STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

May 9, 2006

Mr. Bharat Mathur
Acting Regional Administrator
U.S. Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604-3950

Dear Mr. Mathur:

The Michigan Department of Environmental Quality (MDEQ) is submitting to the U.S. Environmental Protection Agency (EPA) a request for redesignation to attainment of the 8-hour ozone National Ambient Air Quality Standard for 11 counties in Michigan comprising six ozone nonattainment areas, and a proposed revision to the Michigan State Implementation Plan. We are also submitting a request for a determination of "insignificant motor vehicle emissions" for the rural counties of Benzie, Mason, and Huron under Section 109 (k) of the federal Transportation Conformity Rule.

Attached are the final Redesignation Petition and Maintenance Plan for the counties of Ingham, Eaton, Clinton, Kent, Ottawa, Kalamazoo, Calhoun, Van Buren, Huron, Mason, and Benzie. This final version documents the public notice and comment process.

The MDEQ requests that the EPA proceed with final review and approval of this submittal. If you have any questions or need additional information, please contact Mr. G. Vinson Hellwig, MDEQ, Air Quality Division, at 517-373-7069.

Sincerely,

Steven E. Chester
Director
517-373-7917

Attachment
cc: Mr. John Mooney, EPA Region 5
Mr. G. Vinson Hellwig, MDEQ
Ms. Mary Maupin, MDEQ

*Proposed Revision to Michigan's State Implementation Plan for Achieving the Ozone National Ambient Air Quality Standard*

# Request to Redesignate to Attainment Status

Eleven Counties comprising Six Ozone Nonattainment Areas in Michigan

and

Proposed Maintenance Plan for Eleven Counties Comprising Six Ozone Nonattainment Areas

Counties of Ingham, Eaton, Clinton, Kent, Ottawa, Kalamazoo, Calhoun, Van Buren, Benzie, Mason, and Huron

Michigan Department of Environmental Quality
Air Quality Division

May 2006

Redesignation and Maintenance Plan Proposal
May 2006

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## 1. Introduction

The State of Michigan, through the Michigan Department of Environmental Quality (MDEQ), is asking the U.S. Environmental Protection Agency (EPA) to make a determination that the six ozone nonattainment areas are in attainment with the ozone National Ambient Air Quality Standard (NAAQS), to change the legal status of these areas from nonattainment to attainment, and to approve the maintenance plans as part of the Michigan Ozone State Implementation Plan (SIP). The MDEQ is also requesting a finding of insignificant motor vehicle emissions for the rural counties of Huron, Benzie, and Mason, in accordance with Section 109(k) of the EPA's Transportation Conformity Rule.

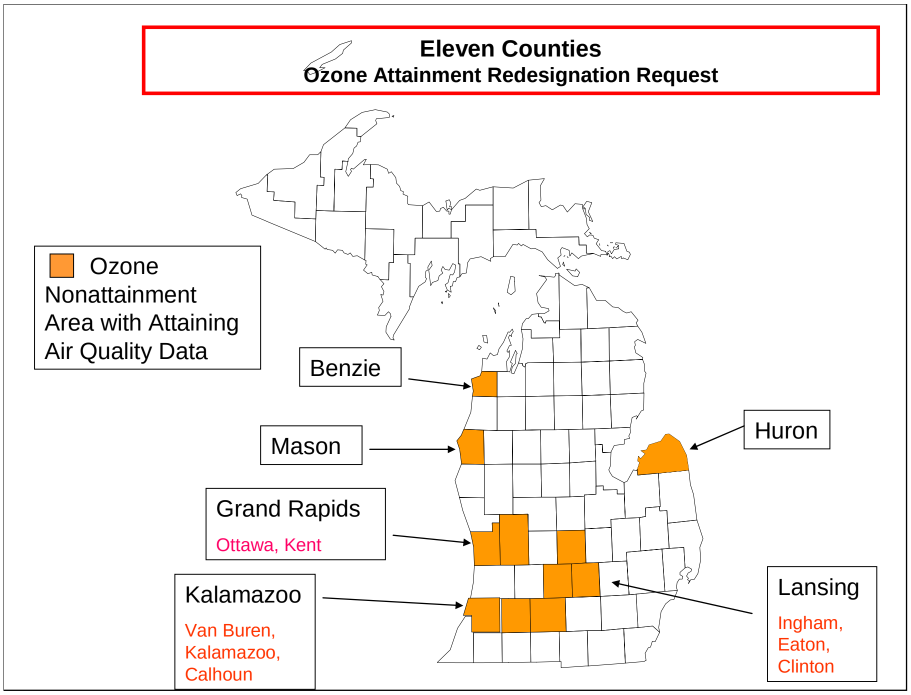
The EPA established a revised NAAQS for ozone that is more restrictive than the pre-existing 1-hour ozone standard. The EPA designated areas in Michigan as attainment or nonattainment of the new 8-hour ozone standard in April 2004. The designations were based on design values derived from air quality monitoring data for the years 2001-2003. Design values over 0.085 parts per million (ppm) are considered too high to be protective of health, and resulted in nonattainment designations for 25 counties in Michigan.

Air quality monitoring data collected since the 2001-2003 period has shown improved ozone design values in 11 of the original 25 nonattainment counties. Data for the years 2002-2004 demonstrate that the counties of Ingham, Eaton, Clinton, Kent, Ottawa, Kalamazoo, Calhoun, Van Buren, Benzie, Mason, and Huron are now meeting the 8-hour ozone NAAQS. These 11 counties comprise six nonattainment areas: Lansing, Grand Rapids, Kalamazoo, Benzie, Mason, and Huron. Each of these counties is subject to the Subpart 1 nonattainment planning and control provisions of the Clean Air Act (CAA). This document is intended to support

Michigan's request that the 11 counties be redesignated from nonattainment to attainment of the 8-hour NAAQS.

**Figure 1.1**

**Map of Michigan Counties for Ozone Attainment Redesignation**




Also included in this package is the MDEQ's proposed revision to the Michigan SIP for the inclusion of 8-hour ozone Maintenance Plans for the counties to be redesignated, including transportation conformity budgets.

The MDEQ prepared this redesignation documentation with the technical assistance of the Michigan Department of Transportation (MDOT) and the Lake Michigan Air Directors' Consortium (LADCO) a coalition of five Lake Michigan states (Michigan, Ohio, Indiana, Illinois, and Wisconsin) in conjunction with the EPA, created to study, model, and ultimately achieve regional attainment of the NAAQS in the Lake Michigan region.

## 2. Redesignation Package Components

Section 107 of the CAA establishes requirements to be met in order for an area to be qualified for redesignation to attainment including:

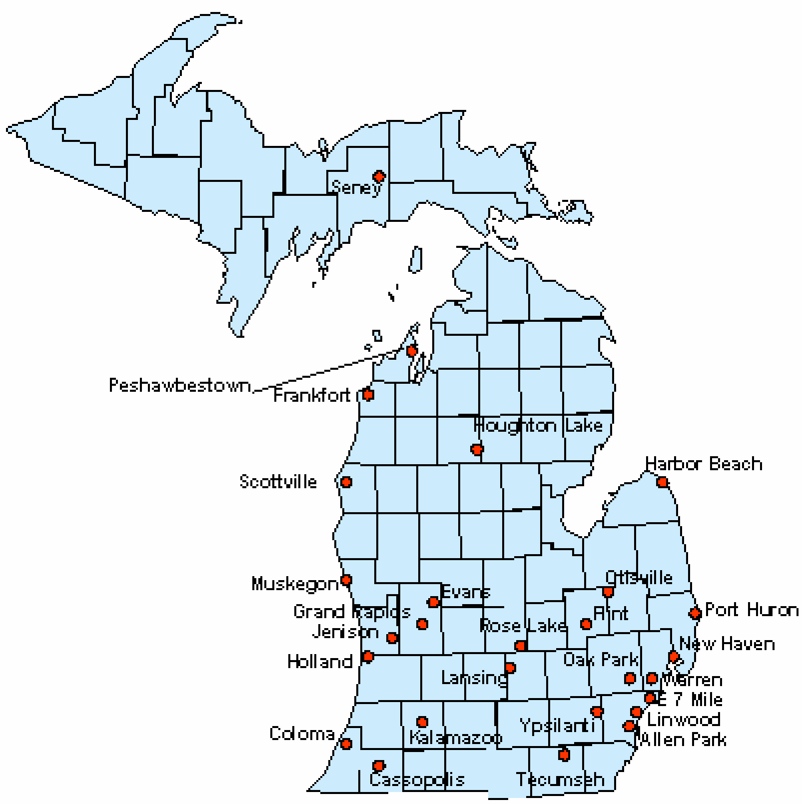
- A determination that the area has attained the 8-hour ozone standard,
- An approved SIP for the area under Section 110,
- A determination that the improvement in air quality is due to permanent and enforceable reductions in emissions resulting from implementation of the SIP and other federal requirements,
- A fully approved maintenance plan under Section 175(A), and
- A determination that all Section 110 and Part D requirements have been met.

This document summarizes compliance with each required component for approval of an attainment redesignation.

## 3. Demonstration of Attainment of the Standard

The MDEQ maintains a comprehensive network of ozone air quality monitors throughout Michigan with the primary objective being to determine compliance with the ozone NAAQS. The MDEQ was assisted in the operation of monitors in the counties to be redesignated by the City of Grand Rapids, Environmental Protection Services Department, and the Kalamazoo County Health Department. The MDEQ submits network reviews to the EPA Region V annually to ensure that its air monitoring operations comply with all applicable federal requirements. The locations of ozone monitors in Michigan are shown in Figure 3.1.

**Figure 3.1 Locations of Ozone Monitors**



Data from air quality monitors located in ozone areas show whether or not violations of the ozone NAAQS are occurring. The design value is the three-year average of the 4th highest values, based on data from each of the monitoring sites in an attainment or nonattainment area. For the period 2002-2004, the design value is less than 0.085 parts per million (ppm) in each of the six ozone areas included in this redesignation request. Design values for 2002-2004 confirming attainment of the NAAQS are shown in Table 3.1.

**Table 3.1 Monitor Data Design Values 2002-2004 for 8-Hour Ozone NAAQS**

*(ppm= parts per million)*

| Ozone Area | County | Monitors | 4th High 2002 (ppm) | 4th High 2003 (ppm) | 4th High 2004 (ppm) | Design Value 2004 (ppm) |
|---|---|---|---|---|---|---|
| Lansing | Ingham<br>Eaton | Lansing 260650012 | 0.088 | 0.085 | 0.068 | 0.080 |
| | Clinton | Rose Lake 260370001 | 0.085 | 0.086 | 0.070 | 0.080 |
| Grand Rapids | Kent | Grand Rapids 260810020 | 0.087 | 0.085 | 0.068 | 0.080 |
| | | Evans 260810022 | 0.088 | 0.093 | 0.072 | 0.084 |
| | Ottawa | Jenison 261390005 | 0.093 | 0.090 | 0.069 | 0.084 |
| Kalamazoo | Kalamazoo<br>Calhoun<br>Van Buren | Kalamazoo 260770008 260770905 | 0.090 | 0.085 | 0.068 | 0.081 |
| Benzie | Benzie | Frankfort 260190003 | 0.086 | 0.089 | 0.075 | 0.083 |
| Mason | Mason | Scottville 261050007 | 0.089 | 0.087 | 0.071 | 0.082 |
| Huron | Huron | Harbor Beach 260630007 260633006 | 0.087 | 0.086 | 0.068 | 0.080 |

Table 3.2 shows historic 8-hour ozone design values at each site in the counties to be redesignated. It is notable that data for the Lansing and Huron nonattainment areas shows attainment of the NAAQS for each three-year period over the past decade except for 2003, the

year for which the nonattainment designation was made by the EPA. The 2005 ozone season monitoring data confirms continued attainment in each of the areas to be redesignated.

Due to ozone transport from upwind areas, the monitors located closest to Lake Michigan (Frankfort, Scottville, and Jenison) typically have higher ozone levels than monitors located further inland in the Grand Rapids, Kalamazoo, and Lansing nonattainment areas, despite having much smaller populations and fewer local emissions of ozone precursors.

**Table 3.2 Historic 8-Hour Ozone Design Values**

| NAA Area | Site | AirsID | Year | 4th Highest* 8HrMax, ppm | Design Value Site * Avg, ppm | Rounded to 2 Decimals Site** Avg, ppm |
|---|---|---|---|---|---|---|
| Lansing | Lansing | 260650012 | 1992 | 0.077 | 9-5-80 sampling began | |
| | Lansing | 260650012 | 1993 | 0.080 | | |
| | Lansing | 260650012 | 1994 | 0.080 | 0.079 | 0.08 |
| | Lansing | 260650012 | 1995 | 0.088 | 0.082 | 0.08 |
| | Lansing | 260650012 | 1996 | 0.085 | 0.084 | 0.08 |
| | Lansing | 260650012 | 1997 | 0.076 | 0.083 | 0.08 |
| | Lansing | 260650012 | 1998 | 0.081 | 0.080 | 0.08 |
| | Lansing | 260650012 | 1999 | 0.089 | 0.082 | 0.08 |
| | Lansing | 260650012 | 2000 | 0.077 | 0.082 | 0.08 |
| | Lansing | 260650012 | 2001 | 0.083 | 0.083 | 0.08 |
| | Lansing | 260650012 | 2002 | 0.088 | 0.083 | 0.08 |
| | Lansing | 260650012 | 2003 | 0.085 | **0.085** | **0.09** |
| | Lansing | 260650012 | 2004 | 0.068 | 0.080 | 0.08 |
| | Lansing | 260650012 | 2005 | 0.082 | 0.078 | 0.08 |
| | | | | | | |
| Lansing | Rose Lake | 260370001 | 1992 | 0.083 | 6-7-79 sampling began | |
| | Rose Lake | 260370001 | 1993 | 0.078 | | |
| | Rose Lake | 260370001 | 1994 | 0.078 | 0.079 | 0.08 |
| | Rose Lake | 260370001 | 1995 | 0.076 | 0.077 | 0.08 |
| | Rose Lake | 260370001 | 1996 | 0.068 | 0.074 | 0.07 |
| | Rose Lake | 260370001 | 1997 | 0.078 | 0.074 | 0.07 |
| | Rose Lake | 260370001 | 1998 | 0.078 | 0.074 | 0.07 |
| | Rose Lake | 260370001 | 1999 | 0.087 | 0.081 | 0.08 |

| NAA Area | Site | AirsID | Year | 4th Highest* 8HrMax, ppm | Design Value Site * Avg, ppm | Rounded to 2 Decimals Site** Avg, ppm |
|---|---|---|---|---|---|---|
| | Rose Lake | 260370001 | 2000 | 0.074 | 0.079 | 0.08 |
| | Rose Lake | 260370001 | 2001 | 0.087 | 0.083 | 0.08 |
| | Rose Lake | 260370001 | 2002 | 0.085 | 0.082 | 0.08 |
| | Rose Lake | 260370001 | 2003 | 0.086 | **0.086** | **0.09** |
| | Rose Lake | 260370001 | 2004 | 0.070 | 0.080 | 0.08 |
| | Rose Lake | 260370001 | 2005 | 0.078 | 0.078 | 0.08 |
| | | | | | | |
| Grand Rapids | Grand Rapids | 260810020 | 1992 | 0.078 | 4-24-80 sampling began | |
| | Grand Rapids | 260810020 | 1994 | 0.084 | 0.081 | 0.08 |
| | Grand Rapids | 260810020 | 1995 | 0.094 | **0.086** | **0.09** |
| | Grand Rapids | 260810020 | 1996 | 0.087 | **0.088** | **0.09** |
| | Grand Rapids | 260810020 | 1997 | 0.077 | **0.086** | **0.09** |
| | Grand Rapids | 260810020 | 1998 | 0.079 | 0.081 | 0.08 |
| | Grand Rapids | 260810020 | 1999 | 0.085 | 0.080 | 0.08 |
| | Grand Rapids | 260810020 | 2000 | 0.068 | 0.077 | 0.08 |
| | Grand Rapids | 260810020 | 2001 | 0.083 | 0.079 | 0.08 |
| | Grand Rapids | 260810020 | 2002 | 0.087 | 0.079 | 0.08 |
| | Grand Rapids | 260810020 | 2003 | 0.085 | **0.085** | **0.09** |
| | Grand Rapids | 260810020 | 2004 | 0.068 | 0.080 | 0.08 |
| | Grand Rapids | 260810020 | 2005 | 0.083 | 0.079 | 0.08 |
| | | | | | | |
| Grand Rapids | Evans | 260810022 | 1999 | 0.094 | **0.086** | **0.09** |
| | Evans | 260810022 | 2000 | 0.073 | 0.084 | 0.08 |
| | Evans | 260810022 | 2001 | 0.085 | 0.084 | 0.08 |
| | Evans | 260810022 | 2002 | 0.088 | 0.082 | 0.08 |
| | Evans | 260810022 | 2003 | 0.093 | **0.089** | **0.09** |
| | Evans | 260810022 | 2004 | 0.072 | 0.084 | 0.08 |
| | Evans | 260810022 | 2005 | 0.083 | 0.083 | 0.08 |
| | | | | | | |
| Grand Rapids | Jenison | 261390005 | 1992 | 0.080 | 4-1-89 sampling began | |
| | Jenison | 261390005 | 1993 | --- | no sampling 1993 | |
| | Jenison | 261390005 | 1994 | 0.086 | | |
| | Jenison | 261390005 | 1995 | 0.083 | | |
| | Jenison | 261390005 | 1996 | 0.084 | 0.084 | 0.08 |
| | Jenison | 261390005 | 1997 | 0.079 | 0.082 | 0.08 |
| | Jenison | 261390005 | 1998 | 0.085 | 0.082 | 0.08 |
| | Jenison | 261390005 | 1999 | 0.091 | **0.085** | **0.09** |
| | Jenison | 261390005 | 2000 | 0.077 | 0.084 | 0.08 |
| | Jenison | 261390005 | 2001 | 0.086 | **0.085** | **0.09** |
| | Jenison | 261390005 | 2002 | 0.093 | **0.085** | **0.09** |

| NAA Area | Site | AirsID | Year | 4th Highest* 8HrMax, ppm | Design Value Site * Avg, ppm | Rounded to 2 Decimals Site** Avg, ppm |
|---|---|---|---|---|---|---|
| | Jenison | 261390005 | 2003 | 0.090 | **0.090** | **0.09** |
| | Jenison | 261390005 | 2004 | 0.069 | 0.084 | 0.08 |
| | Jenison | 261390005 | 2005 | 0.086 | 0.082 | 0.08 |
| Kalamazoo | Kalamazoo | 260770905 | 1992 | 0.090 | 6-1-92 sampling began | |
| | Kalamazoo | 260770905 | 1993 | 0.080 | | |
| | Kalamazoo | 260770905 | 1994 | 0.079 | 0.083 | 0.08 |
| | Kalamazoo | 260770905 | 1995 | 0.093 | 0.084 | 0.08 |
| | Kalamazoo | 260770905 | 1996 | 0.085 | **0.085** | **0.09** |
| | Kalamazoo | 260770008 | 1997 | 0.082 | **0.086** | **0.09** |
| | Kalamazoo | 260770008 | 1998 | 0.087 | 0.084 | 0.08 |
| | Kalamazoo | 260770008 | 1999 | 0.091 | **0.086** | **0.09** |
| | Kalamazoo | 260770008 | 2000 | 0.070 | 0.082 | 0.08 |
| | Kalamazoo | 260770008 | 2001 | 0.085 | 0.082 | 0.08 |
| | Kalamazoo | 260770008 | 2002 | 0.090 | 0.082 | 0.08 |
| | Kalamazoo | 260770008 | 2003 | 0.085 | **0.087** | **0.09** |
| | Kalamazoo | 260770008 | 2004 | 0.068 | 0.081 | 0.08 |
| | Kalamazoo | 260770008 | 2005 | 0.086 | 0.080 | 0.08 |
| | | | | | | |
| Benzie | Frankfort | 260190003 | 1992 | 0.072 | 7-28-92 sampling began | |
| | Frankfort | 260190003 | 1993 | 0.083 | | |
| | Frankfort | 260190003 | 1994 | 0.085 | | |
| | Frankfort | 260190003 | 1995 | 0.099 | **0.089** | **0.09** |
| | Frankfort | 260190003 | 1996 | 0.085 | **0.089** | **0.09** |
| | Frankfort | 260190003 | 1997 | 0.078 | **0.087** | **0.09** |
| | Frankfort | 260190003 | 1998 | 0.090 | 0.084 | 0.08 |
| | Frankfort | 260190003 | 1999 | 0.097 | **0.088** | **0.09** |
| | Frankfort | 260190003 | 2000 | 0.081 | **0.089** | **0.09** |
| | Frankfort | 260190003 | 2001 | 0.091 | **0.090** | **0.09** |
| | Frankfort | 260190003 | 2002 | 0.086 | **0.086** | **0.09** |
| | Frankfort | 260190003 | 2003 | 0.089 | **0.089** | **0.09** |
| | Frankfort | 260190003 | 2004 | 0.075 | 0.083 | 0.08 |
| | Frankfort | 260190003 | 2005 | 0.086 | 0.083 | 0.08 |
| | | | | | | |
| Mason | Scottville | 261050006 | 1998 | 0.087 | **0.088** | **0.09** |
| | Scottville | 261050006 | 1999 | 0.101 | **0.091** | **0.09** |
| | Scottville | 261050006 | 2000 | 0.081 | **0.089** | **0.09** |
| | Scottville | 261050006 | 2001 | 0.093 | **0.092** | **0.09** |
| | Scottville | 261050006 | 2002 | 0.089 | **0.088** | **0.09** |
| | Scottville | 261050006 | 2003 | 0.087 | **0.090** | **0.09** |
| | Scottville | 261050006 | 2004 | 0.071 | 0.082 | 0.08 |
| | Scottville | 261050006 | 2005 | 0.085 | 0.081 | 0.08 |
| | | | | | | |

| NAA Area | Site | AirsID | Year | 4th Highest* 8HrMax, ppm | Design Value Site * Avg, ppm | Rounded to 2 Decimals Site** Avg, ppm |
|---|---|---|---|---|---|---|
| Huron | Harbor Beach | 260630006 | 1993 | 0.075 | 6-23-93 sampling began | |
| | Harbor Beach | 260630007 | 1994 | 0.082 | 4-1-94 sampling began | |
| | Harbor Beach | 260630007 | 1995 | 0.083 | 0.080 | 0.08 |
| | Harbor Beach | 260630007 | 1996 | 0.084 | 0.083 | 0.08 |
| | Harbor Beach | 260630007 | 1997 | 0.075 | 0.080 | 0.08 |
| | Harbor Beach | 260630007 | 1998 | 0.087 | 0.082 | 0.08 |
| | Harbor Beach | 260630007 | 1999 | 0.090 | 0.084 | 0.08 |
| | Harbor Beach | 260630007 | 2000 | 0.072 | 0.083 | 0.08 |
| | Harbor Beach | 260630007 | 2001 | 0.088 | 0.083 | 0.08 |
| | Harbor Beach | 260630007 | 2002 | 0.087 | 0.082 | 0.08 |
| | Harbor Beach | 260630007 | 2003 | 0.086 | **0.087** | **0.09** |
| | Harbor Beach | 260630007 | 2004 | 0.068 | 0.080 | 0.08 |
| | Harbor Beach | 260630007 | 2005 | 0.077 | 0.077 | 0.08 |

Ambient monitoring data collected for the 11 counties meets the completeness criteria specified in *40 Code of Federal Regulations 50, Appendix H,* is quality assured in accordance with *40 Code of Federal Regulations 58.10*, recorded in the EPA Air Quality System (AQS) data base, and is available for public view. Such data completeness regulations require a minimum completeness of 75 percent annually and 90 percent over each three year period. Data completeness levels for the monitoring sites in the six nonattainment areas are shown in Table 3.3.

## Table 3.3 Completeness of 8-Hour Ozone Data for Selected Sites in Michigan

Calculated according to July 19, 1997 final Ozone NAAQS.

| Site | AirsID | Year | Number of Measure-ments Collected | Number of Measure-ments Required | Must be >=75% Annual % Complet | Must be >=90% 3-year % complete | 4th Highest 8HrMax, ppm | Design Value Site* Avg, ppm | Rounded to 2 Decimals Site** Avg, ppm |
|---|---|---|---|---|---|---|---|---|---|
| Lansing | 260650012 | 2002 | 183 | 183 | 100 | | 0.088 | 0.088 | 0.08 |
| Lansing | 260650012 | 2003 | 182 | 183 | 99 | | 0.085 | **0.087** | **0.09** |
| Lansing | 260650012 | 2004 | 183 | 183 | 100 | 100 | 0.068 | 0.080 | 0.08 |
| Lansing | 260650012 | 2005 | 179 | 183 | 98 | 99 | 0.082 | 0.078 | 0.08 |
| Rose Lake | 260370001 | 2002 | 182 | 183 | 99 | | 0.085 | 0.085 | 0.08 |
| Rose Lake | 260370001 | 2003 | 183 | 183 | 100 | | 0.086 | **0.086** | **0.09** |
| Rose Lake | 260370001 | 2004 | 183 | 183 | 100 | 100 | 0.070 | 0.080 | 0.08 |
| Rose Lake | 260370001 | 2005 | 183 | 183 | 100 | 100 | 0.078 | 0.078 | 0.08 |
| Grand Rapids | 260810020 | 2002 | 178 | 183 | 97 | | 0.087 | 0.087 | 0.08 |
| Grand Rapids | 260810020 | 2003 | 179 | 183 | 98 | | 0.085 | **0.086** | **0.09** |
| Grand Rapids | 260810020 | 2004 | 180 | 183 | 98 | 98 | 0.068 | 0.080 | 0.08 |
| Grand Rapids | 260810020 | 2005 | 181 | 183 | 99 | 98 | 0.083 | 0.079 | 0.08 |
| Evans | 260810022 | 2002 | 183 | 183 | 100 | | 0.088 | 0.088 | 0.08 |
| Evans | 260810022 | 2003 | 183 | 183 | 100 | | 0.093 | **0.091** | **0.09** |
| Evans | 260810022 | 2004 | 182 | 183 | 99 | 100 | 0.072 | 0.084 | 0.08 |
| Evans | 260810022 | 2005 | 180 | 183 | 98 | 99 | 0.083 | 0.083 | 0.08 |
| Jenison | 261390005 | 2002 | 181 | 183 | 99 | | 0.093 | **0.093** | **0.09** |
| Jenison | 261390005 | 2003 | 183 | 183 | 100 | | 0.090 | **0.092** | **0.09** |
| Jenison | 261390005 | 2004 | 180 | 183 | 98 | 99 | 0.069 | 0.084 | 0.08 |
| Jenison | 261390005 | 2005 | 181 | 183 | 99 | 99 | 0.086 | 0.082 | 0.08 |
| Kalamazoo | 260770008 | 2002 | 183 | 183 | 100 | | 0.090 | 0.090 | 0.08 |
| Kalamazoo | 260770008 | 2003 | 178 | 183 | 97 | | 0.085 | **0.088** | **0.09** |
| Kalamazoo | 260770008 | 2004 | 183 | 183 | 100 | 99 | 0.068 | 0.081 | 0.08 |
| Kalamazoo | 260770008 | 2005 | 180 | 183 | 98 | 99 | 0.086 | 0.080 | 0.08 |
| Frankfort | 260190003 | 2002 | 183 | 183 | 100 | | 0.086 | **0.086** | **0.09** |
| Frankfort | 260190003 | 2003 | 183 | 183 | 100 | | 0.089 | **0.088** | **0.09** |
| Frankfort | 260190003 | 2004 | 183 | 183 | 100 | 100 | 0.075 | 0.083 | 0.08 |
| Frankfort | 260190003 | 2005 | 180 | 183 | 98 | 99 | 0.086 | 0.083 | 0.08 |
| Scottville | 261050007 | 2002 | 183 | 183 | 100 | | 0.089 | **0.089** | **0.09** |
| Scottville | 261050007 | 2003 | 183 | 183 | 100 | | 0.087 | **0.088** | **0.09** |
| Scottville | 261050007 | 2004 | 176 | 183 | 96 | 99 | 0.071 | 0.082 | 0.08 |
| Scottville | 261050007 | 2005 | 174 | 183 | 95 | 97 | 0.085 | 0.081 | 0.08 |
| Harbor Beach | 260630007 | 2002 | 183 | 183 | 100 | | 0.087 | 0.087 | 0.08 |
| Harbor Beach | 260630007 | 2003 | 177 | 183 | 97 | | 0.086 | 0.087 | 0.09 |
| Harbor Beach | 260630007 | 2004 | 183 | 183 | 100 | 99 | 0.068 | 0.080 | 0.08 |
| Harbor Beach | 260630007 | 2005 | 177 | 183 | 97 | 98 | 0.077 | 0.077 | 0.08 |

* 4th highest 8-hour average and 3-year average truncated.

