</u> /	1	Proposed	SO ₂ WS, WD, TEMP, STAB. SO ₂	11-2-83		SO ₂ -TECO 43 MET-	Don Litchfield Amoco Oil Co. Mandan Refinery P.O. Box 549 Mandan, ND 54554 (701) 667-2400
FT. BERTHOLD* INDIAN RESERVATION (GRI) <u>1</u> /	1		TSP SO ₂ H ₂ S WS, WD, TEMP	8-1-82 8-1-82 4-1-83 8-1-82		TSP-Hi-Vol SO ₂ -TECO 43 H ₂ S-TECO 45 MET-	Rich Schilf Ft. Berthold Res. Nat. Resources Dept. P.O. Box 460 New Town, ND 58763 (701) 627-3620
AMERICAN NATURAL GAS (GRI) <u>1</u> /	1		H ₂ S	5-1-83		H ₂ S-TECO 45	Danny R. Guminski ANG Coal Gas. Co. Great Plains Gas. Associates P.O. Box 1149 Beulah, ND 58523 (701) 873-6603
(PSD)							

*Not Required to Monitor.

1/ Consultant



☐ Operational Monitoring Network

MAP A

Industrial Ambient Air Quality
Monitoring Network