** Final site average rounded.

## 4. State Implementation Plan Approval and Compliance with CAA Section 110 and Part D Requirements

Section 110 of the CAA delineates general SIP requirements and Part D contains requirements applicable to the Subpart 1 nonattainment areas. Michigan meets all applicable requirements for ozone redesignation under these provisions of the CAA for the six nonattainment areas.

Of the six areas included in this redesignation request, only the Grand Rapids area, Kent and Ottawa counties, was a classified nonattainment area under the 1-hour ozone NAAQS. The Grand Rapids area was redesignated to ozone attainment in 1996, (61 FR Page 31831, June 21, 1996). In the attainment redesignation approval, the EPA made a determination that all ozone SIP requirements had been met. No new nonattainment area requirements under the 8-hour NAAQS have come due.

Michigan's SIP contains all emission control programs related to ozone under Section 110(k) of the CAA required for attainment redesignation. Programs for emissions limitations, permitting, emissions inventories and statements, emissions fees, enforcement authorities, ambient monitoring, Reasonably Available Control Technology (RACT), and conformity requirements, general and transportation, have been implemented in Michigan and are included in the SIP.

Subpart 110(a) (2) (D) requires that SIPs contain certain measures to prevent sources in a state from significantly contributing to air quality problems in another state. Michigan has met the requirements of the federal Nitrogen Oxides (NOx) SIP Call, Phase 1 to reduce NOx emissions contributing to downwind states. Michigan's rules to implement the NOx SIP Call have been approved as part of the SIP (70 FR 23029, May 4, 2005).

Redesignation approval is not contingent on state adoption of certain Part D requirements found in Section 172(c) (1) – (9) that have not come due prior to the date of this submission, including RACT and Reasonably Available Control Measures (RACM) , and contingency measures. Conformity and New Source Review requirements are not linked to redesignation. This eliminates the need for the EPA approval of the program elements prior to redesignation. However, Michigan has submitted conformity SIPs to the EPA, and has adopted many volatile organic compound (VOC) RACT rules statewide. Michigan also administers a New Source Review permitting program.

## New Source Review

New Source Review permitting for major new and modified sources of ozone precursors in attainment areas is required under Michigan's Prevention of Significant Deterioration (PSD) permit program. PSD program responsibility was delegated to Michigan on September 10, 1979, and amended on November 7, 1983, and September 26, 1988. Permits to install cannot be issued unless the applicant can demonstrate, among other things, that increased emissions from the new or modified source will not result in a violation of the NAAQS. Included in the Michigan SIP are Rule 702, which requires the installation of Best Available Control Technology (BACT) regardless of size or location of all new and modified sources of VOC in the state, and Rule 207, which requires denial of any permit to install if operation of the equipment will interfere with attainment or maintenance of the NAAQS.

Conformity

Section 176(c) of the CAA requires states to establish criteria and procedures to ensure that federally supported or funded projects conform to the air quality planning goals in the SIP. The requirement to determine conformity applies to transportation plans, programs and projects developed, funded, or approved under title 23 of the United States Code and the Federal Transit Act (transportation conformity), as well as to all other federally supported or funded projects (general conformity). In Michigan, air quality transportation conformity is enforced through the process provided under Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. On June 15, 2005, the MDEQ submitted a revision of the Michigan SIP to the EPA based on an amendment to the federal Transportation Conformity Rule, issued July 1, 2004, to include criteria and procedures for the 8-hour Ozone NAAQS. Michigan's general conformity procedures submitted pursuant to 40 CFR part 51, subpart W, were approved in FR 61-66607.

RACT measures

The MDEQ has adopted statewide RACT regulations for major sources (100 tons/year) of VOC emissions for the following industrial point source categories:

- Gasoline Loadings Terminals
- Gasoline Bulk Plants
- Fixed Roof Petroleum Tanks
- Miscellaneous Refinery Sources (Vacuum Producing Systems, Wastewater Separators, and Process Unit Turnarounds)
- Cutback Asphalt
- Solvent Metal Cleaning
- Can Coating
- Metal Coil Coating

- Fabric Coating
- Paper Coating
- Automobile and Light-Duty Truck Coating
- Metal Furniture Coating
- Magnet Wire Coating
- Coating of Large Appliances
- Leaks from Petroleum Refineries
- Miscellaneous Metal Parts
- Flatwood Paneling
- Synthesized Pharmaceutical Products
- External Floating Roof Petroleum Tanks
- Graphic Arts
- Perchloroethylene Dry Cleaning
- Gasoline Tank Trucks and Vapor Collection System Leaks
- Large Petroleum Dry Cleaners
- Stage 1 Vapor Recovery in Urbanized Areas

The MDEQ adopted additional RACT regulations applicable to the former moderate nonattainment areas under the 1-hour ozone NAAQS in Kent and Ottawa Counties, for the following source categories:

- SOCMI and Polymer Manufacturing Equipment Leaks
- Equipment Leaks from Natural Gas/Gasoline Processing Plants
- Resin Manufacturing
- Plastic Parts Coating

## 5. Demonstration of Improvement in Air Quality

Improvement in air quality must be reasonably attributed to emissions reductions of the ozone precursor pollutants NOx and VOC that are permanent and enforceable.

An examination of NOx and VOC emissions from a period of nonattainment (1999) to attainment (2002) indicates a continuous decrease in overall emissions. The source of the emissions data is the EPA final 1999 National Emissions Inventory (NEI) and the final 2002 NEI (published in February 2006). The 1999 and 2002 NEI estimates of non-road emissions differ greatly. These differences are the result of using different versions of the EPA NON-ROAD model. To provide consistency, the non-road source emissions for 1999 and 2002 were rerun using the latest version of NMIM (downloaded from the EPA in February 2006). Specific details regarding this data are included in Appendix A.

Table 5.1 identifies emission reductions by source category for the subject counties. Both VOC and NOx emissions decrease from 1999 to 2002 for most counties. Some individual counties show an increase in one pollutant, but there is an overall decrease in emissions of both VOC and NOx when the entire nonattainment area emissions are totaled. From 1999 to 2002, in the Lansing nonattainment area (Ingham, Clinton, and Eaton Counties) NOx emissions decreased 1,157 tons per year and VOC emissions decreased 5,985 tons. In the Grand Rapids nonattainment area (Kent and Ottawa Counties) NOx emissions decreased 20,276 tons per year, and VOC emissions decreased 9,949 tons. In the Kalamazoo nonattainment area (Kalamazoo, Calhoun, and Van Buren Counties) NOx emissions decreased 1,964 tons and VOC emissions decreased 3,661 tons.

## Table 5.1 Emission Reduction Demonstration Inventories

## 1999 and 2002

*All units are in tons per year*

### Lansing Area – Ingham, Eaton, and Clinton Counties

#### Ingham

| | | NOX | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 6133 | 1293 | 8360 | 1520 | 17306 |
| 2002 | 6150 | 1043 | 7892 | 1509 | 16594 |

| | | VOC | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 1668 | 6706 | 6218 | 1558 | 16150 |
| 2002 | 2092 | 3879 | 4678 | 1541 | 12190 |

#### Eaton

| | | NOX | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 2583 | 356 | 3921 | 876 | 7736 |
| 2002 | 1919 | 416 | 3670 | 847 | 6852 |

| | | VOC | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 99 | 3348 | 2335 | 796 | 6578 |
| 2002 | 56 | 2205 | 2052 | 779 | 5092 |

### Clinton

| | | NOX | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 117 | 213 | 3035 | 783 | 4148 |
| 2002 | 168 | 232 | 3432 | 755 | 4587 |

| | | VOC | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 188 | 2421 | 1638 | 879 | 5126 |
| 2002 | 197 | 1645 | 1870 | 875 | 4587 |

## Grand Rapids Area – Kent and Ottawa Counties

### Kent

| | | NOX | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 1134 | 3122 | 15939 | 4938 | 25133 |
| 2002 | 769 | 2862 | 17229 | 4932 | 25792 |

| | | VOC | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 4506 | 18002 | 12225 | 5063 | 39796 |
| 2002 | 2104 | 14546 | 10392 | 4956 | 31998 |

### Ottawa

| | | NOX | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 37001 | 1132 | 7774 | 2642 | 48549 |
| 2002 | 17690 | 1216 | 6079 | 2629 | 27614 |

| | | VOC | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 1640 | 7279 | 5071 | 2598 | 16588 |
| 2002 | 1375 | 6896 | 3603 | 2563 | 14437 |

## Kalamazoo Area – Kalamazoo, Calhoun, and Van Buren Counties

### Kalamazoo

| | | NOX | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 2202 | 944 | 7489 | 1640 | 12275 |
| 2002 | 816 | 1033 | 7958 | 1620 | 11427 |

| | | VOC | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 547 | 7709 | 5410 | 1986 | 15652 |
| 2002 | 470 | 8739 | 4796 | 1907 | 15912 |

### Calhoun

| | | NOX | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 1036 | 649 | 5702 | 982 | 8369 |
| 2002 | 817 | 666 | 5560 | 973 | 8016 |

| | | VOC | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 499 | 5077 | 3633 | 1026 | 10235 |
| 2002 | 580 | 3071 | 3158 | 1007 | 7816 |

### Van Buren

| | | NOX | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 42 | 423 | 3582 | 543 | 4590 |
| 2002 | 36 | 303 | 2953 | 535 | 3827 |

| | | VOC | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 32 | 3699 | 1777 | 1105 | 6613 |
| 2002 | 22 | 2373 | 1583 | 1133 | 5111 |

## Benzie Area

### Benzie

| | | NOX | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 4 | 78 | 595 | 186 | 863 |
| 2002 | 7 | 73 | 584 | 182 | 846 |

| | | VOC | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 3 | 1005 | 314 | 1536 | 2858 |
| 2002 | 1 | 783 | 323 | 1643 | 2750 |

## Mason Area

### Mason

| | | NOX | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 587 | 157 | 895 | 288 | 1927 |
| 2002 | 280 | 147 | 758 | 287 | 1472 |

| | | VOC | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 174 | 1551 | 536 | 1382 | 3643 |
| 2002 | 108 | 1021 | 435 | 1532 | 3096 |

## Huron Area

### Huron

| | | NOX | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 1282 | 300 | 1245 | 1040 | 3867 |
| 2002 | 1468 | 174 | 908 | 1018 | 3568 |

| | | VOC | | | |
|---|---|---|---|---|---|
| | Point Total | Area Total | Onroad | Nonroad | Total |
| 1999 | 36 | 2222 | 660 | 1428 | 4346 |
| 2002 | 76 | 1008 | 509 | 1452 | 3045 |

Reductions in emissions between 1999 and 2002, as well as in the time period between 2001 and 2003, the years upon which the nonattainment designations were based, and 2002-2004, the years in which ozone attainment was demonstrated can be attributed to state, regional and federal emissions control programs. The Federal Motor Vehicle Control Program has produced significant emission reductions from on-road and non-road motor vehicles throughout the country. The National Low Emission Vehicle (NLEV) program was phased-in for passenger cars during 1999-2001. NLEV vehicles are 70 percent cleaner than “Tier 1” (the previous level of emission control) vehicles with reductions in VOCs, NOx, and toxics. Phase-in of federal “Tier 2” standards began in 2004. Light-duty passenger vehicles standards, including sport utility vehicles, minivans, and pickup trucks, gasoline sulfur content regulations, non-road diesel engine standards, and heavy-duty diesel vehicles standards all contributed to a reduction in emissions of NOx and hydrocarbons in the 11 counties, as well as in upwind areas contributing to the ozone levels in these counties.

The federal Acid Rain Program and federal NOx SIP Call requirements resulted in significant reductions in NOx emissions from stationary sources in Michigan. Electric generating units located in Michigan and subject to the federal Acid Rain Program emitted 62,728.5 tons of NOx in 2002, and 32,493.9 tons of NOx in 2004. The federal NOx SIP Call resulted in the adoption of state rules to further limit NOx emissions in Michigan and in some upwind states. The May 31, 2004, compliance date for the NOx SIP Call assures that many regional NOx emissions reductions occurred during the applicable time period. Upwind ozone nonattainment areas in the Lake Michigan region, including Chicago, Illinois; Gary, Indiana; and Milwaukee, Wisconsin, have continued to reduce emissions of NOx and VOCs in keeping with Rate of Progress obligations under the CAA for the 1-hour ozone NAAQS.  Upwind reductions in emissions of VOCs and NOx have resulted in lower concentrations of transported ozone arriving onshore in West Michigan counties.  Reductions that have occurred due to these programs are permanent and enforceable.

## 6. Maintaining Ozone Attainment into the Future

A maintenance plan must demonstrate continued attainment for at least ten years after approval of redesignation. Section 175A of the CAA sets forth the elements of a maintenance plan for areas seeking redesignation from nonattainment to attainment. Eight years after the redesignation, a revised maintenance plan demonstrating that attainment will continue to be maintained for the next ten years must be submitted to the EPA. To address the possibility of future NAAQS violations, the maintenance plan must contain contingency measures to assure prompt correction of any future ozone NAAQS violation.

Future attainment is demonstrated through emission inventory projections. This demonstration includes an actual attainment year inventory for 2002, a projected interim year inventory for 2009, and a projected maintenance inventory for 2018. The future year inventories of VOC and NOx emissions are shown to remain below attainment year 2002 emissions levels to assure that local contribution to ozone formation will not exceed current levels. The inventory emissions totals are provided in Table 6.1. The numbers in bold have changed from the version of this table that went out to public hearing. The changes are the result of comments received during the public comment period and corrections made to the LADCO regional modeling inventory.

**Table 6.1 Maintenance Plan Emission Inventories**
**2002 - 2009 - 2018**
*All units are in tons per day*

## Lansing Area – Ingham, Eaton, and Clinton Counties

### Ingham

NOX

| | Point non-EGU | Point EGU | Point Total | Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 4.35 | 14.79 | 19.14 | 1.23 | 22.96 | 6.16 | 49.49 |
| 2009 | 2.67 | 8.66 | 11.33 | 1.29 | 15.34 | **4.42** | **32.38** |
| 2018 | 2.69 | 11.10 | 13.79 | 1.33 | 4.84 | **2.45** | **22.41** |
| Safety Margin | | | | | | | **27.08** |

VOC

| | Point non-EGU | Point EGU | Point Total | Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 7.43 | 0.12 | 7.55 | 13.69 | 13.90 | 4.29 | 39.43 |
| 2009 | 5.71 | 0.12 | 5.83 | 13.32 | 8.30 | **2.80** | **30.25** |
| 2018 | 6.39 | 0.12 | 6.51 | 13.71 | 4.43 | **2.38** | **27.03** |
| Safety Margin | | | | | | | **12.40** |

### Eaton

NOX

| | Point non-EGU | Point EGU | Point Total | Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.11 | 6.40 | 6.51 | 0.45 | 11.86 | 3.30 | 22.12 |
| 2009 | 0.09 | 6.22 | 6.31 | 0.47 | 7.88 | **2.16** | **16.82** |
| 2018 | 0.09 | 7.42 | 7.51 | 0.49 | 2.39 | **1.43** | **11.82** |
| Safety Margin | | | | | | | **10.30** |

VOC

| | Point non-EGU | Point EGU | Point Total | Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.17 | 0.04 | 0.21 | 5.04 | 6.48 | 1.80 | 13.53 |
| 2009 | 0.17 | 0.05 | 0.22 | 5.03 | 3.90 | **1.37** | **10.52** |
| 2018 | 0.19 | 0.05 | 0.24 | 5.27 | 1.97 | **1.06** | **8.54** |
| Safety Margin | | | | | | | **4.99** |

**Clinton**

| | Point non-EGU | Point EGU | Point Total | NOX<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.56 | 0.00 | 0.56 | 0.24 | 11.91 | 2.84 | 15.55 |
| 2009 | 0.52 | 0.00 | 0.52 | 0.26 | 7.91 | **2.39** | **11.08** |
| 2018 | 0.55 | 0.00 | 0.55 | 0.26 | 2.46 | **1.46** | **4.73** |
| Safety Margin | | | | | | | **10.82** |

| | Point non-EGU | Point EGU | Point Total | VOC<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.66 | 0.00 | 0.66 | 3.01 | 6.10 | 2.24 | 12.01 |
| 2009 | 0.65 | 0.00 | 0.65 | 2.99 | 3.68 | 1.82 | 9.14 |
| 2018 | 0.74 | 0.00 | 0.74 | 3.08 | 1.97 | 1.44 | 7.23 |
| Safety Margin | | | | | | | 4.78 |

## Grand Rapids Area – Kent and Ottawa Counties

**Kent**

| | Point non-EGU | Point EGU | Point Total | NOX<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 1.76 | 0.40 | 2.16 | 3.61 | 46.94 | 14.26 | 66.97 |
| 2009 | 1.87 | 0.01 | 1.88 | 3.79 | 32.17 | **10.32** | **48.16** |
| 2018 | 2.08 | 0.02 | 2.10 | 3.94 | 10.19 | **5.56** | **21.79** |
| Safety Margin | | | | | | | **45.18** |

| | Point non-EGU | Point EGU | Point Total | VOC<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 7.66 | 0.01 | 7.67 | 28.73 | 31.13 | 12.42 | 79.95 |
| 2009 | 7.70 | 0.00 | 7.70 | 28.81 | 18.81 | **8.34** | **63.66** |
| 2018 | 9.46 | 0.00 | 9.46 | **30.63** | 9.85 | **6.92** | **56.86** |
| Safety Margin | | | | | | | **23.09** |

**Ottawa**

| | Point non-EGU | Point EGU | Point Total | NOX<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.85 | 51.23 | 52.08 | 1.51 | 18.00 | 7.96 | 79.55 |
| 2009 | 0.80 | **18.93** | **19.73** | 1.58 | 12.21 | **6.05** | **39.57** |
| 2018 | 0.84 | **21.45** | **22.29** | 1.65 | 4.19 | **3.83** | **31.96** |
| Safety Margin | | | | | | | **47.59** |

| | Point non-EGU | Point EGU | Point Total | VOC<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 4.23 | 0.51 | 4.74 | 12.18 | 10.82 | 5.32 | 33.06 |
| 2009 | 4.32 | **0.48** | **4.80** | **12.47** | 6.58 | **3.69** | **27.54** |
| 2018 | 5.34 | **0.55** | **5.89** | 13.35 | 3.54 | **3.03** | **25.81** |
| Safety Margin | | | | | | | **7.25** |

## Kalamazoo Area – Kalamazoo, Calhoun, and Van Buren Counties

**Kalamazoo**

| | Point non-EGU | Point EGU | Point Total | NOX<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 2.08 | 0.01 | 2.09 | 1.19 | 22.52 | 6.97 | 32.77 |
| 2009 | 2.07 | 0.00 | 2.07 | 1.25 | 15.15 | **4.61** | **23.08** |
| 2018 | 2.15 | 0.02 | 2.17 | 1.30 | 4.75 | **2.66** | **10.88** |
| Safety Margin | | | | | | | **21.89** |
| | | | | | | | |

| | Point non-EGU | Point EGU | Point Total | VOC<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 1.58 | 0.00 | 1.58 | 12.46 | 14.29 | 4.89 | 33.22 |
| 2009 | 1.69 | 0.00 | 1.69 | 12.49 | 8.53 | **3.25** | **25.96** |
| 2018 | 1.98 | 0.00 | 1.98 | 13.20 | 4.28 | **2.74** | **22.20** |
| Safety Margin | | | | | | | **11.02** |

**Calhoun**

| | Point non-EGU | Point EGU | Point Total | NOX<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 2.29 | 0.12 | 2.41 | 0.75 | 17.83 | 4.49 | 25.48 |
| 2009 | 2.29 | 0.00 | 2.29 | 0.79 | 11.77 | **2.88** | **17.73** |
| 2018 | 2.39 | 0.02 | 2.41 | 0.82 | 3.82 | **1.72** | **8.77** |
| Safety Margin | | | | | | | **16.71** |

| | Point non-EGU | Point EGU | Point Total | VOC<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 1.66 | 0.01 | 1.67 | 7.66 | 9.76 | 2.62 | 21.71 |
| 2009 | 1.54 | 0.00 | 1.54 | 7.49 | 5.85 | **1.96** | **16.84** |
| 2018 | 1.95 | 0.00 | 1.95 | 7.78 | 3.09 | **1.51** | **14.33** |
| Safety Margin | | | | | | | **7.38** |

**Van Buren**

| | Point non-EGU | Point EGU | Point Total | NOX<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.17 | 0.00 | 0.17 | 0.31 | 11.16 | 1.80 | 13.44 |
| 2009 | 0.16 | 0.00 | 0.16 | 0.33 | 7.32 | **1.35** | **9.16** |
| 2018 | 0.17 | 0.00 | 0.17 | 0.34 | 2.18 | **0.90** | **3.59** |
| Safety Margin | | | | | | | **9.85** |

| | Point non-EGU | Point EGU | Point Total | VOC<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.09 | 0.00 | 0.09 | 4.16 | 5.17 | 2.87 | 12.29 |
| 2009 | 0.11 | 0.00 | 0.11 | **4.03** | 3.15 | **2.72** | **10.01** |
| 2018 | 0.13 | 0.00 | 0.13 | 4.14 | 1.68 | **1.83** | **7.78** |
| Safety Margin | | | | | | | **4.51** |

## Benzie Area

### Benzie

| | Point non-EGU | Point EGU | Point Total | NOX<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.03 | 0.00 | 0.03 | 0.06 | 2.10 | 0.61 | 2.80 |
| 2009 | 0.03 | 0.00 | 0.03 | 0.07 | 1.40 | **0.55** | **2.05** |
| 2018 | 0.03 | 0.00 | 0.03 | 0.07 | 0.37 | **0.53** | **1.00** |
| Safety Margin | | | | | | | **1.80** |

| | Point non-EGU | Point EGU | Point Total | VOC<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.01 | 0.00 | 0.01 | 1.54 | 1.08 | 4.05 | 6.68 |
| 2009 | 0.01 | 0.00 | 0.01 | 1.42 | 0.65 | 4.31 | 6.39 |
| 2018 | 0.01 | 0.00 | 0.01 | 1.37 | 0.31 | **2.85** | **4.54** |
| Safety Margin | | | | | | | **2.14** |

## Mason Area

### Mason

| | Point non-EGU | Point EGU | Point Total | NOX<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.30 | 0.49 | 0.79 | 0.16 | 2.48 | 1.97 | 5.40 |
| 2009 | 0.32 | 0.03 | 0.35 | 0.17 | 1.66 | **1.68** | **3.86** |
| 2018 | 0.35 | 0.10 | 0.45 | 0.17 | 0.51 | **1.52** | **2.65** |
| Safety Margin | | | | | | | **2.75** |

| | Point non-EGU | Point EGU | Point Total | VOC<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.39 | 0.00 | 0.39 | 1.89 | 1.39 | 2.88 | 6.55 |
| 2009 | 0.49 | 0.00 | 0.49 | 1.86 | 0.83 | 3.03 | 6.21 |
| 2018 | 0.64 | 0.00 | 0.65 | 1.92 | 0.43 | 2.02 | 5.02 |
| Safety Margin | | | | | | | 1.53 |

**Huron Area**

**Huron**

| | Point non-EGU | Point EGU | Point Total | NOX<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.21 | 5.95 | 6.16 | 0.20 | 3.31 | 5.73 | 15.40 |
| 2009 | 0.21 | 1.18 | 1.39 | 0.21 | 2.21 | **5.95** | **9.76** |
| 2018 | 0.24 | 1.45 | 1.69 | 0.22 | **0.65** | **5.20** | **7.76** |
| Safety Margin | | | | | | | **7.64** |

| | Point non-EGU | Point EGU | Point Total | VOC<br>Area Total | Onroad | Nonroad | Total |
|---|---|---|---|---|---|---|---|
| 2002 | 0.25 | 0.02 | 0.27 | 2.18 | 1.68 | 3.29 | 7.42 |
| 2009 | 0.24 | 0.05 | 0.29 | 2.13 | 1.01 | 3.27 | 6.70 |
| 2018 | 0.27 | 0.06 | 0.33 | 2.19 | 0.55 | **2.39** | **5.46** |
| Safety Margin | | | | | | | **1.99** |

A comprehensive baseline emissions inventory was prepared by the MDEQ and includes area, mobile, and point sources of VOC and NOx for the year 2002, as required by the EPA Consolidated Emissions Reporting Rule (40 CFR Part 51). Full documentation of methodologies and models used to derive emission inventories is contained in Appendix A.

The 2009 projected interim year inventory was prepared by LADCO as part of the regional planning effort for ozone, PM 2.5, and regional haze. The 2018 projected maintenance inventory was also prepared by LADCO, with the exception of the on-road mobile inventories that were projected by MDOT. Although significant emission reductions are projected to occur throughout the maintenance period, it must be stressed that many of the counties in West Michigan are so overwhelmingly impacted by transported ozone that continued attainment is significantly dependent on the decrease in emissions in the Lake Michigan upwind areas.

<u>Maintenance Commitments</u>

Michigan will develop and submit to the EPA no later than eight years after approval of this redesignation request a new maintenance plan covering the next ten-year period.

The MDEQ will continue to track ozone levels through the operation of an EPA-approved monitoring network as necessary to demonstrate on-going compliance with the NAAQS. Data will be entered into the AQS on a timely basis in accordance with federal regulations. The MDEQ will continue to produce periodic emission inventories as required by the Federal Consolidated Emissions Reporting Rule, (40 CFR Part 51) to track levels of emissions in the future. The control measures for VOC and NOx emissions that were contained in the SIP before redesignation of these areas to attainment shall be retained, as required by Section 175(A) of the CAA.

Michigan will expeditiously enact legal authorities needed for additional contingency control measures, and/or studies of conditions resulting in unexpected ozone increases in response to identified triggering events.

<u>Action Level Response</u>

An Action Level Response will be prompted when a two-year average fourth high monitored value of 85 ppb occurs within a maintenance area. If this response is triggered, a review of circumstances leading to the high monitored values will be conducted. The MDEQ will explore whether a special event, malfunction, or noncompliance with permit conditions resulted in high ozone levels in order to immediately address needed corrective measures. The MDEQ will also review meteorological conditions during high ozone episodes. This review will be conducted within six months following the close of the ozone season. If the MDEQ determines that contingency measure implementation is necessary to prevent a future violation, the MDEQ will select and implement a measure that can be implemented promptly.

Contingency Measure Response

If a violation of the ozone NAAQS occurs, Michigan will select one or more control measures from the following list of potential contingency measures options for implementation. The timing for implementation of a contingency measure is dependent on the process needed for legal adoption and source compliance which varies for each measure. Some potential measures/ controls have already been promulgated and are scheduled to be implemented at the federal or state levels. Other measures will need state administrative rule-making or legislative approval. The MDEQ will seek to expedite the process of securing enabling authority and implementing the selected measures as needed to reduce ozone levels measured at air quality monitors in the maintenance areas, with a goal of having measures in place as expeditiously as practicable and within 18 months. Opportunity for public participation in the contingency measure response will be provided.

List of Potential Contingency Measures

Michigan will select one or more measures for implementation in the event that a Contingency Level Response has been triggered.

1. Lower Reid Vapor Pressure gasoline program.
2. Reduced VOC content in Architectural, Industrial, and Maintenance (AIM) coatings rule.
3. Auto body refinisher self-certification audit program.
4. Reduced VOC degreasing rule.
5. Transit improvements.
6. Diesel retrofit program.
7. Reduced VOC content in commercial and consumer products.
8. Clean Air Interstate Rule reductions.
9. Tier II reductions including low sulfur fuel, and vehicle standards.
10. Reduce idling program.

## 7. Transportation Conformity Budgets

Transportation conformity is required by section 176(c) of the CAA. The EPA's conformity rule requires that transportation plans, programs, and projects conform to SIPs and establishes the criteria and procedures for determining whether or not they do. Conformity to a SIP means that transportation activities will not produce new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS.

Estimates of on-road motor vehicle emissions are projected for the maintenance period, which must be at least ten years, to assess emission trends, and to ensure continued compliance with the ozone NAAQS. On-road emissions include those from cars, buses, and trucks driven on public roadways. These estimates are considered a ceiling or "budget" for emissions and are used to determine whether transportation plans and projects conform to the SIP. Estimated on-road mobile emissions of VOC and NOx must not exceed the emission budgets contained in the maintenance plan. The emissions estimates for this sector reflect appropriate and up-to-date assumptions about vehicle miles traveled, socio-economic variables, fuels used, weather inputs, and other planning assumptions.

A safety margin is the difference between the level of emissions in a year used to determine attainment of the NAAQS (from all sources) and the projected level of emissions (from all sources) in the maintenance plan. In this maintenance plan, the safety margin is the difference in total emissions between the years 2002 and 2018. The maintenance plan is designed to provide for future growth while still maintaining the ozone NAAQS. The conformity budgets for each maintenance area are being allocated 90 percent of the safety margin for VOC and NOx emissions. Transportation emission budgets for conformity are provided in Table 7.1.

**Table 7.1 Transportation Conformity Budgets**
*In Tons per Day*

| Maintenance Area | VOC | NOx |
|---|---|---|
| **Lansing**<br>Ingham, Eaton, Clinton | **62.75** | **82.34** |
| **Grand Rapids**<br>Kent, Ottawa | **109.98** | **137.24** |
| **Kalamazoo**<br>Kalamazoo, Calhoun, Van Buren | **64.93** | **66.85** |
| **Benzie** | **6.47** | **2.62** |
| **Mason** | **6.40** | **5.13** |
| **Huron** | **7.25** | **14.64** |

<u>Request for a Finding of "Insignificance" for Huron, Benzie, and Mason</u>

The MDEQ is requesting that the EPA make a finding of "insignificant motor vehicle emissions," as provided by the Transportation Conformity Rule, Section 108(k), for Huron, Benzie, and Mason Counties for ozone. Such a finding would suspend the requirement that these counties satisfy a regional emissions analysis for transportation conformity. The MDEQ asserts that it is an unreasonable expectation that these counties would experience enough motor vehicle emissions growth in VOCs and NOx to cause a NAAQS violation to occur. The ozone levels measured in these counties have historically reflected an overwhelming amount of ozone transport rather than locally generated ozone precursors.

On-road mobile emissions totals in each of these counties were very low in the 2002 base year and are projected by Mobile 6.2 to be significantly lower in future year inventories as shown in Table 7.2. Total populations and projected future populations in the counties of Huron, Benzie, and Mason are shown in Table 7.3.

**Table 7.2 On-road Mobile Emissions**
(As reflected in the Maintenance Plan Inventories)
*In Tons per Day*

| County | 2002 VOC | 2018 VOC | 2002 NOx | 2018 NOx |
|---|---|---|---|---|
| Benzie | 0.92 | 0.31 | 1.77 | 0.37 |
| Huron | 1.43 | 0.55 | 2.76 | 0.65 |
| Mason | 1.18 | 0.43 | 2.12 | 0.51 |

**Table 7.3**
**Population Projections**

| County | 1990 Census | 2000 Census | Estimated 2002 * | Estimated 2015 * |
|---|---|---|---|---|
| Benzie | 12,200 | 15,998 | 16,818 | 16,900 |
| Huron | 34,951 | 36,079 | 35,422 | 34,200 |
| Mason | 25,537 | 28,274 | 28,879 | 28,100 |

*U.S. Census Bureau, County Population Estimates: April 1, 2000 to July 1, 2002. Release Date: April 17, 2003.
Estimates were prepared by the Census Bureau through the Federal-State Cooperative Program for Population Estimates (FSCPE).

## 8. Public Hearing and Comments

In accordance with Section 110(a) (2) of the CAA, public participation in the SIP process is provided for as follows:

Notice of availability of the ozone redesignation documents and notice of the public hearing and comment period was published in the Grand Rapids Press, Huron Daily Tribune, Lansing State Journal, and Traverse City Record-Eagle on March 17, 2006. Notice has also been posted on the MDEQ web pages at http://www.Michigan.gov/deqair. A notice of the public hearing and comment period was sent to the EPA.

A public hearing on the redesignation request and maintenance plan SIP revision was held on April 18, 2006, at 525 W. Allegan, Lansing, MI, Constitution Hall.

A summary of comments received and the MDEQ responses is included in Appendix B of the submittal to the EPA.

# Appendix A

## OZONE REDESIGNATION EMISSIONS INVENTORY SUPPORT DOCUMENTATION

## For

## Ingham, Eaton, Clinton, Kent, Ottawa, Kalamazoo, Calhoun, Van Buren, Benzie, Mason, and Huron Counties, Michigan

Michigan Department of Environmental Quality
Air Quality Division

March 2006

# Emission Reduction Demonstration Inventories

An examination of NOx and VOC emissions from a period of nonattainment (1999) to attainment (2002) indicates a continuous decrease in overall emissions. The source of the emissions data is the EPA final 1999 National Emissions Inventory (NEI) and the final 2002 NEI (as posted by the EPA in February 2006). The 1999 and 2002 NEI estimates of non-road emissions differ greatly. These differences are the result of using different versions of the EPA NON-ROAD model. To provide consistency, the non-road source emissions for 1999 and 2002 were re-run using the latest version of NMIM (downloaded from the EPA in February 2006). Since these inventories do not contain emissions in tons per summer weekday for all categories, the comparison in tons per year was made.

### Emissions for 1999 and 2002 in Tons per Year

| NOX | | Point | | Area | | Onroad | | Nonroad | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| County | poll | 99 tons | 02 tons | 99 tons | 02 tons | 99 tons | 02 tons | 99 tons | 02 tons | 99 tons | 02 tons |
| Benzie | NOX | 4 | 7 | 78 | 73 | 595 | 584 | 186 | 182 | 863 | 846 |
| Kent | NOX | 1134 | 769 | 3122 | 2862 | 15939 | 17229 | 4938 | 4932 | 25133 | 25792 |
| Ottawa | NOX | 37001 | 17690 | 1132 | 1216 | 7774 | 6079 | 2642 | 2629 | 48549 | 27614 |
| Huron | NOX | 1282 | 1468 | 300 | 174 | 1245 | 908 | 1040 | 1018 | 3867 | 3568 |
| Calhoun | NOX | 1036 | 817 | 649 | 666 | 5702 | 5560 | 982 | 973 | 8369 | 8016 |
| Kalamazoo | NOX | 2202 | 816 | 944 | 1033 | 7489 | 7958 | 1640 | 1620 | 12275 | 11427 |
| Van Buren | NOX | 42 | 36 | 423 | 303 | 3582 | 2953 | 543 | 535 | 4590 | 3827 |
| Clinton | NOX | 117 | 168 | 213 | 232 | 3035 | 3432 | 783 | 755 | 4148 | 4587 |
| Eaton | NOX | 2583 | 1919 | 356 | 416 | 3921 | 3670 | 876 | 847 | 7736 | 6852 |
| Ingham | NOX | 6133 | 6150 | 1293 | 1043 | 8360 | 7892 | 1520 | 1509 | 17306 | 16594 |
| Mason | NOX | 587 | 280 | 157 | 147 | 895 | 758 | 288 | 287 | 1927 | 1472 |

| VOC | | Point | | Area | | Onroad | | Nonroad | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| County | poll | 99 tons | 02 tons | 99 tons | 02 tons | 99 tons | 02 tons | 99 tons | 02 tons | 99 tons | 02 tons |
| Benzie | VOC | 3 | 1 | 1005 | 783 | 314 | 323 | 1536 | 1643 | 2858 | 2750 |
| Kent | VOC | 4506 | 2104 | 18002 | 14546 | 12225 | 10392 | 5063 | 4956 | 39796 | 31998 |
| Ottawa | VOC | 1640 | 1375 | 7279 | 6896 | 5071 | 3603 | 2598 | 2563 | 16588 | 14437 |
| Huron | VOC | 36 | 76 | 2222 | 1008 | 660 | 509 | 1428 | 1452 | 4346 | 3045 |
| Calhoun | VOC | 499 | 580 | 5077 | 3071 | 3633 | 3158 | 1026 | 1007 | 10235 | 7816 |
| Kalamazoo | VOC | 547 | 470 | 7709 | 8739 | 5410 | 4796 | 1986 | 1907 | 15652 | 15912 |
| Van Buren | VOC | 32 | 22 | 3699 | 2373 | 1777 | 1583 | 1105 | 1133 | 6613 | 5111 |
| Clinton | VOC | 188 | 197 | 2421 | 1645 | 1638 | 1870 | 879 | 875 | 5126 | 4587 |
| Eaton | VOC | 99 | 56 | 3348 | 2205 | 2335 | 2052 | 796 | 779 | 6578 | 5092 |
| Ingham | VOC | 1668 | 2092 | 6706 | 3879 | 6218 | 4678 | 1558 | 1541 | 16150 | 12190 |
| Mason | VOC | 174 | 108 | 1551 | 1021 | 536 | 435 | 1382 | 1532 | 3643 | 3096 |

**1999 On-road**

Summary – The EPA 1999 version 3 annual records aggregated on county/pollutant.

Details - Beginning with the EPA's version 3 1999 inventory (downloaded file 99V3onroadascii.zip) Michigan's records were selected from emonroad.txt file into emonroadmi.txt, and "|"-separated into emonroadmi.txt.sep via script orem_sep_99EPA.pl. This was loaded via script load1999EPAorem.sql into postgres table orem99. 99V3_draft2002.mdb Access database was linked via ODBC to table public_orem99 and created table, 99ORannNOXVOC via Access query 99ORannNOXVOCmakerQ of annual, full-period (type 30) emission records for NOX and VOC aggregated to the county level.

**1999 Non-road**

The 1999 and 2002 NEI estimates of non-road emissions differ greatly. These differences are the result of using different versions of the EPA NON-ROAD model. To provide consistency, the non-road source emissions for 1999 and 2002 were re-run using the latest version of NMIM (downloaded from the EPA in February 2006). The model defaults were used.

**1999 Non-Point**

Summary – The EPA 1999 version 3 annual records were aggregated on county/pollutant.

Details- Beginning with the EPA's version 3 1999 inventory (downloaded file 99V3areaascii.zip.) Michigan's records were selected from emarea.txt file into emareami.txt and "|", separated into emnonroadmi.txt.sep via script arem_sep_99EPA.pl, and loaded via script load1999EPAnrem.sql into postgres table arem99. 99V3_draft2002.mdb Access database was linked via ODBC to table public_arem99 and created table 99ARannNOXVOC via Access query 99ARannNOXVOCmakerQ of annual, full-period (type 30) emission records for NOX and VOC aggregated to the county level.

**1999 Point**

Summary – The EPA 1999 version 3 annual records were aggregated on county/pollutant.

Details - Beginning with the EPA's version 3 1999 inventory (downloaded file 99V3pointascii032004.zip.) Michigan's records were selected from empoint.txt file into empointmi.txt and"|", separated into empointmi.txt.sep via the script ptem_sep_99EPA.pl. and loaded t via script load1999EPApt.sql into PostgreSQL. 99V3_draft2002.mdb Access database was linked via ODBC to table public_arem99 and created table 99PTannNOXVOC via Access query 99PTannNOXVOCmakerQ of annual, full-period (type 30) emission records for NOX and VOC aggregated to the county level.

**2002 On-road**

Summary – Feb 2006 final EPA 2002 annual records aggregated on county/pollutant.

Details - Beginning with files extracted from EPA's final 2002 inventory (downloaded file nei2002_mobile_onroad_detailed_data_022306.zip ), Michigan's records were selected from emonroad.txt file into emonroadmi.txt, and "|"-separated into emonroadmi.txt.sep via script orem_sep_02EPA.pl., and loaded via script load2002EPAorem.sql into postgres table orem02. 99V3_draft2002.mdb Access database was linked via ODBC to table public_orem02 and created table 02ORannNOXVOC via Access query 02ORannNOXVOCmakerQ of annual, full-period (type 30) emission records for NOX and VOC aggregated to the county level.

**2002 Non-road**

The 1999 and 2002 NEI estimates of non-road emissions differ greatly.  These differences are the result of using different versions of the EPA NON-ROAD model.  To provide consistency, the non-road source emissions for 1999 and 2002 were re-run using the latest version of NMIM (downloaded from the EPA in February 2006).  The model defaults were used.

**2002 Non-Point**

Summary – Feb 2006 final EPA 2002 annual records aggregated on county/pollutant.

Details - Beginning with files extracted from the EPA's final 2002 inventory (downloaded file nei2002_nonpoint_detailed_data.zip), Michigan's records were selected from emarea.txt file into emareami.txt and "|"-separated into emareami.txt.sep via script arem_sep_02EPA.pl.  Loaded that via script load2002EPAarem.sql into postgres table arem02.  Linked 99V3_final2002.mdb Access database via ODBC to table public_arem02 and created table 02ARannNOXVOC via Access query 02ARannNOXVOCmakerQ of annual, full-period (type 30) emission records for NOX and VOC aggregated to the county level.

**2002 Point**

Summary – Feb 2006 final EPA 2002 annual records aggregated on county/pollutant.

Details - Beginning with files extracted from the EPA's final 2002 inventory (downloaded file nei2002_point_detailed_data.zip), Michigan's records were selected from empoint.txt file into empointmi.txt and "|"-separated into empopintmi.txt.sep via script ptem_sep_02EPA.pl.  Loaded that via script load2002EPAarem.sql into PostgreSQL table ptem02.  Linked 99V3_final2002.mdb Access database via ODBC to table public_ptrem02 and created table 02PTannNOXVOC via Access query 02PTannNOXVOCmakerQ of annual, full-period (type 30) emission records for NOX and VOC aggregated to the county level.

**Compilation of data for comparison**

Data was compiled in Access database 99V3_final2002.mdb using query OutputMakerQ into table Output.  Output table was exported as Excel Spreadsheet where data was sorted, and totals were added.

# Maintenance Plan Inventories

Emissions inventory documentation support for the Maintenance Plan emissions inventory provided in the 2006 Ozone Maintenance Plan for the Lansing, Grand Rapids, Kalamazoo, Benzie, Mason, and Huron nonattainment areas is provided below. Except where indicated (e.g. 2018 mobile estimates prepared by MDOT), the summer day emissions described here represent the Midwest Planning Organization's typical summer weekday. The meteorological conditions on July 12, 2002, which occurred during a significant ozone episode, were chosen to represent the typical summer day. Conditions on this day will not only be used for this demonstration, but will be used for comparisons during the development of 8-hour ozone attainment demonstrations throughout the Midwest region. The future year projections take into account existing control measures and measures that are known to be on the way (e.g., CAIR measures). These inventories are taken from the Lake Michigan Air Director's Consortium (LADCO) base K inventories, as posted in January 2006.

## I. EGU Point Sources

The table below summarizes typical ozone season weekday Electric Generating Unit (EGU) point source emissions in the redesignation counties for the years 2002, 2009 and 2018.

DAILY TOTAL VOC (TONS)

| COUNTY | 2002 | 2009 | 2018 |
|---|---|---|---|
| Benzie | 0.00 | 0.00 | 0.00 |
| Kent | 0.01 | 0.00 | 0.00 |
| Ottawa | 0.51 | 0.48 | 0.55 |
| Huron | 0.02 | 0.05 | 0.06 |
| Calhoun | 0.01 | 0.00 | 0.00 |
| Kalamazoo | 0.00 | 0.00 | 0.00 |
| Van Buren | 0.00 | 0.00 | 0.00 |
| Clinton | 0.00 | 0.00 | 0.00 |
| Eaton | 0.04 | 0.05 | 0.05 |
| Ingham | 0.12 | 0.12 | 0.12 |
| Mason | 0.00 | 0.00 | 0.00 |

DAILY TOTAL NOX (TONS)

| COUNTY | 2002 | 2009 | 2018 |
|---|---|---|---|
| Benzie | 0.00 | 0.00 | 0.00 |
| Kent | 0.40 | 0.01 | 0.02 |
| Ottawa | 51.23 | 18.93 | 21.45 |
| Huron | 5.95 | 1.18 | 1.45 |
| Calhoun | 0.12 | 0.00 | 0.02 |
| Kalamazoo | 0.01 | 0.00 | 0.02 |
| Van Buren | 0.00 | 0.00 | 0.00 |
| Clinton | 0.00 | 0.00 | 0.00 |
| Eaton | 6.40 | 6.22 | 7.42 |
| Ingham | 14.79 | 8.66 | 11.10 |
| Mason | 0.49 | 0.03 | 0.10 |

**2002 EGU Point Source Methodologies**

The 2002 EGU point source data has as its origin the dataset generated by the EPA for the 2002 NEI database. The document DOCUMENTATION FOR THE 2002 ELECTRIC GENERATING UNIT (EGU) NATIONAL EMISSIONS INVENTORY (NEI), prepared by: Eastern Research Group, Inc., 1600 Perimeter Park Drive, Morrisville, NC 27560 and E. H. Pechan & Associates, Inc., 5528-B Hempstead Way, Springfield, VA 22151 for: Emission Factor and Inventory Group (D205-01), Emissions, Monitoring and Analysis Division, the EPA, Research Triangle Park, NC 27711, September 2004, describes the methodology used to estimate the emissions for the 2002 NEI EGU Point Sources. Further validation and quality assurance of the EPA 2002 NEI EGU sources was completed using a cross-reference list between the EPA 2002 NEI EGU emission units and ORIS ID Boilers created by E. H. Pechan & Associates for LADCO.

**Growing EGU Point Source Years 2009 and 2018:**

The 2009 and 2018 data is extracted from emissions modeling performed by LADCO. The source scenario is the base K modeling run posted January 2006. The following is an RPO IPM document, which details the methodologies used to project the EGU emissions to 2009 and 2018 in the IPM model:

Inter-RPO IPM Global Parameter Decisions (May 11, 2005):

> The following summarizes the decisions as made by VISTAS, MRPO, CENRAP, and MANE-VU for global assumptions to be used in EGU forecasting with IPM. These decisions and changes are made to IPM version 2.1.9 assumptions, which can be referenced via the EPA's IPM website at:
>
> http://www.epa.gov/airmarkets/epa-ipm/

A. Market Assumptions

1. National Electricity and Peak Demand.
   Decision: Use unadjusted EIA AEO 2005 national electricity and peak demand values.
2. Regional Electricity and Demand Breakout.
   Decision: Use the existing IPM region breakdown as conducted in earlier modeling.
3. Natural Gas Supply Curve and Price Forecast.
   Decision: Take existing supply curves and scale application to EIA AEO 2005 price point. In this approach, the EPA 2.1.9 gas supply curves will be scaled in such a manner that IPM will solve for AEO 2005 gas prices when the power sector gas demand in IPM is consistent with AEO 2005 power sector gas demand projections. In instances where the power sector gas demand in IPM is lower than that of AEO 2005 projections, IPM will project gas prices that are lower than that in AEO 2005 and vice versa.
4. Oil Price Forecast.
   Decision: Use EIA AEO 2005 values.
5. Coal Supply and Price Forecast.
   Decision: Take existing supply curves and scale application to EIA AEO 2005 price points, coal supply regions, and coal grades. In this approach, the coal supply curves used in the EPA 2.1.9 are scaled in such a manner that the average mine mouth coal prices that the IPM is solving in aggregated coal supply regions are comparable to AEO 2005. Due to the fact that the coal grades and supply regions between AEO 2005 and the EPA 2.1.9 are not directly comparable, this is an approximate approach and has to be performed in an iterative fashion. This approach does not involve updating the coal transportation matrix with EIA assumptions due to significant differences between the EPA 2.1.9 and EIA AEO 2005 coal supply and coal demand regions.

B. Technical Assumptions

1. Firmly Planned Capacity Assumptions
   Decision: Use revisions and new data as provided by RPOs and stakeholders.
   Decision: Allow NC Clean Smokestacks 2009 data as provided to define "must run" units.
2. Pollution Control Retrofit Cost and Performance [SO2, NOx, and Hg]
   Decision: Retain pollution control retrofit cost and performance values.
3. New Conventional Capacity cost and performance assumptions.
   Decision: Use EIA AEO 2005 cost and performance assumptions for new conventional capacity.
   Decision: Retain existing 2.1.9 framework cost and performance for new renewable capacity.
   Decision: Exclude constraint on new capacity type builds (i.e., no new coal).
4. SO2 Title IV Allowance Bank.
   Decision: Use existing SO2 allowance bank value (4.99 million tons) for 2007.

5. Nuclear Re-licensing and Uprate.
   Decision: Use existing IPM configuration with updated EIA AEO 2005 (~$27/kW) incurrence cost for continued operation.

C. Strategy Assumptions
1. Clear Air Mercury Rule (CAMR).
   Decision: Include CAMR in future rounds of IPM modeling.
2. Renewable Portfolio Standards.
   Decision: Model RPS based on the most recent RGGI documentation using a single RPS region for MA, RI, NY, NJ, MD and CT. The RPS requirements within these states can be met by renewable generation from New England, New York and PJM. The EPA 2.1.9 methodology and hardwired EIA AEO 2004 projected renewable builds for the remainder of the country.

D. Other Assumptions
1. Run Years
   Decision: Revise runs years to 2008 [2007-08], 2009 [2009], 2012 [2010-13], 2015 [2014-17], 2018 [2018], 2020 [2019-22], and 2026 [2023-2030].
2. Canadian Sources.
   Decision: Utilize existing v.2.1.9 configuration (no Canadian site specific sources).

## II. Non-EGU Point Sources

The table below summarizes typical ozone season weekday non-EGU point source emissions for the redesignation counties for the years 2002, 2009 and 2018.

DAILY TOTAL VOC (TONS)

| COUNTY | 2002 | 2009 | 2018 |
|---|---|---|---|
| Benzie | 0.01 | 0.01 | 0.01 |
| Kent | 7.66 | 7.70 | 9.46 |
| Ottawa | 4.23 | 4.32 | 5.34 |
| Huron | 0.25 | 0.24 | 0.27 |
| Calhoun | 1.66 | 1.54 | 1.95 |
| Kalamazoo | 1.58 | 1.69 | 1.98 |
| Van Buren | 0.09 | 0.11 | 0.13 |
| Clinton | 0.66 | 0.65 | 0.74 |
| Eaton | 0.17 | 0.17 | 0.19 |
| Ingham | 7.43 | 5.71 | 6.39 |
| Mason | 0.39 | 0.49 | 0.64 |

DAILY TOTAL NOX (TONS)

| COUNTY | 2002 | 2009 | 2018 |
|---|---|---|---|
| Benzie | 0.03 | 0.03 | 0.03 |
| Kent | 1.76 | 1.87 | 2.08 |
| Ottawa | 0.85 | 0.80 | 0.84 |
| Huron | 0.21 | 0.21 | 0.24 |
| Calhoun | 2.29 | 2.29 | 2.39 |
| Kalamazoo | 2.08 | 2.07 | 2.15 |
| Van Buren | 0.17 | 0.16 | 0.17 |
| Clinton | 0.56 | 0.52 | 0.55 |
| Eaton | 0.11 | 0.09 | 0.09 |
| Ingham | 4.35 | 2.67 | 2.69 |
| Mason | 0.30 | 0.32 | 0.35 |

**2002 Non-EGU Point Source Methodologies**

The 2002 point source data has as its original source the 2002 Michigan point source emission inventory. The data used was extracted from the dataset generated for the EPA 2002 NEI database. This section of the document describes the compilation and processing of point source emission data submitted to the EPA to comply with the Consolidated Emission Reporting Rule for the EPA NEI 2002 emission inventory.

The data originates with the entry of data by the reporting facilities into the Michigan Air Emissions Reporting System (MAERS). Full discussion of the MAERS system is beyond the scope of this document, but it is worth noting that annually, data is entered into electronic format at the reporting facilities, reviewed, and compiled by MDEQ staff, and exported to the fixed-width text version of the National Inventory Format (NIF), with a couple of added fields for internal use.

The data was loaded into a PostgreSQL database closely resembling the MS Access version of the NIF, and the following processing steps and checks are performed:

Both emissions estimated by default calculations in MAERS and any emissions reported by facility operators are maintained in MAERS. For evaluation and quality assurance purposes, both types of records are included in the exports. To avoid double-counting, where a specific process/pollutant has emission records calculated by the facility operator, as well as estimated by MAERS default calculations, the latter are excluded.

Portable facilities (primarily asphalt plants) report total throughput and emissions for the facility in MAERS. External to MAERS, the facilities report process-level operating percentages for each county in which the portable facility was located during the year. Corresponding record sets are generated for each county of operation, throughput and emissions are apportioned based on the operating percentages reported by county and SCC, and geo-coordinates for the center of the counties of operation are assigned.

As particulate emission quality assurance efforts have focused on PM10-PRI and PM25-PRI, PM-PRI records are excluded.

As over 99.8 percent of total criteria emissions are accounted for by emissions reported by operator, the exported criteria emissions estimated via default calculations are excluded.

In the site table, where strFacilityCategory is null, it is set to "01."

Mandatory geo-coordinate fields were added to the NIF specifications released in December 2003, well after it would have been possible to collect this information from the reporting facilities. The following values were deemed most often representative and the exported data are updated accordingly:

"strHorizontalCollectionMethodCode" is set to '027'
"strHorizontalAccuracyMeasure" is set to '2000'
"strHorizontalReferenceDatumCode" is set to '001'
"strReferencePointCode" is set to '106'

MAERS tracks emissions of interest to the Great Lakes Commission, but are not valid pollutant codes according to the most recent NIF code tables. Emission records for the following pollutant codes are excluded:

7440508
8052413
DICDD,TOT
DICDF,TOT
HYDFLUORO
PERFLUORO
TRICDD,TOTRICDF,TO
CH4
CO2
N20
117840
7783064

Emission records for ammonia are exported with the CAS number 7 664417, rather than the pollutant code NH3. These pollutant codes are updated to NH3.

All criteria and HAP emissions are reported at the process level, and the export routines reflect that in the strEmissionDataLevel field of the emission table. Guidance indicates that this field should be null for criteria pollutants, so the field is set to null for criteria pollutant emission records.

All emissions are exported as pounds of annual emissions. Guidance suggests that criteria pollutant emission be reported in tons. The field strEmissionUnitNumerator is changed to TON and the filed dblEmissionNumericValue is divided by 2000 for criteria pollutant emission records.

Null values in the quarterly throughput fields of process records are set to zero.

Where quarterly throughput fields of process records sum to zero, throughput percentages are set to 25 percent for each quarter.

MAERS recognizes a control device code of '909' for a "Roll Media Fiberglass Tack Filter (Tacky 1 side)," which is not recognized in the NIF code tables. In the one instance where this control device code is exported, the "strPrimaryDeviceTypeCode" field of the control equipment table is updated to a value of 058.

Because of the exclusion of emission records as described above, the referential integrity of the exported data has been compromised. At this point, it is re-established by deleting records stepwise, in the following order.

1. CE records without corresponding EM records
2. PE records without corresponding EM records
3. EP records without corresponding EM records
4. ER records without corresponding EP records
5. EU records without corresponding EP records
6. SI records without corresponding EU records

Summer period records, average summer weekday emission (emission type 27) records, and average summer weekend day emission (emission type 28) records are generated from annual data and merged into the period and emission tables. The throughput for the summer period records is annual throughput multiplied by the summer throughput percentage from the corresponding emitting process record. For summer weekday and weekend day emissions, summer throughput percentage and annual average days per week information from the corresponding emitting process record is applied. Annual emissions are multiplied by the summer throughput percentage, divided by 92 days in the summer period, and multiplied by seven days per week to get average summer week emissions. Average summer weekday and weekend day records are then created for three different situations. Where average annual days per week is five or less; weekday emissions are one fifth of weekly emissions, and weekend day emissions are zero. Where average annual days per week is six; weekday emissions are one sixth of weekly emissions, and weekend day emissions are one twelfth of weekly emissions. Where average annual days per week is seven, both weekday emissions and weekend day emissions are one seventh of weekly emissions.

The data are then checked again for referential integrity and mandatory fields and then loaded into the MS Access shell version of the NIF via append queries that connect to the PostgreSQL data tables via ODBC. The Basic Content and Format Checker is run and its output is reviewed.

There are three basic differences between the MAERS and NEI datasets. The MAERS emissions are annual average, while those for NEI represent both annual average and also have been temporally allocated to best reflect an average ozone season day. The data provided for NEI included emissions from electrical generation utility (EGU) facilities and were replaced by the EPA with emissions reported by the EGU facilities to the EPA's Acid Rain Division, so EGU emissions from MAERS have been temporally allocated according to the same methodology used for the NEI sources, and added into the above total for 2002.

The 2002 point source records were incorporated into the LADCO base K inventory. The emissions presented here are identical to those posted by LADCO in January 1006.

**Growing Stationary Non-EGU Point, Stationary Area, Locomotive, Shipping, and Aircraft Categories to the Years 2009 and 2018:**

The 2009 and 2018 figures are based on work and a follow-up report (E.H. Pechan & Associates, Inc., Development of Growth and Control Factors for Lake Michigan Air Directors Consortium, Final Report, December 14, 2004,) done by E.H. Pechan & Associates, Inc. (Pechan). This work supports LADCO's efforts to forecast anthropogenic emissions for the purpose of assessing progress for air quality goals, including goals related to regional haze and attainment of the ozone national ambient air quality standards (NAAQS). The Pechan growth factors were used to estimate the LADCO base K future year emissions that were posted by LADCO in January 2006. The future year emissions represent emission controls that already exists and those that are known to be on the way (e.g., CAIR control measures).

To assess progress for attaining air quality goals, LADCO requires emission activity growth and control data to forecast emissions from a 2002 base year inventory to several future years of interest. These future years were identified by LADCO as 2007, 2008, 2009, 2012, and 2018 (e.g., 2018 is the first milestone for regional haze reasonable progress demonstrations). Pechan prepared emission control factors to support forecasting for each of these years. Because the incremental level of effort required to develop emission activity growth factors for each year over the 2003-2018 period was nominal, Pechan prepared non-EGU point and area and non-road source growth factors for each year over this entire period.

The report describes Pechan efforts to develop emission growth and control data to support future year air quality modeling by LADCO. The report is organized into a background chapter and:

Chapter II, which describes the development of the emission activity growth data;
Chapter III, which discusses how the emission control data were compiled;
Chapter IV, which describes the preparation of the growth and control factor files;
Chapter V, which identifies projection issues for future consideration; and
Chapter VI, which presents the references consulted in preparing this report.

The Pechan Growth and Control Factor report is too lengthy to be included in this document, but it can be provided upon request or downloaded at:
http://www.ladco.org/reports/rpo/MWRPOprojects/Strategies/Growth&ControlDraftReportOct26-04.pdf

## III. Stationary Area Sources

The table below summarizes typical ozone season weekday stationary area source emissions for the Michigan redesignation counties for the years 2002, 2009, and 2018.

DAILY TOTAL VOC (TONS)

| COUNTY | 2002 | 2009 | 2018 |
|---|---|---|---|
| Benzie | 1.54 | 1.42 | 1.37 |
| Kent | 28.73 | 28.81 | 30.63 |
| Ottawa | 12.18 | 12.47 | 13.35 |
| Huron | 2.18 | 2.13 | 2.19 |
| Calhoun | 7.66 | 7.49 | 7.78 |
| Kalamazoo | 12.46 | 12.49 | 13.20 |
| Van Buren | 4.16 | 4.03 | 4.14 |
| Clinton | 3.01 | 2.99 | 3.08 |
| Eaton | 5.04 | 5.03 | 5.27 |
| Ingham | 13.69 | 13.32 | 13.71 |
| Mason | 1.89 | 1.86 | 1.92 |

DAILY TOTAL NOX (TONS)

| COUNTY | 2002 | 2009 | 2018 |
|---|---|---|---|
| Benzie | 0.06 | 0.07 | 0.07 |
| Kent | 3.61 | 3.79 | 3.94 |
| Ottawa | 1.51 | 1.58 | 1.65 |
| Huron | 0.20 | 0.21 | 0.22 |
| Calhoun | 0.75 | 0.79 | 0.82 |
| Kalamazoo | 1.19 | 1.25 | 1.30 |
| Van Buren | 0.31 | 0.33 | 0.34 |
| Clinton | 0.24 | 0.26 | 0.26 |
| Eaton | 0.45 | 0.47 | 0.49 |
| Ingham | 1.23 | 1.29 | 1.33 |
| Mason | 0.16 | 0.17 | 0.17 |

## A. 2002 Area Source Methodologies

The following methodologies were used to compile the emissions for the various Stationary Area Source categories for the 2002 Emissions Inventory base year.

### Oil and Natural Gas Production

The oil and gas production area source category represents those VOC emissions that result from the exploration, drilling, and the field processing of crude oil and natural gas. Fugitive VOC emissions occur from control valves, relief valves, spills, pipe fittings, pump seals and compressor seals in the production and field processing of crude oil and natural gas. Individual county crude oil and natural gas production data was obtained from the DEQ, Geological and Land Management Division. VOC emission factors were derived from the EPA publication entitled: Revision of Evaporative Hydrocarbon Emission Factors (The EPA – 450/3-76-039). The emission factors are 107 pounds of emitted VOCs per thousand barrels of produced crude oil and 175 pounds of emitted VOCs per million cubic feet of produced natural gas. For crude oil production, emission controls reflecting NESHAP application of a 45 percent reduction in VOCs were considered. This control level was based on the EPA determination of an overall 45 percent reduction in VOCs from oil and natural gas production facilities. This control reduction was obtained from a May 14, 1999, the EPA fact sheet that was published with the Final Air Toxics Rules for Oil and Natural Gas Production Facilities and Natural Gas Transmission and Storage Facilities. Rule effectiveness of 80 percent was then applied, and point source deductions were performed to estimate the area source contribution. For natural gas, emission controls from Michigan air pollution control rule R336.1629 of 72 percent and the federal emission control reduction in VOCs of 19 percent associated with NESHAP application to natural gas transmission and storage were applied. The 19 percent emission reduction was obtained from the May 14, 1999, the EPA fact sheet that was published with the Final Air Toxics Rules for Oil and Natural Gas Production Facilities and Natural Gas Transmission and Storage Facilities. The federal NESHAP rule became effective June 17, 1999. Area source emissions were then reported using SCC codes of 2310010000 for crude petroleum oil production and 2310020000 for natural gas production.

### Vessel Loading/Ballasting

Evaporative volatile organic compounds occur from Great Lakes ships when being loaded with gasoline and petrochemicals. Vapors are also displaced when cargo tanks are loaded with water for ballasting. To estimate VOC emissions from vessel loading and ballasting activities, a list of marine terminals at Michigan-based ports handling petroleum products was obtained from the Michigan Department of Transportation (MDOT). Because of the need to acquire information on gasoline and petrochemical handling at each Michigan port and the time frames during vessel loading/ballasting occurred, a survey form was sent to the marine terminals. This state survey approach went beyond the EPA's prescribed inventory procedures in Volume III, Chapter 12 of the Emission Inventory Improvement Program January 2001, guidance for Marine Vessel Loading, Ballasting and Transit. The survey form requested information on days of operation, seasonal fuel transfer information on gasoline, distillate fuel oil, jet naphtha, jet kerosene, kerosene, residual fuel oil, and crude petroleum loading into ship and barge cargo tanks as well as ballast operations. The survey data was then summed to derive individual county totals. The results of this survey revealed that there were only two fuel types (contaminated gasoline, and residual fuel oil) where loading had occurred. VOC emission factors (0.00009 lbs/1000 gallons of residual fuel oil and 3.4 lbs/1000 gallons of gasoline) were then applied to their respective fuel volumes to obtain the estimated emission losses. Although the EPA on September 19, 1995, issued Federal Standards for Marine Tank Vessel Loading

Operations and National Emission Standards for Hazardous Air Pollutants for Marine Vessel Loading Operations, the respective facilities transferring fuel were exempt from control requirements. Consequently, emissions estimates were based on the respective emission factors without the application of control measures. Individual county VOC emission estimates from loading and ballasting operations were reported using the following SCC codes:

| Vessel Loading/Ballasting Operations | Reported SCC Code |
|---|---|
| Vessel loading, distillate fuel oil | 2505020090 |
| Vessel loading, gasoline | 2505020120 |
| Vessel loading, residual fuel oil | 2505020060 |
| Vessel loading, crude oil | 2505020030 |
| Vessel loading, naphtha | 2505020150 |
| Vessel loading, jet kerosene | 2505020180 |
| Vessel loading, kerosene | 2505020180 |
| Vessel ballasting, gasoline | 2505020900 |
| Vessel ballasting, crude oil | 2505020900 |

**Service Station Loading (Stage I)**

Gasoline vapor loss occurs at service stations when gasoline is unloaded from delivery tank trucks into underground storage tanks. The extent of vapor loss is dependent upon the method of filling (splash, submerge, or vapor balanced). In computing VOC emissions from service station loading, year 2002 gasoline throughput estimates were obtained from Energy Information Administration's Petroleum Marketing Monthly data. The monthly data was then summed to derive an estimated statewide gasoline total. County gasoline total estimates were then determined by apportioning the statewide gasoline by the percent of state gasoline sales occurring within each county. County gasoline sales data was obtained from the U.S. Department of Commerce, Bureau of Census, Michigan 1997 Economic Census, Retail Trade, Geographic Area Series. State gasoline throughput consumption was apportioned on a county basis using the following mathematical equation:

$Ct = St \times Cs/Ss$

Where:

Ct = Estimated county gasoline consumption for year 2002
St = Statewide gasoline consumption for year 2002
Cs = County gasoline service station retail sales data
Ss = State gasoline service station retail sales data

VOC emission estimates were developed based upon the guidance provided in the EPA prescribed inventory procedures in Volume III, Chapter 11 of the Emission Inventory Improvement Program January 2001 guidance for Gasoline Marketing (Stage I and Stage II) and subsequent September 2002 Draft Summary of the Analysis of the Emissions Reported in the 1999 NEI for Stage I and Stage II Operations at Gasoline Service Stations. Year 2002 and summer weekday emission factors were developed based upon actual temperature, and Reid vapor pressure (RVP) fuel volatility information for various regions of the State to reflect the applicable RVP control measures. Monthly temperature data was obtained for the year 2002 from the NOAA, National Climatic Center Local Climatological Data that was utilized in determining year and summer day temperatures for the Michigan Upper Peninsula and Michigan Lower Peninsula regions. Reid vapor pressure data for marketed gasoline during year 2002 was obtained from the Michigan Department of Agriculture, Motor Fuels Quality, Laboratory Division. VOC emission factors were then developed for splash fill, submerge fill, and vapor balanced gasoline dispensing facilities on a county basis, which reflected the actual temperature and RVP of marketed gasoline products.

Stage I loading emission factors were determined using the methodology specified in September 2002 Draft Summary of the Analysis of the Emissions Reported in the 1999 NEI for Stage I and Stage II Operations at Gasoline Service Stations. The following equation is presented:

$L = 12.46 x SPM/T$

Where: L = Loading loss (uncontrolled), pounds per 1000 gal of liquid loaded

S= A saturation factor where S= 0.6 for submerged loading with no vapor balance, S = 1.00 for submerge loading with vapor balance, and S = 1.45 = splash loading no vapor balance

P = True vapor pressure of liquid loaded, pounds per square Inch absolute (psia)

M = Molecular weight of vapors, pounds per pound-mole

T = Temperature of bulk liquid in degrees F + 460

The quantity of county gasoline throughput that is splash filled, submerge filled, and vapor balanced was estimated on basis of past gasoline surveys, and the applicability of state regulations which require the installation of submerge fill or vapor balanced systems. These percentages were obtained from the year 1999 emissions inventory. The same county fractional percentages of splash filled, submerge filled, and vapor balanced were used in the year 2002 inventory for consistency with respect to prior emission inventory.

The respective emission estimates were reported using the following SCC codes:

**Michigan Gasoline Marketing Stage I Emission SCC Codes**

| Stage I Type | SCC |
|---|---|
| Submerge filled loading | 2501060051 |
| Splash filled loading | 2501060052 |
| Vapor balanced loading | 2501060053 |

The EPA, on December 19, 2003, issued final rule requirements for stage I gasoline distribution in Standards of Performance for Bulk Gasoline Terminals and National Emission Standards for Gasoline Distribution Facilities (Bulk Gasoline Terminals and Pipeline Breakout Stations. These NESHAP requirements will be applied in point source inventories for bulk terminals.

**Calculation of Stage I Emission Factors**

**Vapor Balance**

| Region | Year 2002 Annual Emission Factor lbs/1000 gal | Ozone Season 4/1/02-9/30/02 Emission Factor lbs/1000 gal | Summer Weekday 6/1/02-8/31 Emission Factor lbs/1000 gal | Year 2002 Annual Temperature F | Year 2002 Ozone Season 4/1/02-9/30/02 Temperature F | Year 2002 Summer Weekday 6/1/02-9/30/02 Temperature F | Annual RVP | Ozone Season RVP 4/1/02-9/30/02 | Summer Weekday RVP 6/1/02-8/31/02 | Year 2002 Annual True Vapor Pressure P | Year 2002 Ozone Season 4/1/02-9/30/02 True Vapor Pressure P | Year 2002 Summer Weekday 6/1/02-9/30/02 True Vapor Pressure P | Saturation Factor S | Year 2002 Annual RVP Molecular Weight | Ozone Season 4/1/02-9/30/02 RVP Molecular Weight | Summer Weekday 6/1/02-9/30/02 RVP Molecular Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upper Peninsula | 0.70 | 0.85 | 0.93 | 50.6 | 66.7 | 76.3 | 10.7 | 9.4 | 8.8 | 4.4 | 5.4 | 6 | 1 | 65.06 | 66.4 | 66.8 |
| Lower Peninsula | 0.79 | 0.96 | 1.01 | 57.5 | 73.2 | 81.3 | 10.7 | 9.4 | 8.8 | 5.02 | 6.2 | 6.6 | 1 | 65.06 | 66.4 | 66.8 |
| SE Michigan | 0.78 | 0.85 | 0.87 | 57.5 | 73.2 | 81.3 | 10.4 | 8.5 | 7.5 | 4.95 | 5.4 | 5.6 | 1 | 65.47 | 67 | 67.7 |

**Submerge Fill**

| Region | Year 2002 Annual Emission Factor lbs/1000 gal | Ozone Season 4/1/02-9/30/02 Emission Factor lbs/1000 gal | Summer Weekday 6/1/02-8/31 Emission Factor lbs/1000 gal | Year 2002 Annual Temperature F | Year 2002 Ozone Season 4/1/02-9/30/02 Temperature F | Year 2002 Summer Weekday 6/1/02-9/30/02 Temperature F | Annual RVP | Ozone Season RVP 4/1/02-9/30/02 | Summer Weekday RVP 6/1/02-8/31/02 | Year 2002 Annual True Vapor Pressure P | Year 2002 Ozone Season 4/1/02-9/30/02 True Vapor Pressure P | Year 2002 Summer Weekday 6/1/02-9/30/02 True Vapor Pressure P | Saturation Factor S | Year 2002 Annual RVP Molecular Weight | Ozone Season 4/1/02-9/30/02 RVP Molecular Weight | Summer Weekday 6/1/02-9/30/02 RVP Molecular Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upper Peninsula | 4.19 | 5.09 | 5.59 | 50.6 | 66.7 | 76.3 | 10.7 | 9.4 | 8.8 | 4.4 | 5.4 | 6 | 0.6 | 65.06 | 66.4 | 66.8 |
| Lower Peninsula | 4.72 | 5.77 | 6.09 | 57.5 | 73.2 | 81.3 | 10.7 | 9.4 | 8.8 | 5.02 | 6.2 | 6.6 | 0.6 | 65.06 | 66.4 | 66.8 |
| SE Michigan | 4.68 | 5.07 | 5.24 | 57.5 | 73.2 | 81.3 | 10.4 | 8.5 | 7.5 | 4.95 | 5.4 | 5.6 | 0.6 | 65.47 | 67 | 67.7 |

**Splash Fill**

| Region | Year 2002 Annual Emission Factor lbs/1000 gal | Ozone Season 4/1/02-9/30/02 Emission Factor lbs/1000 gal | Summer Weekday 6/1/02-8/31 Emission Factor lbs/1000 gal | Year 2002 Annual Temperature F | Year 2002 Ozone Season 4/1/02-9/30/02 Temperature F | Year 2002 Summer Weekday 6/1/02-9/30/02 Temperature F | Annual RVP | Ozone Season RVP 4/1/02-9/30/02 | Summer Weekday RVP 6/1/02-8/31/02 | Year 2002 Annual True Vapor Pressure P | Year 2002 Ozone Season 4/1/02-9/30/02 True Vapor Pressure P | Year 2002 Summer Weekday 6/1/02-9/30/02 True Vapor Pressure P | Saturation Factor S | Year 2002 Annual RVP Molecular Weight | Ozone Season 4/1/02-9/30/02 RVP Molecular Weight | Summer Weekday 6/1/02-9/30/02 RVP Molecular Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upper Peninsula | 10.13 | 12.30 | 13.50 | 50.6 | 66.7 | 76.3 | 10.7 | 9.4 | 8.8 | 4.4 | 5.4 | 6 | 1.45 | 65.06 | 66.4 | 66.8 |
| Lower Peninsula | 11.40 | 13.95 | 14.72 | 57.5 | 73.2 | 81.3 | 10.7 | 9.4 | 8.8 | 5.02 | 6.2 | 6.6 | 1.45 | 65.06 | 66.4 | 66.8 |
| SE Michigan | 11.31 | 12.26 | 12.65 | 57.5 | 73.2 | 81.3 | 10.4 | 8.5 | 7.5 | 4.95 | 5.4 | 5.6 | 1.45 | 65.47 | 67 | 67.7 |

**Service Station Unloading/Vehicle Fueling (Stage II)**

Motor vehicle fueling at service stations results in evaporative loss of gasoline. VOC emissions are produced during displacement of vaporized hydrocarbons and spillage of gasoline during refueling. The EPA guidance in Volume III, Chapter 11 of the Emission Inventory Improvement Program January 2001 guidance for Gasoline Marketing (Stage I and Stage II) recommends the MOBILE model be used to generate refueling (Stage II) emission factors for highway emission inventories. Additional procedures were presented in September 2002 Draft Summary of the Analysis of the Emissions Reported in the 1999 NEI for Stage I and Stage II Operations at Gasoline Service Stations. The MOBILE6 model was used to derive the Stage II emission factor by obtaining monthly emission factors in grams/VOC mile, as well as fuel economy, as miles per gallon and vehicle miles traveled mix for the different gasoline vehicle types (e.g., LDTV, LDGT, and HDGV). For each vehicle type, the monthly emission factor was multiplied by the fuel economy to obtain an emission factor in unit grams of VOC/gallon.

grams VOC/gallon = Grams/mile x miles/gallon

The stage II grams/gallon refueling emission factor rates were prepared by the Southeast Michigan Council of Government (SEMCOG) using MOBILE6.2 that reflected state specific RVP and temperature data. The VMT mix for each vehicle types was used to calculate a single weighted monthly emission factor. Summer and average annual emission factors were then developed for Southeast Michigan, the rest of the Lower Peninsula, and the Upper Peninsula. SEMCOG's stage II grams/gallon emission factors are presented below.

**SEMCOG Year 2002 Refueling Emission Rates for State of Michigan**

| **Average Type and Geographical Area** | **Grams/Gallon** |
|---|---|
| **Summer** (Average of monthly refueling emission rates for June, July and August 2002) | |
| **Southeast Michigan** (Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw and Wayne counties) | 2.398 |
| **Rest of Lower Peninsula** (All counties in Lower Peninsula except the seven Southeast Michigan counties) | 2.867 |
| **Upper Peninsula** (All counties in the Upper Peninsula) | 2.697 |
| **Average Annual** (Average of monthly refueling emission rates) | |
| **Southeast Michigan** (Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw and Wayne counties) | 2.649 |
| **Rest of Lower Peninsula** (All counties in Lower Peninsula except the seven Southeast Michigan counties) | 2.765 |
| **Upper Peninsula** (All counties in the Upper Peninsula) | 2.542 |

All rates calculated using MOBILE6.2 model

The respective SEMCOG grams VOC/gallon were then converted to lbs/1000 gallons.

Lbs VOC/1000 gallons = Grams VOC/gallon x 1 lb/453 grams x 1000 gallons

Year 2002 gasoline throughput estimates were obtained from Energy Information Administration's Petroleum Marketing Monthly data. The monthly data was then summed to derive an estimated statewide gasoline total. County gasoline total estimates were then determined by apportioning the statewide gasoline by the percent of state gasoline sales occurring within each county. County gasoline sales data was obtained from the U.S. Department of Commerce, Bureau of Census, Michigan 1997 Economic Census, Retail Trade, Geographic Area Series. Total county emissions estimates were based on the county gasoline volume by the corresponding refueling emission factor. Emission rates were reported using the SCC code 2501060100.

**Service Station Tank Breathing**

Pressure changes occur within underground storage tanks as a result of temperature differences that exist between gasoline vapor and the liquid phases. The exchange of vapor within the storage tank to the atmosphere is commonly described as tank breathing. Underground gasoline storage tank breathing losses were estimated by applying a 1.0 pound per thousand gallon throughput emission factor using procedures presented in the EPA publications Volume III, Chapter 11 of the Emission Inventory Improvement Program January 2001 guidance for Gasoline Marketing (Stage I and Stage II) and September 2002 Draft Summary of the Analysis of the Emissions Reported in the 1999 NEI for Stage I and Stage II Operations at Gasoline Service Stations. Year 2002 county gasoline consumption estimates were obtained by apportionment of the statewide gasoline consumption based on the county percentage of state gasoline retail sales. Statewide gasoline consumption data was obtained from Energy Information Administration's Petroleum Marketing Monthly and county retail gasoline sales information was identified in the U.S. Department of Commerce, Bureau of Census, Michigan 1997 Economic Census, Retail Trade, Geographic Area Series. Emission estimates were reported using the SCC of 2501060200.

**Gasoline Tank Truck Transit**

Breathing losses from gasoline tank trucks occurs as a result of pressure changes within the containment vessel. The pressure change in the containment vessel is caused by temperature differences between the vapor and liquid phases as well as agitation during transport. Gasoline tank trucks leak VOC vapors and liquids from gaskets, seals, and seams during transport.

Because some gasoline is delivered to bulk plants rather than delivered directly to service stations from terminals, the amount of gasoline transferred in any area may exceed the total gasoline consumption due to additional trips involved. Therefore, gasoline tank truck transit evaporation emissions were based on the total volume of gasoline transferred rather than county consumption level.

The total gasoline transferred in a given county was obtained by taking the sum of both the service station volume delivery and the bulk plant gasoline transfer. The bulk plant gasoline transfer volume in a county was obtained from point source data. VOC emissions estimates were developed using the gasoline tank truck transit emission factors identified by the EPA procedures presented in Volume III, Chapter 11 of the Emission Inventory Improvement Program January 2001 guidance for Gasoline Marketing (Stage I and Stage II). In this document, VOC loss from gas-filled tank truck emission factor was 0.005 lbs/1000 gallons while empty vapor-filled tank trucks were 0.055 lbs/1000 gallons. A single emission factor of 0.06 lbs/1000 gallons was derived by taking the sum of the two respective factors, and then applying this emission factor to the total transported gasoline volume. Further emission adjustments were then made to the respective emission totals to reflect those delivery vessels in those counties that are subject to Michigan Air Pollution Control Rule R 336.1627. A control efficiency of 76 percent was considered before subsequent application of an 80 percent rule effectiveness and 100 percent rule penetration factors for delivery vessels in those counties subject to R336.1627. Emission estimates were reported using the SCC of 2505030120.

**Aviation Fuel Stage I Loading**

Gasoline vapor loss occurs at airports when gasoline is unloaded from delivery tank trucks into underground storage tanks. Because of the need to temporally adjust aircraft refueling emissions for all respective fuel types within all Michigan counties, it was determined that local aviation fuel sales information could only be acquired by contacting each fuel distributor serving each airport. Because the fleet of the aircraft varies at each airport, the amount of fuel type consumed will likewise be dependent on the types of aircraft being serviced and not just based upon landings and takeoffs (LTOs) alone.

A list of those Michigan commercial and private airports where fuels are dispensed was obtained from the MDOT publication 2003 Michigan Airport Directory. A survey form was then mail to each airport operations manager. Total fuels sales information by fuel type(s) and season were obtained from either airport staff or assigned fixed base operators. This information was then summed for each Michigan County to provide an estimate of the total volumes of jet kerosene, jet naphtha, and aviation gasoline handled at each airport facility. Stage I loading volatile organic compound emission factors for jet kerosene and jet naphtha were determined using the following equation:

$$L = 12.46 x SPM/T$$

Where:
L = Loading loss (uncontrolled), pounds per 1000 gal of liquid loaded
S= A saturation factor where 1.45 = splash loading

P = True vapor pressure of liquid loaded, pounds per square Inch absolute (psia)
M = Molecular weight of vapors, pounds per pound-mole
T = Temperature of bulk liquid in degrees F + 460

For stage I aviation gasoline VOC emissions, an emission factor was obtained the EPA publication entitled: Documentation for the 2002 Nonpoint Source National Emission Inventory for Criteria and Hazardous Air Pollutants (January 2004 Version). The resultant emission factors were then applied to the total county fuel throughput after considering point source fuel throughput deductions. Because the EPA does not have itemized SCC codes by fuel type, VOC emissions were added together and reported using an SCC of 2501080050.

**Aircraft Refueling (Stage II)**

Aircraft refueling at airports results in the evaporative loss of aviation gasoline, jet kerosene, and jet naphtha. VOC emissions occur when vapor-laden air in a partially empty fuel tank is displaced to the atmosphere during refueling. The quantity of the vapor being displaced is dependent upon the fuel temperature, fuel vapor pressure, aircraft fuel tank temperature, and the fuel dispensing rate.

Because of the need to temporally adjust aircraft refueling emissions for each respective fuel type within each Michigan county, it was determined that local aviation fuel sales information could only be acquired by contacting each fuel distributor serving each airport. Because the fleet of the aircraft varies at each airport, the amount of fuel type consumed will likewise be dependent on the types of aircraft being serviced and not just based upon landings and takeoffs (LTOs) alone.

A list of those Michigan commercial and private airports where fuels are dispensed was obtained from the MDOT publication 2003 Michigan Airport Directory. A survey form was then mail to each airport operations manager. Total fuels sales information by fuel type(s) and season were obtained from either airport staff or assigned fixed base operators. This information was then summed up for each Michigan County to provide the total dispensed volumes of jet kerosene, jet naphtha, and aviation gasoline. VOC aviation refueling loss emission factors were obtained from the EPA publication, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42), were then applied to the respective county total fuel volumes.

| Aviation Fuel Type | Emission Factor as lbs of volatile organic compounds/1000 gallons fuel |
|---|---|
| Jet kerosene | 0.08 |
| Jet naphtha | 5.58 |
| Aviation gasoline | 12.20 |

There is no provision currently to allow for the reporting of emissions by individual fuel type; therefore, emissions were summed for all fuel types and reported using the SCC code 2275900000.

**Traffic Marking Coatings**

Traffic marking coatings are paints that are used to mark pavement, including dividing lines for traffic lanes, parking space markings, crosswalks, and arrows to direct traffic flow. VOC emissions result from the evaporation of organic solvents during the application and curing of the marking paint.

VOC emissions were estimated for each county using the methodology identified in the EPA publication, Volume III, Chapter 14 of the Emission Inventory Improvement Program May 1997 Final Guidance for Traffic Markings. The preferred method was to conduct surveys to determine the volume of water and solvent-based coating consumption, coating formulation (in terms of pounds of VOC content per applied gallon), and months of year 2002 when the coatings were applied. Survey forms were mailed to all Michigan county road commissions, major municipality road maintenance departments, and to the MDOT. In those situations where a county road commission failed to submit such information, emission estimates were based upon results of those counties that had responded to the survey. An average coating application rate (total gallons of coating applied per road miles in county) was first determined from survey respondents. Road length miles were obtained for the counties that failed to respond to the survey. Total coating gallon consumption estimates were estimated for counties that failed to respond by applying the road length miles to the average coating application rate. Similarly, an average VOC content (as lbs/gallon) was obtained by dividing the total mass of VOC emissions by the total coating volume of survey respondents. The result thereof was then applied to the estimated coating volumes for those counties that did not respond to the survey. This average density was reflective of the proportions of solvent- and water-based coatings by survey respondents. Seasonal coating application was also based upon county survey results of the months during which the coatings were applied. It should be recognized that year 2002 was a recession year in which Michigan County and local governments had limited budgets. Consequently, it is likely that projected emissions would be greater during better economic times. Traffic marking paint emissions were reported using an SCC of 2401008000

**Cutback Asphalts**

Cutback asphalt is a bituminous road coating material that is prepared by blending an asphalt cement tar with a petroleum distillate (such as naphtha, kerosene, or other fuel oils). Cutback asphalt is used as a pavement sealant, tack coat, pothole filler, and a bonding agent between layers of paving material. Evaporative loss of the solvent from bitumen cement occurs as the cutback asphalt cures on the road surface. The rate at which VOC emissions occur is dependent both upon the temperature of the applied road surface and the type of solvent used in the formulation of the cutback asphalt material. Gasoline or naphtha is used as a diluent in the production of “rapid cure” cutback asphalts. Kerosene and other low volatility fuel oils are also used as diluents in the production of “medium cure” and “slow cure” cutback asphalts.

VOC emissions were estimated for each county using the methodology identified in the EPA publication, Volume III, Chapter 17 of the Emission Inventory Improvement Program January 2001 Final Guidance for Asphalt Paving. In this document, the preferred method was to conduct surveys to determine locally-specific information on cutback asphalt use on Michigan roads.

To estimate VOC emissions from the application of cutback asphalt materials (rapid cure, medium cure, and slow cure), a survey was mailed to all Michigan county road commissions, major municipality road maintenance departments, and to the MDOT. The survey requested information on:

- The quantities of rapid cure, medium cure, and slow cure cutback asphalt materials that were applied during year 2002;
- The type of petroleum distillate and volume that was used as a diluent in the formulation of each cutback paving material; and
- The months during which cutback asphalt materials were applied.

The EPA has determined that evaporation occurs of about four months with 75 percent by weight of diluent evaporating in the first day for rapid cure materials. It takes about one week for 50 percent by weight of diluent to evaporate from medium cure cutback asphalt materials. Conservative estimates were made by assuming that 100 percent of the diluent evaporates within the season during which it is applied.

VOC emission estimates were based on the amount of the petroleum-based diluent that comprises the cutback asphalt material and then applying their respective solvent density. Emission estimates were reported using an SCC of 2461021000.

**Emulsified Asphalts**

Emulsified asphalts are a type of liquefied road surfacing material that is used in the same application as cutback asphalts. Instead of blending the asphalt material with a petroleum distillate like their cutback asphalt counterparts, emulsified asphalts use a blend of water with an emulsifier (soap). Emulsified asphalts either rely on water evaporation to cure (anionic-high float emulsions) or ionic bonding of the emulsion and the aggregate surface (cationic emulsions).

In the EPA publication, Volume III, Chapter 17 of the Emission Inventory Improvement Program January 2001 Final Guidance for Asphalt Paving, the preferred method is conduct a survey of emulsified asphalt application on Michigan roads. Survey forms were mailed to all Michigan county road commissions, major municipality road maintenance departments, and to the MDOT. This form requested information on the quantities of asphalt materials (in pounds and barrels) applied to Michigan roadways and the months during which they were applied. Road length miles were also obtained for all Michigan counties. In those situations where a county road commission failed to submit such information, emission estimates were based upon results of those counties that had responded to the survey. An average application rate (total barrels of emulsified asphalts applied per road miles in county) was first determined from survey respondents. Total barrel consumption estimates were estimated for counties that failed to respond by applying the road length miles to the average emulsified asphalt application rate. VOC emissions were obtained by applying an EPA factor of 9.2 lbs VOC/barrel of applied asphalt. It was further assumed that all emissions occur during the season that the asphalt materials were applied and reported using an SCC of 2461022000.

**Breweries**

Breweries, microbreweries, brewpubs, and contract brewers emit VOCs including ethanol, ethyl acetate, myrcene and other higher alcohols from various brewing processes. For the smaller brewers, VOCs are lost by the fermentation, in brew kettles, hot wort, mash and lauter tuns, and through spent grain. Microbreweries and brewpubs typically produce beer for patron on-site consumption, although some may have limited keg distribution. These smaller microbreweries and brewpubs typically combine some processes, and canning/bottling operations typically do not exist since the beer is consumed on-site or stored in kegs.

Various trade organization lists were obtained to identify brewers in the State of Michigan along with their beer production. Although there are some regional breweries, the vast majority are brewpubs and microbreweries. These facilities have very small to insignificant VOC emissions. Emission estimates were based on a combined emission factor rate obtained from Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42) of 3.0465 lbs of VOC per 1000 barrels. Consequently, this small emission factor and Michigan beer production rates didn't justify the need for a survey of such establishments. Emissions were estimated by establishment on the basis of trade reported production and applying the respective emission factor. An SCC of 2302070001 was used in reporting brewery emissions.

**Distilleries**

Distilleries include ethanol production facilities that are used in the production of gasohol motor fuels, grain alcohol for industrial purposes, and distilled spirits for personal consumption. These products are produced from the fermentation of aged mashed grains with distillation for the capture of desired alcohol-based products. The fermentation products use yeast to convert grain sugars into ethanol, ethyl acetate, isoamyl alcohol, isobutyl alcohol and carbon dioxide. Grains used in the process may include corn, rye, barley, and wheat. A more detailed description of distilleries and their emissions can be found in the EPA publication, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42).

In identifying distilleries in Michigan, contact was made with the Michigan Biomass Energy Program of the Michigan Department of Consumer and Energy Services. During year 2002, there was only one ethanol production facility in Caro, Michigan. This facility was already being reported as a point source. Consequently, the area source contribution from distilleries using SCC 2302070010 had zero emissions for all Michigan counties.

**Wineries**

Wineries produce alcohol beverages from the fermentation of fruit juices. The major processes in vinification include fruit harvesting, crushing, pressing, fermentation, clarification, aging, finishing, and bottling. During this fermentation process of both red and white wines, primarily ethanol and smaller quantities of methyl alcohol, n-propyl alcohol, butyl alcohol, isoamyl alcohol, and acetaldehydes are produced along with carbon dioxide. This process involves the reaction of a yeast with glucose and fructose sugars to produce ethanol and carbon dioxide. The EPA emission factors are reflective of volatile organic compounds evolved during fermentation in vinification.

County estimates of wine production were based upon wine volume information of Michigan Department of Treasury tax receipt information supplied to the Michigan Grape and Wine Industry Council. A VOC emission factor was obtained from Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42).of 4.6263 lbs VOC/ 1000 gallons. This emission factor is a sum of ethyl alcohol, methyl alcohol, n-propyl alcohol, n-butyl alcohol, sec-butyl alcohol, isobutyl alcohol, isoamyl alcohol and acetaldehyde for red wine from AP-42. Emission estimates were reported using an SCC of 230207005.

**Stationary Source Fossil Fuel Combustion**

The combustion of natural gas, propane-LPG, distillate fuel oil, kerosene, and residual fuel oil in small boilers, furnaces, heaters, and stoves are also a source of VOCs, nitrogen oxides, particulates, sulfur dioxide, and ammonia emissions. Because these sources are so numerous to be identified in point source inventories, this area source category attempts to provide a collective estimate of emissions from these smaller energy consumption sources by subtracting all fuel used by point sources from total fuel consumption. Procedures for the estimation of these smaller sources are presented in the EPA's documents, entitled:

Volume II, Chapter 2 of the Emission Inventory Improvement Program January 2001 Preferred and Alternate Methods for Estimating Air Emissions from Boilers.

Emission Inventory Improvement Program –April 6, 1999, Area Source Category Abstract- Fuel Oil and Kerosene Combustion

Emission Inventory Improvement Program –April 6, 1999, Area Source Category Abstract- Natural Gas and LPG Combustion

Emission Inventory Improvement Program –April 6, 1999, Area Source Category Abstract-Coal Combustion

Documentation for the Draft 1999 National Emissions Inventory (Version 3.0) for Criteria Air Pollutants and Ammonia

Hanke, B.H, manuscript prepared for the EPA entitled: A National Methodology and Emission Inventory for Residential Fuel Combustion

This documentation involves determination of total fuel consumption over an area with subsequent fuel deductions made for point source fuel consumption, and then applying emissions factors to estimate fuel emissions.

Total fuel consumption information was based on data supplied from the U.S. Department of Energy, Energy Information Administration documents. This unaccounted fuel consumption was then apportioned to individual counties using the U.S. Census Bureau information for the individual end use sector fuel types based upon LADCO states methodology. Area source fuel emissions were reported for the following residential, commercial/institutional, and industrial end use sectors. Since utility boilers are accounted as point sources, area source emissions are not reported for this end use sector.

**Residential Boilers & Furnaces**

County emission estimates for the residential end use sector were based upon the consumption of natural gas, propane-LPG, distillate fuel oil, kerosene, and coal. This energy consumption information was obtained from the U.S. Department of Energy, Energy Information Administration data. Since the Energy Information Administration merely provides statewide fuel consumption totals, county fuel consumption estimates were obtained by apportioning the fuel consumption based upon the number of year 2000 occupied household census counts using the given fuel. Emission estimates were calculated using the following mathematical equation:

$$Cf = Ch/Sh \times Sf$$

Where:

Cf = Estimated county residential sector consumption of a given fuel type for year 2002
Ch = Number of year 2000 census occupied households in a given county that utilize a given fuel type
Sh = Total number of year 2000 census occupied households statewide that utilize a given fuel type
Sf = Total statewide residential sector consumption of a given fuel type

**Michigan Residential Fuel Consumption Information Sources**

| Residential Fuel Type | U.S. Dept of Energy, Energy Information Administration Data Sources |
|---|---|
| Natural gas | Natural Gas Monthly |
| Propane LPG | Petroleum Marketing Annual, 2002 |
| Distillate fuel oil | Fuel Oil and Kerosene Sales 2002 Report |
| Kerosene | Fuel Oil and Kerosene Sales 2002 Report |
| Coal | State Energy Data Report 2000 (most recent) |

Upon obtaining county residential fuel consumption estimates for the various fuel types in all Michigan counties Cf, emission estimates were obtained by applying an emission factor that is specific to that fuel type. These emission factors were obtained from various EPA publications.

**Michigan Residential Fuel Emission Factors**

| Residential Fuel Type | Units | CO | $NH_3$ | NOx | PM10-PRI | PM25-PRI | $SO_2$ | VOC |
|---|---|---|---|---|---|---|---|---|
| Natural gas | Lbs/million cubic feet | 40 | 0.49 | 94 | 7.6 | 7.6 | 0.6 | 5.5 |
| Propane LPG | Lbs/1000 gal | 3.2 | | 13 | 0.68 | 0.68 | 0.1 | 0.5 |
| Distillate fuel oil | Lbs/1000 gal | 5.0 | 0.8 | 18 | 2.38 | 2.13 | 42.60 | 0.7 |
| Kerosene | Lbs/1000 gal | 4.8 | 0.8 | 17.4 | 2.38 | 2.13 | 41.1 | 0.7 |
| Coal | Lbs/ton | 275 | 0.000565 | 3.0 | 20.7 | 5.4 | 58.5 | 10 |

Sources of Emission Factors:

The EPA Documentation for the Draft 1999 National Emissions Inventory (Version 3.0) for Criteria Air Pollutants and Ammonia

Hanke, B.H, manuscript prepared for the EPA entitled: A National Methodology and Emission Inventory for Residential Fuel Combustion

The EPA Final Report on Development and Selection of Ammonia Emission Factors

The resulting emission estimates were reported by individual fuel type using the following SCC codes.

**Michigan Residential Combustion Emission SCC Codes**

| Residential Fuel Type | SCC |
|---|---|
| Natural gas | 2104006000 |
| Propane LPG | 2199007000 |
| Distillate fuel oil | 2104004000 |
| Kerosene | 2104011000 |
| Coal | 2104001000 |

**Commercial/Institutional Boilers and Furnaces**

Estimation of fuel combustion by the commercial/institutional sector was performed using an adaptation of a methodology presented in the following EPA publications:

Emission Inventory Improvement Program –April 6, 1999, Area Source Category Abstract- Fuel Oil and Kerosene Combustion.

Emission Inventory Improvement Program –April 6, 1999, Area Source Category Abstract- Natural Gas and LPG Combustion.

Emission Inventory Improvement Program –April 6, 1999, Area Source Category Abstract-Coal Combustion.

County emission estimates for the commercial/institutional end use sector were based upon the consumption of natural gas, residual fuel oil, distillate fuel oil, kerosene, and coal. This energy consumption information was obtained from the U.S. Department of Energy, Energy Information Administration data. Fuels were subtracted for point sources, and the net area fuel contribution was apportioned or allocated using procedures instructed by LADCO. This procedure involved statewide commercial/institutional fuel apportionment to a county level using the commercial/ institutional employment data as obtained from the U.S. Department of Commerce, Bureau of Census publication entitled: County Business Patterns, Michigan: 2000 (CBP/00-24 issued May, 2002). County fuel estimates of individual fuel types were estimated using the following equation:

$$Cf = Ce/Se \times Sf$$

Cf = Estimated county commercial/institutional sector consumption of a given fuel type
Ce= Total county employment in the commercial/institutional sector
Se= Statewide employment in commercial/institutional sector
Sf= Statewide commercial/institutional sector consumption of a given fuel type

Because the Energy Information data includes diesel fuel totals within the distillate fuel oil total, these motor vehicle fuels were deducted to provide only an estimate of #1, #2, and #4 fuel oils.

**Michigan Commercial/Institutional Fuel Consumption Information Sources**

| Fuel Type | U.S. Dept of Energy, Energy Information Administration Data Sources |
|---|---|
| Natural gas | Natural Gas Monthly |
| Residual fuel oil | Fuel Oil and Kerosene Sales 2002 Report |
| Distillate fuel oil | Fuel Oil and Kerosene Sales 2002 Report |
| Kerosene | Fuel Oil and Kerosene Sales 2002 Report |
| Coal | State Energy Data Report 2000 (most recent) |

Upon obtaining county commercial/institutional fuel consumption estimates for the various fuel types in all Michigan counties Cf, emission estimates were calculated by applying an emission factor that is specific to that fuel type. These emission factors were obtained from various EPA publications.

**Michigan Commercial/Institutional Fuel Emission Factors**

| Commercial/Institutional Fuel Type | Units | CO | $NH_3$ | NOx | PM10-PRI | PM25-PRI | $SO_2$ | VOC |
|---|---|---|---|---|---|---|---|---|
| Natural gas | Lbs/million cubic feet | 84 | 0.49 | 100 | 7.16 | 7.6 | 0.6 | 5.5 |
| Residual fuel oil | Lbs/1000 gal | 5 | 0.80 | 55 | 9.07 | 3.37 | 194.05 | 1.13 |
| Distillate fuel oil | Lbs/1000 gal | 5 | 0.80 | 20 | 1.08 | 0.83 | 53.96 | 0.34 |
| Kerosene | Lbs/1000 gal | 5 | 0.80 | 18 | 2.38 | 2.13 | 41.1 | 0.713 |
| Coal | Lbs/ton | 6 | 0.000565 | 7.5 | 6.0 | 2.2 | 38 | 0.05 |

Sources of Emission Factors:

LADCO state uniform adopted emission factors for commercial/institutional natural gas combustion

The EPA FIRES database

The EPA, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42)

The EPA Final Report on Development and Selection of Ammonia Emission Factors

The resulting emission estimates were reported by individual fuel type using the following SCC codes.

**Michigan Commercial/Institutional Combustion Emission SCC Codes**

| Fuel Type | SCC |
|---|---|
| Natural gas | 2103006000 |
| Residual fuel oil | 2103005000 |
| Distillate fuel oil | 2103004000 |
| Kerosene | 2103011005 |
| Coal | 2103002000 |

**Industrial Boilers and Furnaces**

Estimation of fuel combustion emissions of industrial boilers and furnaces was performed in similar manner as the commercial/institutional sector. Statewide industrial fuel consumption information was obtained from the U.S. Department of Energy, Energy Information Administration publications. Point source deductions were made for each fuel type to obtain the area contribution, which was then apportioned to the county level using LADCO prescribed procedures.

County fuel consumption estimates of natural gas, residual fuel oil, distillate fuel oil, kerosene, and coal were based upon the following mathematical equation:

$$Cf = Ce/Se \times Sf$$

Cf = Estimated county industrial sector consumption of a given fuel type
Ce = Total county employment in the industrial sector
Se = Statewide employment in industrial sector
Sf = Statewide industrial sector consumption of a given fuel type

**Michigan Industrial Fuel Consumption Information Sources**

| Industrial Fuel Type | U.S. Dept of Energy, Energy Information Administration Data Sources |
|---|---|
| Natural gas | Natural Gas Monthly |
| Residual fuel oil | Fuel Oil and Kerosene Sales 2002 Report |
| Distillate fuel oil | Fuel Oil and Kerosene Sales 2002 Report (#1, #2, and #4 fuel oils– excludes diesel oil) |
| Kerosene | Fuel Oil and Kerosene Sales 2002 Report |
| Coal | State Energy Data Report 2000 (most recent) |

County employment data was obtained from the U.S. Department of Commerce, Bureau of Census publication entitled: <u>County Business Patterns, Michigan: 2000 (CBP/00-24 issued May 2002)</u>. Upon obtaining county industrial fuel consumption estimates for the various fuel types in all Michigan counties Cf, emission estimates were obtained by applying an emission factor that is specific to that fuel type. These emission factors were generally based on the LADCO adopted emissions factors.

**Michigan Industrial Fuel Emission Factors**

| Industrial Fuel Type | Units | CO | $NH_3$ | NOx | PM10-PRI | PM25-PRI | $SO_2$ | VOC |
|---|---|---|---|---|---|---|---|---|
| Natural gas | Lbs/million cubic feet | 84 | 3.2 | 100 | 7.6 | 7.6 | 0.6 | 5.5 |
| Residual fuel oil | Lbs/1000 gal | 5.0 | 0.8 | 55 | 7.17 | 4.67 | 157 | 0.28 |
| Distillate fuel oil | Lbs/1000 gal | 5.0 | 0.8 | 20 | 1.0 | 0.25 | 142 | 0.2 |
| Kerosene | Lbs/1000 gal | 5.0 | 0.8 | 18 | 2.38 | 2.13 | 41.1 | 0.713 |
| Coal | Lbs/ton | 6 | 0.00057 | 7.5 | 6.0 | 2.2 | 38 | 0.05 |

Sources of Emission Factors:

LADCO state uniform adopted emission factors for industrial natural gas, residual fuel oil, distillate fuel oil, and coal combustion

The EPA FIRES database

The EPA Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42)

The EPA Final Report on Development and Selection of Ammonia Emission Factors

Emission estimates were reported using the following SCC codes:

**Michigan Industrial Combustion Emission SCC Codes**

| Industrial Fuel Type | SCC |
|---|---|
| Natural gas | 2102006000 |
| Residual fuel oil | 2102005000 |
| Distillate fuel oil | 2102004000 |
| Kerosene | 2102011000 |
| Coal | 2102002000 |

**Remedial Action, Site Clean Up and Leaking Storage Tanks**

Evaporative VOC emissions occur during remediation and clean up at those sites of environmental contamination. Such remediation activities may include air stripping or sparging of a VOC from contaminated groundwater or incineration of a spoil material removed from a contaminated site. In some instances carbon adsorption may be required to reduce VOC emitted during air stripping or spraying operations.

Estimation of VOC loss from remedial action activities was determined by summing the allowable emissions from permits to those parties that were engaged in such activities as provided by the MDEQ, Air Quality Division, Permit Section. Although site remediation activities are subject to National Emission Standards for Hazardous Air Pollutants (NESHAPs), these requirements did not apply at the time of the year 2002 emissions inventory. Emissions were reported using an SCC of 2660000000.

**Municipal Waste Landfills**

A municipal solid waste landfill is defined as any facility that is regulated under Subtitle D of the Resource Conservation and Recovery Act (RCRA), which receives primarily household and/or commercial wastes.

VOCs are produced from municipal solid waste by: the volatilization of the waste material itself, the microbiological (anaerobic) putrefaction of organic waste materials that result in the formation of organic acids and alcohols which are vaporized, and the chemical reaction of one or more waste materials or chemical decomposition intermediate. The rate at which VOCs are emitted from a landfill is dependent upon the structural design of cells, the waste composition (physical/chemical properties), the moisture content of the waste, the amount of waste disposed, temperature, age of the landfill, the chemical reactivity of the waste, and the microbiological toxicity of the waste.

Estimation of VOC emissions from municipal landfills were based on the revised technical procedures presented in the EPA publication entitled: Volume III, Chapter 15 of the Emission Inventory Improvement Program January 2001 Revised Final Guidance for Landfills. In this publication, the preferred method for the estimation of area source emissions is to use the LandGem model or the equations from the Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition and Supplements (AP-42) section on landfills. LandGem is a computer-based model that uses the same equations as that of AP-42. The emissions calculation for the estimation of landfill gas requires site specific information including: landfill design capacity, accumulated waste totals from operation of the landfill, and existing control requirements from landfill gas collection systems. Landfills may be subject to either new source performance standards (40 Code of Federal Regulations part 60 Subpart WWW) or emission guidelines (40 Code of Federal Regulations, part 60, Subpart Cc). Landfills are also subject to National Emission Standards for Hazardous Air Pollutants (NESHAPs), which did not apply at the time of the year 2002 emissions inventory since these standards became effective on January 16, 2003. In Michigan, most municipal solid waste landfills are inventoried as point sources of which landfill operators estimate their yearly emissions using an MDEQ Emission Calculation Fact Sheet for Municipal Solid Waste Landfills. General fugitive emissions are reported using SCC codes 50400201 and 30502504. For landfills with gas recovery, landfill gas may be flared (50100410, 50200601, 50300601, 50100410, 50200601, and 50300601), used in boilers/heaters (10200701), or used in reciprocating/turbine engines (20100802 and 20100801). For those landfills that were not being reported in the point source inventory, area emission estimates were reported on the basis on LandGem model simulations using the SCC of 2620030000. These simulations reflected total waste receipts under the prior year 1999 inventory with addition made for waste receipts for years 2000-2002 as obtained from annual reports by the Michigan Department of Environmental Quality, Waste and Hazardous Division Report of Solid Waste Landfilled in Michigan.

**Architectural Surface Coating**

Architectural surface coating operations consist of the application of a thin layer of paint, primer, varnish or lacquer to the exterior or interior surfaces of architectural structures. From these coatings, or the solvents used as thinners and cleaning agents, VOCs are emitted.

To estimate these emissions, alternative method one was chosen from the guidance document Emission Inventory Improvement Program (EIIP), Volume III, Area Sources Preferred and Alternative Methods, Chapter 3: Architectural Surface Coating. Data was readily available for the use of per capita emission factors.

The AQD staff determined per capita usage factors by dividing the national total architectural surface quantities for solvent and water-based coatings (U.S. Census Bureau MA325F, Paint and Allied Products) by the U.S. population for 2002 (U.S. Census Bureau, http://www.census.gov).
http://www.census.gov/industry/1/ma325f02.pdf

**Solvent-Based Paint**

Solvent-based paints produced and shipped in the U.S. in 2002 were totaled (total includes architectural lacquers and architectural coatings). The resulting number was divided by the 2002 U.S. population to produce a per capita solvent-based paint usage factor of 0.4428 gallons per person.

The resulting solvent paint use, in gallons per county, was multiplied by a VOC emission factor of 3.87 lb/gal, from Table 5-2 of the Emission Inventory Improvement Program (EIIP) guidance, Volume III, Area Sources Preferred and Alternative Methods, Chapter 3: Architectural Surface Coating to produce total VOC emissions from solvent-based paint.

**Water-Based Paint**

Water-based paints produced and shipped in the U.S. in 2002 were totaled. The resulting number was divided by the 2002 U.S. population to produce a per capita water-based paint usage factor of 2.044 gallons per person.

The resulting water-based paint use in gallons per county was multiplied by a VOC emission factor of 0.74 lb/gal, from Table 5-2 from the EIIP guidance, Volume III, Area Sources Preferred and Alternative Methods, Chapter 3: Architectural Surface Coating. This produced total VOC emissions from water-based paint.

No point source deductions were performed for solvent-based or water-based paint, as none were needed for the category of architectural surface coating.

A seasonal adjustment factor of 1.3 was made for this category for the ozone season, per Table 5.8.1 of the EPA document Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I: General Guidance for Stationary Sources. Ozone season daily emissions were calculated per the example on page 5-23 of this document. Ozone season throughput was also calculated. Seven activity days per week were selected, per Table 5.8.1. Annually, 365 days of operation were assumed.

**Auto Body Refinishing**

Auto body refinishing is the repairing of damaged automobiles, trucks, and other vehicles, and involves the application of paint coatings on top of that provided by the original equipment manufacturer assembly plants. Emissions of VOCs are released from this activity. The majority of the sources engaged in auto body refinishing are area sources, but there are several such sources in Michigan's point source inventory. The point source emissions have been deducted from the total emissions estimated for this category to produce area source emissions.

Per the EIIP guidance Volume III, Area Sources Preferred and Alternative Methods, Chapter 13: Auto Body Refinishing (Jan. 2000 external draft), a per capita factor can be created by using population data from the U.S. Bureau of the Census to allocate a national emissions estimate for body shops. This estimate for VOC may be obtained from Section 4.1 of the auto body refinishing chapter. The national VOC emissions estimate is based on 1998 and 1999 data. Once allocated by population, an emission factor of 0.5 lbs/yr was obtained for the per capita method. The per capita method utilizes county population data to allocate the national emissions estimate.

A seasonal adjustment factor of 1.0 was made for this category for the ozone season. The category of auto refinishing was considered to be uniform throughout the year, per Table 5.8.1 of the EPA document, Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I: General Guidance for Stationary Sources. Ozone season daily emissions were calculated per the example on page 5-23 of this document. Ozone season throughput was also calculated. Five activity days per week were selected, per Table 5.8.1. Annually, 260 days of operation were assumed.

**Consumer and Commercial Solvent Use**

<u>Overview</u>

The methodology for this category came from the source, EIIP, Volume 3, Chapter 5, Consumer and Commercial Solvent Use. The consumer and commercial solvent source category includes a wide array of products such as personal care products, household cleaning products and household pesticides. However, all VOC emitting products used by businesses, institutions and numerous industrial manufacturing operations are also included. A detailed list of products included in this category can be found on page 5.2-3 of the 1996 EIIP document. The majority of VOCs introduced into the atmosphere from this category are a result of evaporation of the solvent contained in the product or from the propellant released during product use.

<u>SCCs</u>

The following SCCs were utilized by Michigan, per recommendations of LADCO:

| | |
|---|---|
| 2460100000 | Personal care products |
| 2460200000 | Household Products |
| 2460400000 | Automotive aftermarket |
| 2460600000 | Adhesives and sealants |
| 2460800000 | FIFRA-regulated product s |
| 2460500000 | Coatings and related products |
| 2460900000 | Miscellaneous products |

These SCCs cover both consumer and commercial solvent use, whereas the EIIP guidance recommended SCCs that represented only consumer use and not commercial use.

Methodology

Per the EIIP (1996), Michigan utilized the recommended methodology, which was the use of per capita-based emission factors.

VOC

1-Use of national average per capita emission factors adjusted for federal, state or local emission limits (preferred method),

Data Elements for using Preferred Method (Population-Based)

Population in the inventory area
Per capita emission factors, and
State and local regulations.

Example:

To estimate VOC emissions from personal care products:

Emissions = (Population) ( Per Capita Emission Factor)(1-(%reduction/100))

Given a population of 1 million persons for a particular area, the VOC emissions from personal care products would be:
(1,000,000 persons) (2.32 lbs VOC/person/year)(1-.1211) = 2,039,048 lb VOC/year
= 1,019.5 tons VOC/year

| Emission Factors: Personal Care | Household | Automotive Aftermarket | Adhesives/ Sealants | FIFRA-Regulated | Coatings | Misc. |
|---|---|---|---|---|---|---|
| lb VOC/ person | lb VOC/ person | lb VOC/ person | lb VOC/ person | lb VOC/ person | lb VOC/ person | lb VOC/ person |
| 2.32 | 0.79 | 1.36 | 0.57 | 1.78 | 0.95 | 0.07 |

Obtained from Table 5.4-1, EIIP Volume III, Area Sources Preferred and Alternative Methods, Chapter 5, Consumer and Commercial Solvent Use.

Following federal rule reduction for first four categories:

| 12.11% reduction | 10.94% reduction | 8.97% reduction | 8.3% reduction |
|---|---|---|---|
| lb VOC/ person | lb VOC/ person | lb VOC/ person | lb VOC/ person |
| 2.04 | 0.70 | 1.24 | 0.52 |

A seasonal adjustment factor of 1.0 was made for this category for the ozone season. Annually, 365 days of operation were assumed.

**Dry Cleaning**

SIC 7215 (coin-operated dry cleaning establishments) was not considered for this inventory. The AQD's dry cleaning staff in the Technical Programs Unit indicated that virtually all coin-operated dry cleaning machines in Michigan have been discontinued due to the high cost of perchloroethylene. SIC 7216 (dry cleaning establishments, excluding coin-operated facilities) was considered instead. Under the NAICS system, SIC 7216 is known as NAICS 812320.

To calculate 2002 VOC emissions, Michigan utilized alternative method two, a per employee emission factor. 2001 county employment data was obtained from the U.S. Census Bureau document 2001 Michigan County Business Patterns. 2002 data was not available, and was not expected until the spring of 2004.

Employment data was obtained for NAICS 812320 (SIC 7216), for each county where it was available. Where available, employment data for the broader category of NAICS 8123 (SIC 72), personal and laundry services, was also obtained. The total population of each county for 2001 to correspond to the 2001 County Business Pattern data was obtained from the State of Michigan Library.

Next, a ratio between the number of employees under NAICS 812320 (SIC 7216), and the number of employees under NAICS 8123 (SIC 72) was determined. For counties with employment numbers for both SIC 7216 and SIC 72 this ratio was determined to be one employee under SIC 7216, per each 2.17 employees under SIC 72. These SIC 72 employment numbers were multiplied by the 1 to 2.17 employment ratio for each county to create an estimate of the 4-digit SIC code employment for each county (except where the actual 4-digit SIC employment number for SIC 7216 was already provided in the 2001 Michigan County Business Patterns).

Michigan's 2002 point source emission inventory was queried, to determine if any counties had point source employment for SIC 7216 (NAICS 812320). Berrien, Ingham and Jackson (NAICS 8123) Counties did have point sources under SIC 7216, and the number of employees at each source was obtained from the emission inventory. Each source's employment number was subtracted from the appropriate county's employment number.

With the availability of estimates of employment for SIC 7216 for each county, an emission factor for VOC was obtained from Table 4.5-1 of EIIP Vol. III, Chapter 4 (1800 lbs/yr/employee).

From EIIP

| Subcategory | Reactive VOC (lb/year/employee) | Total Organics (lb/year/employee) |
|---|---|---|
| All solvents (total) | 1,800 | 2,300 |
| Halogenated Solvents | | |
| PERC, TCA and CFC 113 | | 980 |
| Coin Operated | | 52 |
| Commercial/Industrial | | 1,200 |
| Mineral Spirits and Other Unspecified Solvents | 1,800 | 1,800 |

A seasonal adjustment factor of 1.0 was made for this category for the ozone season, per Table 5.8.1 of the EPA document Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I: General Guidance for Stationary Sources. Ozone season daily emissions were calculated per the example on page 5-23 of this document. Ozone season throughput was also calculated. Five activity days per week were selected, per Table 5.8.1. Annually, 260 days of operation were assumed.

**Graphic Arts, 2002**

The graphic arts industry uses several different technologies, such as rotogravure, flexographic and letter press printing, to apply inks or coatings to different substrates. The inks and coatings are sources of volatile organic compound emissions.

The EIIP area source guidance document, dated November 18, 1996, was followed. This was the most updated guidance available.

The EIIP preferred method was not utilized, as it required a survey of facilities. Alternative Method 1 was found to be not feasible for Michigan, as (during calculation of the 1999 inventory) point sources used more ink than the state proportion of national ink production was calculated to be.

Per Alternative Method 2, the population of the inventory region was obtained from state data for 2002, and multiplied by the per capita emission factor provided in the EIIP guidance. This produced total uncontrolled emissions from all graphic arts facilities with less than 100 tons per year of VOC emissions, for the entire state. This method used a 1991 EPA emission factor of 0.00065 tons VOC per capita.

Total uncontrolled VOC emissions from area source graphic arts facilities (those with less than 100 tons per year of VOC emissions) were then estimated for each county. This was done by obtaining uncontrolled VOC emissions from point sources with less than 100 tons per year of VOC, from the 2002 EI. SICs 2711, 2721, 2752 and 2754 were the SIC codes queried. This number was then subtracted from total uncontrolled emissions from graphic arts facilities, on a county by county basis. The remaining number is the area source VOC emissions per year. If a negative number is the result, as for Clinton County, the value was set to zero for that county.

The seasonal adjustment factor = 1.0, uniform. Activity days of five days per week were assumed, per the EPA document, Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I: General Guidance for Stationary Sources.

**Solvent Cleaning 2002**

In this category, the use of solvents is broken into two broad classifications. The classifications are solvent cleaning (which is composed of cold cleaning and vapor/in-line cleaning), and solvent cleanup (predominantly wipe cleaning of external surfaces).

EIIP Alternative Method Solvent Cleaning Equipment (both Cold Cleaners and Vapor/In-line Cleaners):

*Emission factors:*

EIIP Table 6.5-2 provides per capita and per employee emission factors, as reproduced below. Michigan population estimates per county for 2002 were obtained from Ken Darga, State Demographer of the Library of Michigan. The population data was multiplied by the appropriate per capita emission factors. Area source emissions were then determined by subtracting point source emissions from total emissions. When the result was a negative number area source emissions were set to zero.

*Recommended Method for Solvent Cleaning Equipment:*

One method is to use the per capita emission factor from Table 6.5-2 for calculating solvent cleaning equipment emissions. The document, Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone: Volume I: General Guidance for Stationary Sources (EPA, 1991), states "Using per capita factors assumes that emissions in a given area can be reasonably associated with population. This assumption is valid over broad areas for certain activities such as dry cleaning, architectural surface coating, small degreasing operations and solvent evaporation from household and commercial products."

Cold cleaning and vapor/in-line cleaning can be calculated together by the use of the total solvent cleaning emission factor. After total solvent cleaning emissions are calculated with the per capita emission factor, point source emissions must be accounted for. One method for accounting for point source emissions is to subtract point source emissions from the total solvent cleaning emissions to generate area source emission estimates for each county.

Michigan chose to use the per capita factors available in Table 6.5-2 for the 2002 emissions inventory. In times of economic fluctuation, the population numbers are likely to be steadier than the employment numbers. Also, Mr. Ron Ryan of the U.S. EPA indicated that for the subcategory of solvent cleaning (which consists of both cold cleaning and vapor/in-line cleaning), the per capita factor and the per employee factor were both estimated using the same national solvent use totals as a starting point. Per suggestion from Mr. Ryan, the general SCC of 2415000000 was utilized for reporting as one lump sum, as the individual categories were just fractions of this whole number.

**Table 6.5-2: Per Capita and Per Employee Solvent Cleaning Emission Factors (EPA, 1991)**

| Subcategory | SIC Codes | Per Capita Factor (lb/yr/person) VOCs | Per Capita Factor (lb/yr/person) Organics | Per Employee Factor (lb/yr/person) VOCs | Per Employee Factor (lb/yr/person) Organics |
|---|---|---|---|---|---|
| **Solvent cleaning (total)** | 25, 33-39, 417, 423, 551, 552, 554-556, 753 | 4.3 | 7.2 | 87 | 144 |
| **Cold Cleaning** | | | | | |
| Automobile Repair | 417, 423, 551, 552, 554-556, 753 | 2.5 | 2.5 | 270 | 270 |
| Manufacturing | 25, 33-39 | 1.1 | 1.1 | 24 | 24 |
| **Vapor and In-Line Cleaning** | | | | | |
| Electronics and Electrical | 36 | 0.21 | 1.1 | 29 | 150 |
| Other | 25, 33-39, 417, 423, 551, 552, 554-556, 753 | 0.49 | 25 | 9.8 | 49 |

The 2002 point source VOC data was obtained from the Michigan Air Emissions Reporting System (MAERS). These values were then deducted from the total emissions estimated by using the per capita emission factor and 2002 Michigan county population data.

*Solvent Cleanup:*

Per employee and per capita emission factors can be developed from information collected for the EPA's Alternative Control Techniques Document – Industrial Cleaning Solvents.

*Recommended Method for Solvent Cleanup:*

Unless states have good data for specific facilities, the preferred way to estimate emissions from solvent cleanup activities is per capita or per employee emission factors from EIIP.

Michigan utilized the nationwide emission estimates from VOC solvent usage presented in Table 6.5-4 to create per capita emission factors. The national population data was obtained from the U.S. Census Bureau. The categories of industries considered in Table 6.5-4, and the SIC codes matched to them, are presented below.

| | |
|---|---|
| Furniture: | SIC 25 |
| Magnetic Tape: | included under SIC 36, Electrical Equipment |
| Packaging: | SIC 265 |
| Photographic supplies: | SIC 3861 |
| Automotive - manufacturing: | SIC 3711 |
| Automotive - trucks and buses: | SIC 3713 |
| Automotive - parts/accessories: | SIC 3714 |
| Automotive - stamping: | SIC 3465 |
| Electrical equipment: | SIC 36 (entire 2 digit SIC number considered for expediency) |

| SIC | National population in 1999 | National solvent cleanup VOC emissions by SIC, tons/yr* | Solvent cleanup emissions per capita, tons/yr | **Solvent cleanup VOC emissions per capita, lbs/yr** |
|---|---|---|---|---|
| 25 | 272,691,000 | 47000 | 0.00017236 | **0.344712513** |
| 265 | 272,691,000 | 7000 | 0.00002567 | **0.051340162** |
| 3465 | 272,691,000 | 330 | 0.00000121 | **0.002420322** |
| 36 | 272,691,000 | 2400 | 0.00000880 | **0.017602341** |
| 3711 | 272,691,000 | 34000 | 0.00012468 | **0.249366499** |
| 3713 | 272,691,000 | 16000 | 0.00005867 | **0.117348941** |
| 3714 | 272,691,000 | 2200 | 0.00000807 | **0.016135479** |
| 3861 | 272,691,000 | 480 | 0.00000176 | **0.003520468** |

* Table 6.5-4, EIIP Area Source Guidance Chapter 6 – Solvent Cleaning

A seasonal adjustment factor of 1.0 was made for this category for the ozone season, per Table 5.8.1 of the EPA document, Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I: General Guidance for Stationary Sources. Ozone season daily emissions were calculated per the example on page 5-23 of this document. Ozone season throughput was also calculated. Six activity days per week were selected, per Table 5.8.1. Annually, 312 days of operation were assumed.

**Industrial Surface Coating**

Surface coating is the process by which paints, inks, varnishes, adhesives, or other decorative or functional coatings are applied to a substrate (e.g., paper, metal, plastic) for decoration and/or protection. After the coating has been applied, it is cured or dried either by conventional curing or radiation curing process. The surface coating products include either a water-based or solvent-based liquid carrier that generally evaporates in the curing process.

Source Identification

Protocol Section 3.2.1-SIC codes

SIC code 2426-Hardwood Dimension & Flooring

SIC code 2429-Special Product Sawmills, NEC

SIC code 243%-Millwork, Veneer, Plywood & Structural Members

SIC code 244%-Wood Containers

SIC code 245%-Wood Buildings and Mobile Homes

SIC code 25%%-Furniture and Fixtures

SIC code 26%%-Paper and Allied Products

SIC code 341%-Metal Cans and Shipping Containers

SIC code 3479-Metal Coating and Allied Services, NEC

SIC code 35%%-Industrial and Commercial Machinery & Computer Equipment

SIC code 3612-Transformers

SIC code 3357-Nonferrous Wire Drawing/Insulating

SIC code 37%%-Transportation Equipment

Protocol Section 3.2.2-SCC/AMS codes

SCC 2401015000-Factory Finished Wood

SCC 2401020000-Wood Furniture

SCC 2401030000-Paper Coating

SCC 2401040000-Metal Cans

SCC 2401045000-Metal Coils

SCC 2401055000-Machinery and Equipment

SCC 2401060000-Appliances

SCC 2401065000-Electronic and other Electrical

SCC 2401070000-New Motor Vehicles

SCC 2401075000-Other Transportation

SCC 2401080000-Marine Coatings

SCC 2401090000-Miscellaneous Manufacturing

SCC 2401100000-Industrial Maintenance

SCC 2401200000-Other Special Purpose

Chapter 8 of the EIIP Area Source technical documents presents the preferred and alternate methods for VOC emission estimation. The preferred method consists of the development of a SIC-Specific, area-specific per employee factor using point source emissions inventory and employment information. This method is used for VOCs. Alternative Method 1 uses the national default per employee emission factors. Alternative Method 2 uses per capita emission factors and population estimates. Michigan chose to use the per capita VOC factors available in Table 8.5-2 for the 2002 emissions inventory. In times of economic fluctuation, the population numbers are likely to be steadier than the employment numbers.

Michigan population estimates per county for 2002 were obtained from Ken Darga, State Demographer of the Library of Michigan.  The population data was multiplied by the appropriate per capita emission factors.  Area source emissions will then be determined by subtracting point source emissions from total emissions.  Point source emissions by county were obtained for the relevant SIC (NAICS) codes from the 2002 EI, and the appropriate deductions were made to determine area source emissions per county.  When the result is a negative number, area source emissions will be set to zero.

A seasonal adjustment factor of 1.0 was made for this category for the ozone season, per Table 5.8.1 of the EPA document, Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone, Volume I: General Guidance for Stationary Sources. Ozone season daily emissions were calculated per the example on page 5-23 of this document. Ozone season throughput was also calculated.  Five activity days per week were selected, per Table 5.8.1.  Annually, 260 days of operation were assumed.

**Residential Wood Burning**

The following method was available to estimate the number of wood burning households per county.

Housing units with wood heat by county was determined by using the U.S. Census Bureau's DP-4, Profile of Selected Housing Characteristics: 2000, Data Set: Census 2000 Summary File 3 (SF 3) for Michigan.  This file provided a total value of households using wood heating. However, no breakdown was given by county.

The MDEQ decided to use the 2000 number of total wood burning households in Michigan, and to use the 1990 county proportions of the 1990 total to apportion the 2000 value to the county level for number of wood burning households per county.

Then, based on county value for number of wood burning households, the value for State Wood Use in Cords was apportioned to each county.  The State Wood Use in Cords data came from the U.S. MAP States Page, *Table* 8, Residential Energy Consumption Estimates,  Selected Years 1960-2000, Michigan, from the U.S. Department of Energy, Energy Information Administration, (http://www.eia.doe.gov/emeu/states/sep_use/res/use_res_mi.html).  Data for 2002 was not yet available.

Once county wood use in cords was produced, the next step was to determine the wood weight in tons for each county.  Utilizing the methodology prescribed in the Emission Inventory Improvement Program, Volume III: Chapter 2, Residential Wood Combustion, wood weight was determined by the following formula:

Wood weight = 'X' cords * 79 cu. ft. * 0.631 specific gravity * 62.4 lb./ cu ft. water

0.631 was selected as the specific gravity based on North Central Oak-Hickory Hardwoods, with a weight of 39.4 lb./ft., through the following formula:

Specific gravity = 39.4 lb./ft. divided by 62.4 lb./cu. ft. water = 0.631

The MDEQ did not have data available on the number of catalytic and non-catalytic woodstoves in Michigan, but did utilize 1993 survey data, which showed the proportions of fireplaces to woodstoves by county in Michigan.  This was used to apportion wood weight per county between wood stoves and fireplaces. SCCs and emission factors were selected for fireplaces – cordwood (2104008001), woodstoves – general (2104008010) and non-catalytic woodstoves – conventional (2104008051). The SCC of 2104008051 was used because it contained a completely separate set of emission factors than 2104008010, and therefore was viewed as complimentary rather than duplicative.

VOC, PM10, CO and NOx emission factors were obtained from the Emission Inventory Improvement Program, Volume III: Chapter 2, Residential Wood Combustion, Table 2.4-1, for Residential Fireplaces, and for Residential Woodstoves – Conventional (reported under 2104008001 and 2104008051, respectively). VOC, PM10, PM2.5, CO, SOx and NOx emission factors were obtained for 2104008010 from the EPA's EFIG, per the latest update to the GLC methodology for toxics. The emissions estimated for 2104008051 for VOC, PM10, CO and NOx were believed to be duplicative of the emissions for 2104008010 and were therefore omitted from the NIF 3.0 files which were prepared for this area source category. There were no other criteria pollutants associated with 2104008051.

It was assumed that 60 percent of wood burning in woodstoves or fireplaces occurred during the winter months, with 20 percent in the spring and 20 percent in the fall. It was assumed that there was no fireplace or wood burning stove activity during the summer months, therefore summer weekday emissions were not calculated.

**Structure Fires**

The EIIP guidance from EIIP Volume III, Chapter 18: Structure Fires, was followed. The preferred method for estimating emissions was used, due to the availability of county level structure fire data for 2002. The data, which was from the Michigan State Police Fire Marshal Division, did not provide any detail on the extent of each structure fire, or indicate if the structure was residential or commercial.

The default fuel loading factor provided in the EIIP guidance (1.15 tons of fuel per structure fire) was used. Emission factors for VOC, CO, and NOx were obtained from Table 18.4-1.

A seasonal adjustment factor of 1.0 was made for this category for the ozone season. Annually, 365 days of operation were assumed.

**Year 2009 and 2018 Stationary Area Source Emission Inventory Projections**:

See under Point Sources section **Growing Stationary Non-EGU Point, Stationary Area, Locomotive, Shipping, and Aircraft Categories for the Years 2009 and 2018** for reference and methodology for growing the Stationary Area Source inventory.

## IV. Non-Road Mobile

The table below summarizes typical ozone season weekday non -road mobile source emissions for the Michigan redesignation counties for the years 2002, 2009 and 2018.

DAILY TOTAL VOC (TONS)

| COUNTY | From Non-Road Model | | | Marine Aircraft and Rail | | |
|---|---|---|---|---|---|---|
| | 2002 | 2009 | 2018 | 2002 | 2009 | 2018 |
| Benzie | 4.04 | 4.30 | 2.84 | 0.01 | 0.01 | 0.01 |
| Kent | 12.20 | 8.12 | 6.66 | 0.22 | 0.22 | 0.26 |
| Ottawa | 5.23 | 3.61 | 2.94 | 0.09 | 0.08 | 0.09 |
| Huron | 3.20 | 3.17 | 2.28 | 0.09 | 0.10 | 0.11 |
| Calhoun | 2.47 | 1.83 | 1.36 | 0.15 | 0.13 | 0.15 |
| Kalamazoo | 4.73 | 3.12 | 2.59 | 0.16 | 0.13 | 0.15 |
| Van Buren | 2.84 | 2.70 | 1.81 | 0.03 | 0.02 | 0.02 |
| Clinton | 2.08 | 1.65 | 1.24 | 0.16 | 0.17 | 0.20 |
| Eaton | 1.74 | 1.33 | 1.02 | 0.06 | 0.04 | 0.04 |
| Ingham | 4.24 | 2.77 | 2.35 | 0.05 | 0.03 | 0.03 |
| Mason | 2.83 | 2.98 | 1.97 | 0.05 | 0.05 | 0.05 |

DAILY TOTAL NOX (TONS)

| COUNTY | From Non-Road Model | | | Marine Aircraft and Rail | | |
|---|---|---|---|---|---|---|
| | 2002 | 2009 | 2018 | 2002 | 2009 | 2018 |
| Benzie | 0.27 | 0.28 | 0.29 | 0.34 | 0.27 | 0.24 |
| Kent | 13.40 | 9.80 | 4.99 | 0.89 | 0.52 | 0.57 |
| Ottawa | 6.10 | 4.52 | 2.36 | 1.86 | 1.53 | 1.47 |
| Huron | 2.76 | 2.46 | 1.73 | 2.97 | 3.49 | 3.47 |
| Calhoun | 3.19 | 2.37 | 1.25 | 1.30 | 0.51 | 0.47 |
| Kalamazoo | 5.30 | 3.94 | 2.02 | 1.67 | 0.67 | 0.64 |
| Van Buren | 1.45 | 1.20 | 0.77 | 0.35 | 0.15 | 0.13 |
| Clinton | 2.63 | 2.20 | 1.24 | 0.21 | 0.19 | 0.22 |
| Eaton | 2.03 | 1.67 | 0.98 | 1.27 | 0.49 | 0.45 |
| Ingham | 5.34 | 4.11 | 2.16 | 0.82 | 0.31 | 0.29 |
| Mason | 0.61 | 0.53 | 0.40 | 1.36 | 1.15 | 1.12 |

### A. 2002 Non-Road Emissions Estimation exclusive of Locomotive, Shipping, and Aircraft Emissions

The most recent Lake Michigan Air Director Consortium (LADCO) 2002 non-road mobile emission inventory (known as base K) was used as the base case of known values. A summary of the non-road NMIM input files used by LADCO to generate the 2002 non-road mobile emissions inventories exclusive of locomotive, shipping, and aircraft follow:

**<u>LADCO Revised NMIM Input Data For Non-Road Sources (Grant D. Hetherington, January 26, 2006)</u>**

### Activity Data

LADCO States: Pechan revised the activity data to include new construction data. 130 SCCs were impacted. The revised NMIM files are saved as five separate files: 1700002.act, 1800002.act, 2600002.act, 3900002.act and 5500002.act even though each file is identical. These duplicates simplify the external file structures in NMIM.

Non-LADCO States: Minnesota revised their activity data. The revised activity data are saved as 2700002.act.

### Allocation Data

LADCO States: Environ revised the allocation data to include new recreational marine data. The revised NMIM files are saved as 17000wib_rev.alo, 17000wob_rev.alo, 18000wib_rev.alo, 18000wob_rev.alo, 26000wib_rev.alo, 26000wob_rev.alo, 39000wib_rev.alo, 39000wob_rev.alo, 55000wib_rev.alo and 55000wob_rev.alo. “wib” stands for watercraft inboard. “wob” stands for watercraft outboard.

Non-LADCO States: Minnesota revised their watercraft inboard, watercraft outboard and snowmobile allocation data. The revised NMIM files are saved as 27000wib_rev.alo, 27000wob_rev.alo and 27000snm_rev.alo. “snm” stands for snowmobile.

### Emission Factor Data

All States: Pechan revised the brake specific fuel consumption (BSFC) emission factor data to include diesel tampers/rammers (2270002006). The revised NMIM file is saved as revBSFC.EMF

### Population Data

LADCO States: Environ and Pechan revised the recreational marine and construction population data respectively. The revised NMIM files are saved as 17000_rev.pop, 18000_rev.pop, 26000_rev.pop, 39000_rev.pop and 55000_rev.pop files.

### Seasonality Data

LADCO States: Environ and Pechan revised the recreational marine and agricultural seasonality data respectively. The revised NMIM files are saved as 17000_rev.sea, 18000_rev.sea, 26000_rev.sea, 39000_rev.sea and 55000_rev.sea.

Non-LADCO States: For Iowa, Minnesota and Missouri, Pechan modified the agricultural seasonality data. The revised NMIM files are saved as 19000_rev.sea, 27000_rev.sea and 29000_rev.sea.

**Growth Data**

LADCO States: Pechan revised the growth file. The revised NMIM files are saved as five separate files: 17000_rev.grw, 18000_rev.grw, 26000_rev.grw, 39000_rev.grw and 55000_rev.grw even though each file is identical. These duplicates are needed for the external file structures in NMIM.

**Fuel Data**

LADCO States: Pechan revised four tables (countyyear, countyyearmonth, datasource and gasoline) in the National County Database (NCD) used by NMIM to incorporate new fuel data. AIR revised gasoline characteristics per instructions from the states.

Additional revisions were incorporated into 2002 data for nonroad Stage 2 controls. Depending on the year being modeled, different versions of the revised tables are used. Also, the countynrfile, countyyear and datasource tables were revised to reference the new activity, allocation, growth, population and seasonality files described above. NCD tables with names ending in “def” are default versions of the table. See the Table below for the appropriate versions of the tables for the selected years.

Non-LADCO States: The countynrfile, countyyear and datasource tables were revised to reference the new activity, allocation and seasonality files described above. See the Table below for the appropriate versions of the tables for the selected years.

**NMIM NCD Tables for Specific Years and States**

| **States** | **Years** | |
|---|---|---|
| | **2002** | **2007 – 2009, 2012 & 2018** |
| LADCO states | countynrfile_rev_all, countyyear_rev_2002, countyyearmonth_rev_all, datasource_rev_all, gasoline_rev_all | countynrfile_rev_all, countyyear_rev_post_2002, countyyearmonth_rev_all, datasource_rev_all, gasoline_rev_all |
| MN | countynrfile_rev_all, countyyear_rev_2002, countyyearmonth_def, datasource_rev_all, gasoline_def | countynrfile_rev_all, countyyear_rev_post_2002, countyyearmonth_def, datasource_rev_all, gasoline_def |
| IA and MO | countynrfile_rev_all, countyyear_def, countyyearmonth_def, datasource_rev_all, gasoline_def | countynrfile_rev_all, countyyear_def, countyyearmonth_def, datasource_rev_all, gasoline_def |

## B. 2002 Aircraft Emissions Estimation

To estimate non-road aircraft emissions, aircraft activity information was obtained from the MDOT. This aircraft activity operations information received from the MDOT consisted of the following:

Scheduled air carrier arrivals for commercial aircraft (as of the week of December 31, 2002)

Airport annual local and itinerant operations for year 2002

Military annual local and itinerant operations for year 2002

Due to the need to have aircraft operations information expressed as landing/take-off (LTO) cycles, the following assumptions were made:

For commercial aircraft activity, the number of weekly scheduled aircraft arrivals equals the number of weekly departures, thereby representing the number of weekly LTO cycles. The weekly LTO cycle frequency was then adjusted to provide expected weekday, Saturday, Sunday, and yearly LTO cycles.

For the annual local and itinerant airport operations, each respective operations total was divided by 2 to obtain the corresponding year local and itinerant LTO cycles. The expected daily local and itinerant LTO cycles then were obtained by dividing these annual totals by 365.

For military annual local and itinerant operations, each respective operations total was divided by 2 to obtain the corresponding year local and itinerant LTO cycles. The expected military daily local and itinerant LTO cycles then were obtained by dividing these annual totals by 365.

Airport LTO cycles were further categorized into commercial aircraft by plane and engine type, general aviation itinerant aircraft of unknown aircraft type, general aviation local aircraft of unknown aircraft type, and military aircraft. This was necessary in order to utilize the U.S. Department of Transportation, Federal Aviation Administration EDMS 4.0 Emissions and Dispersion Modeling System. A description of this model can be found in the Federal Aviation Administration publication entitled, Emissions and Dispersion Modeling System (EDMS) Reference Manual. Emissions were determined by each commercial aircraft type using the EDMS 4.0 emissions model where possible. In most cases, default commercial aircraft taxi and queue times were used in the EDMS 4.0 model for all airports with the exception of Wayne County's Detroit Metropolitan Airport. Due to the volume of commercial aircraft Land and Take-Offs (LTOs) at this airport, a major connecting hub for Northwest Airlines, and the potential for air traffic delays, additional information was obtained from airport operations personnel regarding longer taxi and queue times. These longer taxi and queue contributed to greater aircraft emissions.

For those commercial aircraft types that could not be determined using the EDMS 4.0 emissions model, aircraft emission factors from the year 1999 inventory were then used to estimate their emissions. These included general aviation itinerant aircraft of unknown aircraft type, general aviation local aircraft of unknown aircraft type, and military aircraft. This former 1999 inventory relied upon a FAA aircraft Emissions Factor database, and fleet average emission factors. These fleet average factors were again used where aircraft types were unknown.

Aircraft emissions were then obtained by adding emissions contributions from commercial, itinerant general and local general aircraft, and were reported using the following SCC codes.

**Michigan Aircraft Emission SCC Codes**

| Aircraft Type | SCC |
|---|---|
| Military | 2275001000 |
| Commercial | 2275020000 |
| General Aviation | 2275050000 |

### C. 2002 Locomotive and Shipping Emissions Estimation

The 2002 non-road locomotive emissions are based on work and a follow-up report (Environ Report for LADCO, April 2004, 2002 Locomotive Emissions Sources) by Environ supporting the Lake Michigan Air Directors Consortium's (LADCO) efforts to prepare a 2002 Air Emissions Inventory. The report describes Environ's efforts to develop a locomotive 2002 air emissions estimates to support air quality modeling by LADCO. The Environ report is too long to be included in this document, but it can be provided upon request or downloaded at:

http://ladco.org/reports/rpo/MWRPOprojects/Emissions/Environ_Final_Report_non-road.pdf

### D. 2002 Shipping Emissions Estimation

The 2002 non-road shipping emissions are based on work and a follow-up report (Environ Report for LADCO, April 2004, 2002 Shipping Emissions Sources) by Environ supporting the Lake Michigan Air Directors Consortium's (LADCO) efforts to prepare a 2002 Air Emissions Inventory. The report describes Environ's efforts to develop shipping 2002 air emissions estimates to support air quality modeling by LADCO. The Environ report is too long to be included in this document, but it can be provided upon request or downloaded at:

http://ladco.org/reports/rpo/MWRPOprojects/Emissions/Environ_Final_Report_non-road.pdf

### E. Year 2009 and 2018 Non-Road Mobile Source Emission Inventory Projections:

The non-road source categories exclusive of locomotive, shipping, and aircraft were projected in the EPA Mobile source model NMIM. The locomotive, shipping, and aircraft non-NMIM source categories were projected using growth factors provided in the report (E.H. Pechan & Associates, Inc., Development of Growth and Control Factors for Lake Michigan Air Directors Consortium, Final Report, and December, 14, 2004) produced by E.H. Pechan & Associates, Inc. for LADCO and available upon request.

## V. On-Road Mobile

The table below summarizes typical ozone season weekday on-road mobile source emissions for the Michigan redesignation counties for the years 2002, 2009 and 2018.

DAILY TOTAL VOC (TONS)

| COUNTY | 2002 | 2009 | 2018 |
|---|---|---|---|
| Benzie | 1.08 | 0.65 | 0.31 |
| Kent | 31.13 | 18.81 | 9.85 |
| Ottawa | 10.82 | 6.58 | 3.54 |
| Huron | 1.68 | 1.01 | 0.55 |
| Calhoun | 9.76 | 5.85 | 3.09 |
| Kalamazoo | 14.29 | 8.53 | 4.28 |
| Van Buren | 5.17 | 3.15 | 1.68 |
| Clinton | 6.10 | 3.68 | 1.97 |
| Eaton | 6.48 | 3.90 | 1.97 |
| Ingham | 13.90 | 8.30 | 4.43 |
| Mason | 1.39 | 0.83 | 0.43 |

DAILY TOTAL NOX (TONS)

| COUNTY | 2002 | 2009 | 2018 |
|---|---|---|---|
| Benzie | 2.10 | 1.40 | 0.37 |
| Kent | 46.94 | 32.17 | 10.19 |
| Ottawa | 18.00 | 12.21 | 4.19 |
| Huron | 3.31 | 2.21 | 0.65 |
| Calhoun | 17.83 | 11.77 | 3.82 |
| Kalamazoo | 22.52 | 15.15 | 4.75 |
| Van Buren | 11.16 | 7.32 | 2.18 |
| Clinton | 11.91 | 7.91 | 2.46 |
| Eaton | 11.86 | 7.88 | 2.39 |
| Ingham | 22.96 | 15.34 | 4.84 |
| Mason | 2.48 | 1.66 | 0.51 |

Except where indicated (e.g. 2018 mobile estimates prepared by MDOT), the summer day emissions described here represent the Midwest Planning Organization’s typical summer weekday. The meteorological conditions on July 12, 2002, which occurred during a significant ozone episode, were chosen to represent the typical summer day. Conditions on this day will not only be used for this demonstration, but will be used for comparisons during the development of 8-hour ozone attainment demonstrations throughout the Midwest region. The future year projections take into account existing mobile source control. These inventories are taken from the LADCO base K inventories, as posted in January 2006. The LADCO On-Road NMIM input files used to generate the 2002 emission inventory are too long to be included in this report, but can be provided upon request. Network information was supplied to LADCO by the MDOT.

## A. Year 2009 and 2018 On-Road Mobile Source Emission Inventory Projections:

The LADCO On-Road NMIM input files used to generate the LADCO base K 2009 emissions inventory and are too long to be included in this document. They can be provided upon request.

MDOT On-Road Redesignation Support Documentation describing the methodology for producing the county emissions for the projected year 2018 follows. The documentation is for the Benzie, Grand Rapids, Huron, Kalamazoo, Lansing and Mason redesignation areas.

### A.1 Benzie County - MI Air Quality Redesignation

MDOT prepared the on-highway motor vehicle emissions estimates using Federal Highway Administration (FHWA) and the EPA approved methodology. The projects in Benzie County were demonstrated to all be exempt, so an actual conformity analysis has not been calculated before this analysis.

Air quality analysis was performed on the State Transportation Improvement Program (STIP) for Benzie County to determine the impact of the transportation system improvements on vehicle emissions. The STIP was used because Benzie County is a non-urban nonattainment area.

#### Air Quality Assessment Criteria

Benzie County proportion of the STIP conformity determination findings were made in compliance with all applicable conformity requirements and have been determined to satisfy the following conformity criteria and procedures set forth in the EPA's Transportation Conformity Rule:

1. The determination was based on the latest planning assumptions.
2. The determination was based on the latest emission model available.
3. The determination was made according to the consultation procedures of the final conformity rule.
4. The State Implementation Plan (SIP) conformity procedures.

Each project contained in the Benzie County portion of the STIP was reviewed by the Interagency Work Group (IAWG), being consistent with the consultation procedures established in the SIP. During the review, a determination was made by the IAWG on each project as to whether it needed to be modeled or was exempt from emission modeling. It was determined that all projects were exempt from modeling.

#### Modeling Procedures

The following describes the procedures used to estimate and analyze travel demand for the Benzie County - MI Nonattainment Area. The MDOT developed socio-economic data for 2000 and 2018. These data are the basis for forecasting in the travel demand model which, in turn, generates the inputs required for the air quality analysis. These inputs are the amount of travel expressed as vehicle miles of travel (VMT) and average speed by National Functional Classification (NFC) by county. Individual NFCs by county are then grouped to provide the needed data structure required for the EPA's Mobile6.2.

Air quality conformity analysis must be performed on a countywide basis. In Benzie County the MDOT statewide model is used to estimate travel. The VMT and speed data generated by the statewide model are scaled using county Highway Performance Monitoring System (HPMS) VMT figures to provide the basis for the estimation of present and future VMT and speeds by NFC for each county. The air quality analysis performed assumes that transportation projects are included in the milestone year they are presumed to be open to traffic.

MDOT developed and calibrated the travel demand model used in this analysis and it utilizes the standard four-step transportation modeling process.

1 - Trip generation model
2 - Trip distribution model
3 - Mode choice model
4 - Highway assignment model

**Statewide Travel Demand Model**

The statewide model was developed in TransCAD and calibrated for year 2000. The model covers all counties of the state and includes NFC collectors and above, local roads are excluded. Trip generation employs a cross classification lookup with trip rates developed from a combination of local models, National Cooperative Highway Research Program Report 187, Nationwide Personal Transportation Survey (NPTS), and Transportation Management Area (TMA) model trip generation rates. The trip generation variables used in the model are households by three income groups and five size categories along with six categories of employment. The trip distribution model uses a gravity model to estimate origin/destination tables. The mode choice model converts person trips to vehicle trips by removing transit trips and applying auto occupancy factors, which are sensitive to the length of the trip (longer trips having higher occupancies). The trip assignment model uses an all-or-nothing algorithm. The model was calibrated according to the strict calibration standards used by MDOT and suggested by FHWA. The model includes 2,392 traffic analysis zones and the network is coded to provide as output VMT, VHT, and speeds by NFC.

**Highway Performance Monitoring System Data**

The EPA and the United States Department of Transportation (USDOT) have both endorsed HPMS as the appropriate source of VMT estimates. HPMS is the FHWA's annual program to collect roadway data in all 50 states to assess the condition of the highway system in terms of traffic congestion, accessibility, and pavement condition. The FHWA requires counts to determine the area wide VMT for all urban areas. The MDOT supplements the counts outside the urbanized area with additional counts in small cities, rural areas, and especially in rural areas of counties with nonattainment status. These supplemental counts follow the same random selection procedures as those inside the urban areas.

The HPMS data used is from the MDOT's Universe file and is stratified by NFC. MDOT is currently undertaking a data improvement process to update the HPMS Universe, non-sample traffic data.

**Model VMT**

HPMS Universe data provides estimates of year 2000 for Benzie County VMT stratified by NFC. To maintain consistency between HPMS and modeled VMT and among the milestone years, the HPMS VMT, by NFC, (for the year the travel demand model was calibrated) is compared to the travel demand model's VMT, by NFC, (for the calibration year), producing scaling factors. For each analysis year, these factors are multiplied to each travel demand model's VMT to produce a scaled VMT by NFC. Since the statewide model does not have local roads the growth for local NFCs were assumed to parallel that of collectors. The scaled VMTs by NFC are collapsed into four groups, to meet the requirements of Mobile6.2. These groups are: 1) rural interstate, 2) rural major & minor arterials/collectors/local streets, 3) urban interstate/ freeway, and 4) urban principal & minor arterials/collectors/ local streets. This is done for all interim and future analysis years. This same process was used to generate VHT. The modeled speeds are derived by dividing each grouped VMT by the equivalent grouped VHT, except for local roads. Speeds for local roads were estimated by average speed generated by the urban models that have modeled years close to the year being analyzed. The scaled travel demand modeled VMTs and speeds are summarized in Table A.1.1.

**Table A.1.1**
**Benzie County Vehicle Miles of Travel and Speed**

| NFC | HPMS 2000 | VMT 2018 | Speed 2000 | Speed 2018 |
|---|---|---|---|---|
| Rural Interstate/Freeway | 0 | 0 | 0 | 0 |
| Rural Major & Minor Arterial/Collector/ Local Street | 478,354 | 586,024 | 48.6 | 48.0 |
| Urban Interstate/Freeway | 0 | 0 | 0 | 0 |
| Urban Principal & Minor Arterial/Collector/ Local Street | 0 | 0 | 0 | 0 |
| **Total** | **478,354** | **586,024** | **48.6** | **48.0** |

**Mobile6.2 Inputs Assumptions**

Mobile6.2 calculates emission factors for eight individual vehicle types in two regions of the country. Mobile6.2 emission factor estimates depend on various conditions such as ambient temperatures, average travel speed, operating modes, fuel volatility, and mileage accrual rates. Many of the variables affecting vehicle emissions can be specified by the user.

A summary of critical Moble6.2 inputs assumptions are shown below:

1. Temperature:
   a. Ambient temperature = 86.8$^{o}$ F
   b. Maximum temperature = 95.0$^{o}$ F
   c. Minimum temperature = 65.0$^{o}$ F

2. The Reid Vapor Pressure (RVP) value = 9.0
3. Emission factors are based on an average day during the month of July.
4. Where speed values are above the maximum allowed modeling input (65MPH for freeway without ramps, and 60.8 for freeways with ramps), actual modeled speeds were truncated and entered into the model as the maximum allowed value.

**Mobile6.2 - Inputs**

The inputs to the Mobile6.2 emissions factor model are VMT and average speed by NFC grouped for year 2018, as shown in Table A.1.1

**Mobile6.2 - Results**

Table A.1.2 provides the results of Mobile6.2 emissions.

**Table A.1.2**
**2018 Emissions by County in Tons per Day**

| **County** | **Emissions in tons/day** | |
|---|---|---|
| | **VOC** | **$NO_X$** |
| Benzie | 0.3120 | 0.3652 |
| **Total Nonattainment Area** | **0.3210** | **0.3652** |

**A. 2 Grand Rapids - MI Air Quality Redesignation**

The MDOT prepared the on-highway motor vehicle emissions estimates using FHWA and the EPA approved methodology. The methodology the MDOT followed included:

Estimates of 2018 VMT were by interpolation of 2015 and 2025 VMT taken from the *Grand Rapids Metropolitan Area 8 hour Ozone Conformity Analysis*, May 2005.

Development of emissions factors using the EPA Mobile6.2 model.

**Development of 2018 VMT and Speeds**

To derive the VMT for year 2018 an average growth rate was determined for each scaled VMT by NFC from year 2015 to 2025. The 2015 and 2025 VMT and VHT were obtained from the above mentioned conformity document analysis. The growth rates by NFC were applied to the 2015 VMTs to achieve estimated VMTs in 2018. Then the VMTs by NFC are collapsed into four groups, to meet the requirements of Mobile6.2. These groups are: 1) rural interstate, 2) rural major & minor arterials/ collectors/local street s, 3) urban interstate/ freeway, and 4) urban principal & minor arterials/collectors/ local streets. The same procedures were applied to VHTs to determine year 2018 values. The modeled speeds were derived by dividing each grouped VMT by the equivalent grouped VHT. The scaled travel demand modeled VMTs and speeds for each county are summarized in Tables A.2.1 and A.2.2.

**Table A.2.1**
**Kent County Vehicle Miles of Travel and Speed**

| NFC | VMT 2015* | VMT 2018 | VMT 2025* | Speed 2015 | Speed 2018 | Speed 2025 |
|---|---|---|---|---|---|---|
| Rural Interstate/Freeway | 689,634 | **698,527** | 719,278 | 51.5 | **51.4** | 51.3 |
| Rural Major & Minor Arterial/Collector/ Local Street | 2,361,159 | **2,424,810** | 2,573,329 | 33.5 | **33.4** | 33.2 |
| Urban Interstate/Freeway | 3,751,887 | **3,803,993** | 3,925,574 | 48.5 | **48.6** | 48.4 |
| Urban Principal & Minor Arterial/ Collector/Local Street | 9,620,507 | **9,835,742** | 10,337,957 | 29.0 | **29.0** | 28.7 |
| Total | 16,423,187 | **16,763,072** | 17,556,138 | 33.3 | **33.2** | 32.0 |

*Source: Grand Rapids Metropolitan Area 8 hour Ozone Conformity Analysis, May 2005

**Table A.2.2**
**Ottawa County Vehicle Miles of Travel and Speed**

| NFC | VMT 2015* | VMT 2018 | VMT 2025* | Speed 2015 | Speed 2018 | Speed 2025 |
|---|---|---|---|---|---|---|
| Rural Interstate/Freeway | 1,469,733 | **1,525,004** | 1,653,972 | 64.8 | **64.4** | 63.7 |
| Rural Major & Minor Arterial/Collector/Local Street | 1,162,066 | **1,212,537** | 1,330,301 | 45.5 | **45.0** | 43.8 |
| Urban Interstate/Freeway | 436,911 | **445,099** | 464,205 | 63.3 | **64.1** | 65.9 |
| Urban Principal & Minor Arterial/Collector/Local Street | 3,187,429 | **3,264,114** | 3,443,047 | 35.5 | **34.9** | 33.7 |
| Total | 6,256,139 | **6,446,754** | 6,891,523 | 43.2 | **42.7** | 41.6 |

*Source: Grand Rapids Metropolitan Area 8 hour Ozone Conformity Analysis, May 2005

**Moble6.2 Inputs Assumptions**

Mobile6.2 calculates emission factors for eight individual vehicle types in two regions of the country. Mobile6.2 emission factor estimates depend on various conditions such as ambient temperatures, average travel speed, operating modes, fuel volatility, and mileage accrual rates. Many of the variables affecting vehicle emissions can be specified by the user.

A summary of critical Moble6.2 inputs assumptions are shown below:

1. Temperature:
   a. Ambient temperature = 86.8° F
   b. Maximum temperature = 95.0° F
   c. Minimum temperature = 65.0° F
2. The Reid Vapor Pressure (RVP) value = 9.0
3. Emission factors are based on an average day during the month of July.
4. Where speed values are above the maximum allowed modeling input (65MPH for freeway without ramps, and 60.8 for freeways with ramps), actual modeled speeds were truncated and entered into the model as the maximum allowed value.

**Mobile6.2 - Inputs**

The inputs to the Mobile6.2 emissions factor model are VMT and average speed by NFC grouped for year 2018, as shown in Tables A.2.1 – A.2.2.

**Mobile6.2 - Results**

Table A.2.3 provides the results of Mobile6.2 emissions.

**Table A.2.3**
**2018 Emissions by County in Tons per Day**

| | **Emissions in tons/day** | |
|---|---|---|
| **County** | **VOC** | **$NO_X$** |
| Kent | 9.8515 | 10.1908 |
| Ottawa | 3.5370 | 4.1934 |
| **Total Nonattainment Area** | **13.3885** | **14.3842** |

## A.3 Huron County - MI Air Quality Redesignation

MDOT prepared the on-highway motor vehicle emissions estimates using FHWA and the EPA approved methodology. The projects in Huron County were demonstrated to all be exempt, so an actual conformity analysis has not been calculated before this analysis.

### Air Quality Assessment Criteria

Huron County proportion of the STIP conformity determination findings were made in compliance with all applicable conformity requirements and have been determined to satisfy the following conformity criteria and procedures set forth in the EPA's Transportation Conformity Rule:

1. The determination was based on the latest planning assumptions.
2. The determination was based on the latest emission model available.
3. The determination was made according to the consultation procedures of the final conformity rule and the State Implementation Plan (SIP) conformity procedures.
4. Each project contained in the Huron County portion of the STIP was reviewed by the Interagency Work Group (IAWG), being consistent with the consultation procedures established in the SIP. During the review, a determination was made by the IAWG on each project as to whether it needed to be modeled or was exempt from emission modeling. It was determined that all projects were exempt from modeling.

### Modeling Procedures

The following describes the procedures used to estimate and analyze travel demand for the Huron County - MI Nonattainment Area. The MDOT developed socio-economic data for 2000 and 2018. These data are the basis for forecasting in the travel demand model, which in turn, generates the inputs required for the air quality analysis. These inputs are the amount of travel expressed as VMT and average speed by NFC by county. Individual NFCs by county are then grouped to provide the needed data structure required for the EPA's Mobile6.2.

Air quality conformity analysis must be performed on a countywide basis. In Huron County the MDOT statewide model is used to estimate travel. The VMT and speed data generated by the statewide model are scaled using county HPMS VMT figures to provide the basis for the estimation of present and future VMT and speeds by NFC for each county. The air quality analysis performed assumes that transportation projects are included in the milestone year they are presumed to be open to traffic.

MDOT developed and calibrated the travel demand model used in this analysis and it utilizes the standard four-step transportation modeling process.

1- Trip generation model
2- Trip distribution model
3- Mode choice model
4- Highway assignment model

### Statewide Travel Demand Model

The statewide model was developed in TransCAD and calibrated for year 2000. The model covers all counties of the state and includes NFC collectors and above, local roads are excluded.  Trip generation employs a cross classification lookup with trip rates developed from a combination of local models, National Cooperative Highway Research Program Report 187, Nationwide Personal Transportation Survey (NPTS), and Transportation Management Area (TMA) model trip generation rates.  The trip generation variables used in the model are households by three income groups and five size categories along with six categories of employment.  The trip distribution model uses a gravity model to estimate origin/destination tables.  The mode choice model converts person trips to vehicle trips by removing transit trips and applying auto occupancy factors, which are sensitive to the length of the trip (longer trips having higher occupancies).  The trip assignment model uses an all-or-nothing algorithm.  The model was calibrated according to the strict calibration standards used by the MDOT and suggested by FHWA.  The model includes 2,392 traffic analysis zones and the network is coded to provide as output VMT, VHT, and speeds by NFC.

**Highway Performance Monitoring System Data**

The EPA and the USDOT have both endorsed HPMS as the appropriate source of VMT estimates.  HPMS is the FHWA's annual program to collect roadway data in all 50 states to assess the condition of the highway system in terms of traffic congestion, accessibility, and pavement condition.  The FHWA requires counts to determine the area wide VMT for all urban areas.  The MDOT supplements the counts outside the urbanized area with additional counts in small cities, rural areas, and especially in rural areas of counties with nonattainment status.  These supplemental counts follow the same random selection procedures as those inside the urban areas.

The HPMS data used is from the MDOT's Universe file and is stratified by NFC.  The MDOT is currently undertaking a data improvement process to update the HPMS Universe, non-sample traffic data.

**Model VMT**

HPMS Universe data provides estimates of year 2000 for Huron County VMT stratified by NFC.  To maintain consistency between HPMS and modeled VMT and among the milestone years, the HPMS VMT, by NFC, (for the year the travel demand model was calibrated) is compared to the travel demand model's VMT, by NFC, (for the calibration year), producing scaling factors.  For each analysis year, these factors are multiplied to each travel demand model's VMT to produce a scaled VMT by NFC.  Since the statewide model does not have local roads the growth for local NFCs were assumed to parallel that of collectors.  The scaled VMTs by NFC are collapsed into four groups, to meet the requirements of Mobile6.2.  These groups are: 1) rural interstate, 2) rural major & minor arterials/collectors/local streets, 3) urban interstate/freeway, and 4) urban principal & minor arterials/collectors/ local streets.  This is done for all interim and future analysis years.  This same process was used to generate VHT.  The modeled speeds are derived by dividing each grouped VMT by the equivalent grouped VHT, except for local roads.  Speeds for local roads were estimated by average speed generated by the urban models that have modeled years close to the year being analyzed.  The scaled travel demand modeled VMTs and speeds are summarized in Table A.3.1.

**Table A.3.1**
**Huron County Vehicle Miles of Travel and Speed**

| NFC | HPMS 2000 | VMT 2018 | Speed 2000 | Speed 2018 |
|---|---|---|---|---|
| Rural Interstate/Freeway | 0 | 0 | 0 | 0 |
| Rural Major & Minor Arterial/ Collector/Local Street | 863,178 | 1,036,369 | 47.9 | 48.0 |
| Urban Interstate/Freeway | 0 | 0 | 0 | 0 |
| Urban Principal & Minor Arterial/Collector/Local Street | 0 | 0 | 0 | 0 |
| **Total** | **863,178** | **1,036,369** | **47.9** | **48.0** |

**Moble6.2 Inputs Assumptions**

Mobile6.2 calculates emission factors for eight individual vehicle types in two regions of the country. Mobile6.2 emission factor estimates depend on various conditions such as ambient temperatures, average travel speed, operating modes, fuel volatility, and mileage accrual rates. Many of the variables affecting vehicle emissions can be specified by the user.

A summary of critical Moble6.2 inputs assumptions are shown below:

1. Temperature:
   a. Ambient temperature = 86.8$^{o}$ F
   b. Maximum temperature = 95.0$^{o}$ F
   c. Minimum temperature = 65.0$^{o}$ F
2. The Reid Vapor Pressure (RVP) value = 9.0
3. Emission factors are based on an average day during the month of July.
4. Where speed values are above the maximum allowed modeling input (65MPH for freeway without ramps, and 60.8 for freeways with ramps), actual modeled speeds were truncated and entered into the model as the maximum allowed value.

**Mobile6.2 - Inputs**

The inputs to the Mobile6.2 emissions factor model are VMT and average speed by NFC grouped for year 2018, as shown in Table A.3.1.

**Mobile6.2 - Results**

Table A.3.2 provides the results of Mobile6.2 emissions.

**Table A.3.2**
**2018 Emissions by County in Tons per Day**

| County | Emissions in tons/day | |
|---|---|---|
| | VOC | $NO_X$ |
| Huron | 0.5518 | 0.6459 |
| **Total Nonattainment Area** | **0.5518** | **0.6459** |

## A.4 Kalamazoo-Battle Creek - MI Air Quality Redesignation

MDOT prepared the on-highway motor vehicle emissions estimates using FHWA and the EPA approved methodology. The methodology MDOT followed included:

Estimates of 2018 VMT were by interpolation of 2015 and 2025 VMT taken from the air quality conformity section of the *FY 2006-2008 Transportation Improvement Program Kalamazoo*, July 2005.

Development of emissions factors using the EPA Mobile6.2 model.

### Development of 2018 VMT and Speeds

To derive the VMT for year 2018 an average growth rate was determined for each scaled VMT by NFC from year 2015 to 2025. The 2015 and 2025 VMT and VHT were obtained from the above mentioned conformity document analysis. The growth rates by NFC were applied to the 2015 VMTs to achieve estimated VMTs in 2018. Then the VMTs by NFC are collapsed into four groups, to meet the requirements of Mobile6.2. These groups are: 1) rural interstate, 2) rural major & minor arterials/collectors/local streets, 3) urban interstate/freeway, and 4) urban principal & minor arterials/collectors/ local streets. The same procedures were applied to VHTs to determine year 2018 values. The modeled speeds were derived by dividing each grouped VMT by the equivalent grouped VHT. The scaled travel demand modeled VMTs and speeds for each county are summarized in Tables A.4.1 through A.4.3.

**Table A.4.1**
**Calhoun County Vehicle Miles of Travel and Speed**

| NFC | VMT 2015* | VMT 2018 | VMT 2025* | Speed 2015* | Speed 2018 | Speed 2025* |
|---|---|---|---|---|---|---|
| Rural Interstate/Freeway | 1,506,539 | **1,561,452** | 1,689,583 | 68.2 | **67.9** | 67.3 |
| Rural Major & Minor Arterial/Collector/Local Street | 1,213,654 | **1,255,196** | 1,352,125 | 46.0 | **45.9** | 45.7 |
| Urban Interstate/Freeway | 663,341 | **686,666** | 741,092 | 57.3 | **57.4** | 57.6 |
| Urban Principal & Minor Arterial/Collector/Local Street | 2,139,353 | **2,219,689** | 2,407,139 | 36.2 | **36.2** | 36.3 |
| Total | 5,522,887 | **5,723,002** | 6,189,939 | 46.4 | **46.3** | 46.3 |

*Source: FY 2006-2008 Transportation Improvement Program Kalamazoo, July, 2005

**Table A.4.2**
**Kalamazoo County Vehicle Miles of Travel and Speed**

| NFC | VMT 2015* | VMT 2018 | VMT 2025* | Speed 2015* | Speed 2018 | Speed 2025* |
|---|---|---|---|---|---|---|
| Rural Interstate/Freeway | 590,947 | **611,868** | 660,684 | 61.7 | **61.3** | 60.5 |
| Rural Major & Minor Arterial/Collector/Local Street | 1,806,474 | **1,892,491** | 2,093,196 | 43.2 | **42.9** | 42.2 |
| Urban Interstate/Freeway | 1,247,301 | **1,289,560** | 1,388,163 | 54.0 | **53.5** | 52.4 |
| Urban Principal & Minor Arterial/Collector/Local Street | 3,692,002 | **3,876,917** | 4,308,384 | 34.3 | **34.0** | 33.6 |
| Total | 7,336,724 | **7,670,836** | 8,450,427 | 40.3 | **39.9** | 39.3 |

*Source: FY 2006-2008 Transportation Improvement Program Kalamazoo, July, 2005

**Table A.4.3**
**Van Buren County Vehicle Miles of Travel and Speed**

| NFC | VMT 2015* | VMT 2018 | VMT 2025* | Speed 2015* | Speed 2018 | Speed 2025* |
|---|---|---|---|---|---|---|
| Rural Interstate/Freeway | 1,186,961 | **1,227,729** | 1,322,854 | 68.4 | **68.2** | 67.7 |
| Rural Major & Minor Arterial/Collector/Local Street | 1,751,710 | **1,808,718** | 1,941,738 | 46.4 | **46.3** | 46.1 |
| Urban Interstate/Freeway | 0 | **0** | 0 | 0 | **0** | 0 |
| Urban Principal & Minor Arterial/Collector/Local Street | 146,511 | **150,152** | 158,648 | 37.4 | **37.4** | 37.3 |
| Total | 3,085,182 | **3,186,599** | 3,423,240 | 52.3 | **52.2** | 52.0 |

*Source: FY 2006-2008 Transportation Improvement Program Kalamazoo, July, 2005

**Moble6.2 Inputs Assumptions**

Mobile6.2 calculates emission factors for eight individual vehicle types in two regions of the country. Mobile6.2 emission factor estimates depend on various conditions such as ambient temperatures, average travel speed, operating modes, fuel volatility, and mileage accrual rates. Many of the variables affecting vehicle emissions can be specified by the user.

A summary of critical Moble6.2 inputs assumptions are shown below:

1. Temperature:
   a. Ambient temperature = 86.8$^{o}$ F
   b. Maximum temperature = 95.0$^{o}$ F
      Minimum temperature = 65. 0$^{o}$ F
2. The Reid Vapor Pressure (RVP) value = 9.0
3. Emission factors are based on an average day during the month of July.
4. Where speed values are above the maximum allowed modeling input (65MPH for freeway without ramps, and 60.8 for freeways with ramps), actual modeled speeds were truncated and entered into the model as the maximum allowed value.

**Mobile6.2 - Inputs**

The inputs to the Mobile6.2 emissions factor model are VMT and average speed by NFC grouped for year 2018, as shown in Tables A.4.1 through A.4.3.

**Mobile6.2 - Results**

Table A.4.4 provides the results of Mobile6.2 emissions.

**Table A.4.4**
**2018 Emissions by County in Tons per Day**

| County | Emissions in tons/day | |
|---|---|---|
| | **VOC** | **$NO_X$** |
| Calhoun | 3.0859 | 3.8184 |
| Kalamazoo | 4.2745 | 4.7491 |
| Van Buren | 1.6761 | 2.1805 |
| **Total Nonattainment Area** | **9.0365** | **10.7480** |

## A.5 Lansing – E. Lansing - MI Air Quality Redesignation

MDOT prepared the on-highway motor vehicle emissions estimates using FHWA and the EPA approved methodology. The methodology MDOT followed included:

Estimates of 2018 VMT were by interpolation of 2015 and 2025 VMT taken from the air quality conformity section of the Lansing Metropolitan Nonattainment Area 8-Hour Ozone Conformity Analysis: Regional 2025 Transportation Plan & 2004-2006 Transportation Improvement Program, March 2005.

Development of emissions factors using the EPA Mobile6.2 model.

**Development of 2018 VMT and Speeds**

To derive the VMT for year 2018 an average growth rate was determined for each scaled VMT by NFC from year 2015 to 2025. The 2015 and 2025 VMT and VHT were obtained from the above mentioned conformity document analysis. The growth rates by NFC were applied to the 2015 VMTs to achieve estimated VMTs in 2018. Then the VMTs by NFC are collapsed into four groups, to meet the requirements of Mobile6.2. These groups are: 1) rural interstate, 2) rural major & minor arterials/collectors/local streets, 3) urban interstate/freeway, and 4) urban principal & minor arterials/collectors/ local streets. The same procedures were applied to VHTs to determine year 2018 values.

The modeled speeds were derived by dividing each grouped VMT by the equivalent grouped VHT. The scaled travel demand modeled VMTs and speeds for each county are summarized in Tables A.5.1 through A.5.3.

**Table A.5.1**
**Clinton County Vehicle Miles of Travel and Speed**

| NFC | VMT 2015* | VMT 2018 | VMT 2025* | Speed 2015* | Speed 2018 | Speed 2025* |
|---|---|---|---|---|---|---|
| Rural Interstate/Freeway | 834,416 | **880,791** | 989,000 | 58.7 | **57.2** | 54.4 |
| Rural Major & Minor Arterial/Collector/Local Street | 1,709,130 | **1,771,116** | 1,915,749 | 49.3 | **49.1** | 48.8 |
| Urban Interstate/Freeway | 551,078 | **574,644** | 629,632 | 56.8 | **56.6** | 56.3 |
| Urban Principal & Minor Arterial/Collector/Local Street | 498,901 | **514,671** | 551,466 | 40.5 | **40.3** | 39.8 |
| Total | 3,593,525 | **3,741,221** | 4,085,846 | 50.7 | **50.3** | 49.5 |

*Source: Lansing Metropolitan Nonattainment Area 8 Hour Ozone Conformity Analysis: Regional 2025 Transportation Plan & 2004-2006 Transportation Improvement Program, March 2005

**Table A.5.2**
**Eaton County Vehicle Miles of Travel and Speed**

| NFC | VMT 2015* | VMT 2018 | VMT 2025* | Speed 2015* | Speed 2018 | Speed 2025* |
|---|---|---|---|---|---|---|
| Rural Interstate/Freeway | 633,277 | **665,443** | 740,498 | 60.5 | **60.3** | 60.0 |
| Rural Major & Minor Arterial/Collector/Local Street | 1,153,968 | **1,193,062** | 1,284,282 | 45.0 | **44.9** | 44.7 |
| Urban Interstate/Freeway | 909,974 | **944,253** | 1,024,240 | 54.1 | **54.0** | 53.8 |
| Urban Principal & Minor Arterial/Collector/Local Street | 865,342 | **883,957** | 927,392 | 39.6 | **39.6** | 39.4 |
| Total | 3,562,560 | **3,686,715** | 3,976,412 | 47.6 | **47.6** | 47.5 |

*Source: Lansing Metropolitan Nonattainment Area 8 Hour Ozone Conformity Analysis: Regional 2025 Transportation Plan & 2004-2006 Transportation Improvement Program, March 2005

**Table A.5.3**
**Ingham County Vehicle Miles of Travel and Speed**

| NFC | VMT 2015* | VMT 2018 | VMT 2025* | Speed 2015* | Speed 2018 | Speed 2025* |
|---|---|---|---|---|---|---|
| Rural Interstate/Freeway | 1,093,535 | **1,140,422** | 1,249,824 | 57.5 | **56.3** | 54.0 |
| Rural Major & Minor Arterial/Collector/Local Street | 1,467,332 | **1,525,943** | 1,662,704 | 47.6 | **47.4** | 47.1 |
| Urban Interstate/Freeway | 1,131,615 | **1,155,522** | 1,211,305 | 47.0 | **46.7** | 46.2 |
| Urban Principal & Minor Arterial/Collector/Local Street | 3,926,653 | **4,017,210** | 4,228,510 | 31.4 | **31.1** | 30.5 |
| Total | 7,619,135 | **7,839,097** | 8,352,342 | 38.3 | **38.0** | 37.4 |

*Source: Lansing Metropolitan Nonattainment Area 8 Hour Ozone Conformity Analysis: Regional 2025 Transportation Plan & 2004-2006 Transportation Improvement Program, March 2005

**Moble6.2 Inputs Assumptions**

Mobile6.2 calculates emission factors for eight individual vehicle types in two regions of the country. Mobile6.2 emission factor estimates depend on various conditions such as ambient temperatures, average travel speed, operating modes, fuel volatility, and mileage accrual rates. Many of the variables affecting vehicle emissions can be specified by the user.

A summary of critical Moble6.2 inputs assumptions are shown below:

1. Temperature:
   a. Ambient temperature = 86.8$^{o}$ F
   b. Maximum temperature = 95.0$^{o}$ F
      Minimum temperature = 65.0$^{o}$ F
2. The Reid Vapor Pressure (RVP) value = 9.0
3. Emission factors are based on an average day during the month of July.
4. Where speed values are above the maximum allowed modeling input (65 MPH for freeway without ramps, and 60.8 for freeways with ramps), actual modeled speeds were truncated and entered into the model as the maximum allowed value.

**Mobile6.2 - Inputs**

The inputs to the Mobile6.2 emissions factor model are VMT and average speed by NFC grouped for year 2018, as shown in Tables A.5.1 – A.5.3.

**Mobile6.2 - Results**

Table A.5.4 provides the results of Mobile6.2 emissions.

**Table A.5.4**
**2018 Emissions by County in Tons per Day**

| **County** | **Emissions in tons/day** | |
|---|---|---|
| | **VOC** | **$NO_X$** |
| Clinton | 1.9734 | 2.4548 |
| Eaton | 1.9705 | 2.3934 |
| Ingham | 4.4296 | 4.8425 |
| **Total Nonattainment Area** | **8.3735** | **9.6907** |

## A.6 Mason County - MI Air Quality Redesignation

MDOT prepared the on-highway motor vehicle emissions estimates using FHWA and the EPA approved methodology. The projects in Mason County were demonstrated to all be exempt, so an actual conformity analysis has not been calculated before this analysis.

**Air Quality Assessment Criteria**

Mason County proportion of the STIP conformity determination findings were made in compliance with all applicable conformity requirements and have been determined to satisfy the following conformity criteria and procedures set forth in the EPA's Transportation Conformity Rule:

1. The determination was based on the latest planning assumptions.
2. The determination was based on the latest emission model available.
3. The determination was made according to the consultation procedures of the final conformity rule and the State Implementation Plan (SIP) conformity procedures.
4. Each project contained in the Mason County portion of the STIP was reviewed by the Interagency Work Group (IAWG), being consistent with the consultation procedures established in the SIP. During the review, a determination was made by the IAWG on each project as to whether it needed to be modeled or was

exempt from emission modeling. It was determined that all projects were exempt from modeling.

**Modeling Procedures**

The following describes the procedures used to estimate and analyze travel demand for the Mason County - MI Nonattainment Area. The MDOT developed socio-economic data for 2000 and 2018. These data are the basis for forecasting in the travel demand model which, in turn, generates the inputs required for the air quality analysis. These inputs are the amount of travel expressed as VMT and average speed by NFC by county. Individual NFCs by county are then grouped to provide the needed data structure required for EPA's Mobile6.2.

Air quality conformity analysis must be performed on a countywide basis. In Mason County the MDOT statewide model is used to estimate travel. The VMT and speed data generated by the statewide model are scaled using county HPMS VMT figures to provide the basis for the estimation of present and future VMT and speeds by NFC for each county. The air quality analysis performed assumes that transportation projects are included in the milestone year they are presumed to be open to traffic.

The MDOT developed and calibrated the travel demand model used in this analysis and it utilizes the standard four-step transportation modeling process.

1- Trip generation model
2- Trip distribution model
3- Mode choice model
4- Highway assignment model

**Statewide Travel Demand Model**

The statewide model was developed in TransCAD and calibrated for year 2000. The model covers all counties of the state and includes NFC collectors and above, local roads are excluded. Trip generation employs a cross classification lookup with trip rates developed from a combination of local models, National Cooperative Highway Research Program Report 187, Nationwide Personal Transportation Survey (NPTS), and Transportation Management Area (TMA) model trip generation rates. The trip generation variables used in the model are households by three income groups and five size categories along with six categories of employment. The trip distribution model uses a gravity model to estimate origin/destination tables. The mode choice model converts person trips to vehicle trips by removing transit trips and applying auto occupancy factors, which are sensitive to the length of the trip (longer trips having higher occupancies). The trip assignment model uses an all-or-nothing algorithm. The model was calibrated according to the strict calibration standards used by the MDOT and suggested by FHWA. The model includes 2,392 traffic analysis zones and the network is coded to provide as output VMT, VHT, and speeds by NFC.

**Highway Performance Monitoring System Data**

The EPA and the USDOT have both endorsed HPMS as the appropriate source of VMT estimates. HPMS is the FHWA's annual program to collect roadway data in all 50 states to assess the condition of the highway system in terms of traffic congestion, accessibility, and pavement condition. The FHWA requires counts to determine the area wide VMT for all urban areas. The MDOT supplements the counts outside the urbanized area with additional counts in small cities, rural areas, and especially in rural areas of counties with nonattainment status. These supplemental counts follow the same random selection procedures as those inside the urban areas.

The HPMS data used is from the MDOT's Universe file and is stratified by NFC. The MDOT is currently undertaking a data improvement process to update the HPMS Universe, non-sample traffic data.

**Model VMT**

HPMS Universe data provides estimates of year 2000 for Mason County VMT stratified by NFC. To maintain consistency between HPMS and modeled VMT and among the milestone years, the HPMS VMT, by NFC, (for the year the travel demand model was calibrated) is compared to the travel demand model's VMT, by NFC, (for the calibration year), producing scaling factors. For each analysis year, these factors are multiplied to each travel demand model's VMT to produce a scaled VMT by NFC. Since the statewide model does not have local roads the growth for local NFCs were assumed to parallel that of collectors. The scaled VMTs by NFC are collapsed into four groups, to meet the requirements of Mobile6.2. These groups are: 1) rural interstate, 2) rural major & minor arterials/collectors/local streets, 3) urban interstate/ freeway, and 4) urban principal & minor arterials/collectors/ local streets. This is done for all interim and future analysis years. This same process was used to generate VHT. The modeled speeds are derived by dividing each grouped VMT by the equivalent grouped VHT, except for local roads. Speeds for local roads were estimated by average speed generated by the urban models that have modeled years close to the year being analyzed. The scaled travel demand modeled VMTs and speeds are summarized in Table A.6.1.

**Table A.6.1**
**Mason County Vehicle Miles of Travel and Speed**

| NFC | HPMS 2000 | VMT 2018 | Speed 2000 | Speed 2018 |
|---|---|---|---|---|
| Rural Interstate/Freeway | 0 | 0 | 0 | 0 |
| Rural Major & Minor Arterial/Collector/Local Street | 529,071 | 656,810 | 50.7 | 50.1 |
| Urban Interstate/Freeway | 0 | 0 | 0 | 0 |
| Urban Principal & Minor Arterial/Collector/Local Street | 133,084 | 156,511 | 40.8 | 40.6 |
| **Total** | **662,154** | **813,321** | **48.3** | **47.9** |

**Moble6.2 Inputs Assumptions**

Mobile6.2 calculates emission factors for eight individual vehicle types in two regions of the country. Mobile6.2 emission factor estimates depend on various conditions such as ambient temperatures, average travel speed, operating modes, fuel volatility, and mileage accrual rates. Many of the variables affecting vehicle emissions can be specified by the user.

A summary of critical Moble6.2 inputs assumptions are shown below:

1. Temperature:
   a. Ambient temperature = 86.8$^o$ F
   b. Maximum temperature = 95.0$^o$ F
   c. Minimum temperature = 65.0$^o$ F
2. The Reid Vapor Pressure (RVP) value = 9.0
3. Emission factors are based on an average day during the month of July.
4. Where speed values are above the maximum allowed modeling input (65MPH for freeway without ramps, and 60.8 for freeways with ramps), actual modeled speeds were truncated and entered into the model as the maximum allowed value.

**Mobile6.2 - Inputs**

The inputs to the Mobile6.2 emissions factor model are VMT and average speed by NFC grouped for year 2018, as shown in Table A.6.1.

**Mobile6.2 - Results**

Table A.6.2 provides the results of Mobile6.2 emissions.

**Table A.6.2**
**2018 Emissions by County in Tons per Day**

| **County** | **Emissions in tons/day** | |
|---|---|---|
| | **VOC** | **$NO_X$** |
| Mason | 0.4330 | 0.5088 |
| **Total Nonattainment Area** | **0.4330** | **0.5088** |

# APPENDIX B

*Public Hearing Record*

**State of Michigan**

**Department of Environmental Quality**

**Air Quality Division**

**PROPOSED REDESIGNATION TO ATTAINMENT AND REVISION TO**

**THE MICHIGAN STATE IMPLEMENTATION PLAN**

**FOR THE 8-HOUR OZONE NATIONAL AMBIENT AIR QUALITY STANDARD**

**FOR INGHAM, EATON, CLINTON, KENT, OTTAWA, KALAMAZOO, CALHOUN,**

**VAN BUREN, HURON, MASON, AND BENZIE COUNTIES**

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

## NOTICE OF PUBLIC HEARING
## DEPARTMENT OF ENVIRONMENTL QUALITY
## AIR QUALITY DIVISION

### OZONE REDESIGNATION PETITION AND MAINTENANCE PLAN

The Michigan Department of Environmental Quality (MDEQ) has prepared a proposal for a redesignation petition and maintenance plan for 11 Michigan counties in association with the 8-hour National Ambient Air Quality Standards (NAAQS) for ozone. At the conclusion of the 2004 ozone season, all monitors in 11 nonattainment counties measured air quality that meets the NAAQS for ozone. The MDEQ plans to submit the redesignation petition and maintenance plan for Ingham, Eaton, Clinton, Kent, Ottawa, Van Buren, Kalamazoo, Calhoun, Huron, Benzie, and Mason counties to the U.S. Environmental Protection Agency to formally request that the 11 counties be redesignated to attainment and classified as "maintenance" under the 8-hour NAAQS for ozone.

A public hearing will be held at 11:00 a.m. on Tuesday, April 18, 2006, at the Constitution Hall, Con-Con Conference Room, 525 West Allegan Street, Lansing, Michigan.

Copies of the proposed redesignation petition and maintenance plan can be viewed on the Internet at http://www.michigan.gov/deqair under "Announcements." The proposed document can also be reviewed and copied at the following locations:

- CADILLAC: MDEQ, Cadillac District Office, 120 West Chapin Street.
- KALAMAZOO: MDEQ, Kalamazoo District Office, 7953 Adobe Road.
- KENTWOOD: MDEQ, Grand Rapids District Office, 4460 44th Street SE.
- LANSING: MDEQ, Air Quality Division, Constitution Hall, 3RD floor North, 525 West Allegan Street.

All interested persons are invited to attend the public hearing or provide written comment on the proposed redesignation petition and maintenance plan. It is requested that all statements be submitted in writing for the hearing record. Written comments must be received by 5:00 p.m. on April 19, 2006. Comments may be mailed, faxed, or emailed to the following:

Attention: Mary Maupin
MDEQ - Air Quality Division
P.O. Box 30260
Lansing, Michigan 48909
Fax: (517) 241-7499
Email: maupinm@michigan.gov

Persons needing accommodations for effective participation in the meeting should contact the Air Quality Division at 517-241-9059 one week in advance to request mobility, visual, hearing or other assistance.

G. Vinson Hellwig, Chief
Air Quality Division

CONSTITUTION HALL • 525 WEST ALLEGAN STREET • P.O. BOX 30260 • LANSING, MICHIGAN 48909-7760
www.michigan.gov • (517) 373-7023

# HURON DAILY TRIBUNE





NOTICE OF PUBLIC HEARING
DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
OZONE REDESIGNATION PETITION AND MAINTENANCE PLAN

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G. Vinson Hellwig, Chief
Air Quality Division
3/3/2006

3-50 St. MI Environmental Quality 068619

STATE OF MICHIGAN
County of Ingham } ss

**NOTICE OF PUBLIC HEARING**
**DEPARTMENT OF ENVIRONMENTAL QUALITY**
**AIR QUALITY DIVISION**

**OZONE REDESIGNATION PETITION AND MAINTENANCE PLAN**

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G. Vinson Hellwig, Chief
Air Quality Division

3-50

LYNN A. REIK ..., being duly sworn, deposes and says, that he is Foremen to the printer of

**Lansing State Journal**

a newspaper printed, published and circulated in the County of Ingham, and that the annexed notice has been published in said paper ... Friday ... 3/17/06 ...
and that the first publication thereof was on the ... 17th ... day of ... March ... in the year ... 2006 ...

Lynn A. Reik

Sworn and subscribed to before me this ... 24th ... day of ... March ... A.D., 2006 ...

LEN
of Michigan
nton
Mar. 30, 2011
Ingham

[signature]
Notary Public for Ingham County, Michigan

13558
mi D.E.Q.

# AFFIDAVIT OF PUBLICATION

**STATE OF MICHIGAN**
**County of Grand Traverse**

**LEGAL NOTICE**
NOTICE OF PUBLIC HEARING
DEPARTMENT OF ENVIRONMENTL QUALITY
AIR QUALITY DIVISION
OZONE REDESIGNATION PETITION
AND MAINTENANCE PLAN

The Michigan Department of Environmental Quality (MDEQ) has prepared a proposal for a redesignation petition and maintenance plan for 11 Michigan counties in association with the 8-hour National Ambient Air Quality Standards (NAAQS) for ozone. At the conclusion of the 2004 ozone season, all monitors in 11 nonattainment counties measured air quality that meets the NAAQS for ozone. The MDEQ plans to submit the redesignation petition and maintenance plan for Ingham, Eaton, Clinton, Kent, Ottawa, Van Buren, Kalamazoo, Calhoun, Huron, Benzie, and Mason counties to the U.S. Environmental Protection Agency to formally request that the 11 counties be redesignated to attainment and classified as "maintenance" under the 8-hour NAAQS for ozone.

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G. Vinson Hellwig, Chief
Air Quality Division
March 17, 2006-1T

**Michael C. Nau being duly sworn deposes and says the annexed printed copy of notice was taken from the Traverse City RECORD-EAGLE, a newspaper printed and circulated in said State and County, and that said notice was published in said newspaper on the following dates:**

Mar 17, 2006
________________
________________

**that he or she is the agent of the printers of said newspaper, and knows well the facts stated herein**

[signature]

**Subscribed and sworn to before this** 17th **day of** Mar **20**06

E. Dolores Eikey

**E. Dolores Eikey**
**Notary Public, State of MI**
**County of Grand Traverse**
**My Commission Expires September 14, 2011**
**Acting in County of Grand Traverse**

Q/Press/Affidavit

**THE GRAND RAPIDS**
# PRESS

Be someone who gets it.

**STATE OF MICHIGAN,**
**COUNTY OF KENT } SS.**

The Advertising Director of THE GRAND RAPIDS, PRESS , a newspaper published in the County of Kent, and circulated throughout West Michigan, being duly sworn, deposes and says that the following advertising was inserted.

## NOTICE OF PUBLIC HEARING DEPARTMENT OF ENVIRONMENTAL QUALITY AIR QUALITY DIVISION

## OZONE REDESIGNATION PETITION AND MAINTENANCE PLAN

The Michigan Department of Environmental Quality (MDEQ) has prepared a proposal for a redesignation petition and maintenance plan for 11 Michigan counties in association with the 8-hour National Ambient Air Quality Standards (NAAQS) for ozone. At the conclusion of the 2004 ozone season, all monitors in 11 nonattainment counties measured air quality that meets the NAAQS for ozone. The MDEQ plans to submit the redesignation petition and maintenance plan for Ingham, Eaton, Clinton, Kent, Ottawa, Van Buren, Kalamazoo, Calhoun, Huron, Benzie, and Mason counties to the U.S. Environmental Protection Agency to formally request that the 11 counties be redesignated to attainment and classified as "maintenance" under the 8-hour NAAQS for ozone.

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G. Vinson Hellwig, Chief
Air Quality Division

3/9/2006 1213990-01

March 17, 2006

Stev S. Westphal

Advertising Director

Sworn and subscribed before me this 17th day of

March A.D. 2006

Monika R. Daukste-Strautnieks

NOTARY PUBLIC, KENT COUNTY, MI

My commission expires:

MONIKA R. DAUKSTS-STRAUTNIEKS
Notary Public, State of Michigan
County of Kent
My Commission Expires July 27, 2012
Acting in the County of Kent

## PUBLIC HEARING ATTENDANCE

**Constitution Hall Building**
**Con-Con Room**
**525 W. Allegan, Lansing, Michigan**
**April 18, 2006**

| | |
|---|---|
| **MDEQ:** | **G. Vinson Hellwig, Division Chief** |
| | **Marion Hart, Hearing Officer** |
| | **John Schroeder** |
| | **Mary Maupin** |
| **MDOT:** | **Donna Wittl** |
| | **Peter Porciello** |
| **Others Present:** | **Lou Pocalujka, Consumers Energy** |
| **Hearing Comments:** | **none** |
| **Written Comments:** | **EPA** |
| | **Gun Lake Tribe** |
| | **Michigan Sugar Company** |
| | **Little River Band of Ottawa Indians** |

## Summary of Comments Submitted and MDEQ Response

COMMENT FROM EPA: There are errors in the maintenance plan emission inventory totals and conformity budget totals.

RESPONSE: Maintenance emission inventory totals have been changed based on adjustments that LADCO made to their base K inventories. Most of these changes were minor, except for a fairly major reduction to the EGU emissions total in Ottawa County based on updated information provided to LADCO by Consumers Energy. Changes to the body of the document can be easily identified by the bolded font. Additionally, the conformity budgets were recalculated and corrections made.

COMMENT FROM EPA: The maintenance plan does not contain motor vehicle emission budgets for Huron, Benzie, and Mason Counties.

RESPONSE: Conformity budgets were added for Huron, Benzie, and Mason Counties, even though the MDEQ has requested an EPA determination of "insignificant motor vehicle emissions" for these counties.

COMMENT FROM EPA: In order to pursue a determination of "insignificant motor vehicle emissions" for Huron, Benzie, and Mason Counties, the MDEQ should provide, at a minimum, a more comprehensive analysis of the contribution and role of local versus transported emissions with respect to each county's ozone levels.

RESPONSE: The MDEQ is not in agreement that more analysis is needed on the role of local versus transported emissions for the West Michigan counties of Mason and Benzie. Extensive modeling of the effects of transported ozone on the Lake Michigan shoreline monitors has been conducted through LADCO, and the EPA has participated fully in every step of LADCO's work. In fact, since 1990 the EPA has provided more than $17 million to LADCO for work that included the Lake Michigan Ozone Study, and follow-up analysis. These analyses unequivocally demonstrated that West Michigan shoreline monitors are <u>overwhelmed</u> by ozone forming over the lake from emissions generated in upwind states. The MDEQ does not believe that redundant submittals of modeling showing the level of ozone transport should be a prerequisite every time the MDEQ asserts that transport is the predominate source of ozone levels measured at the shoreline monitors.

Further, the MDEQ believes that this comment exemplifies the need for the EPA to follow though on the Western Michigan Ozone Demonstration Project mandated in Section 996 of the Energy Policy Act of 2005. The results of such a study authored by the EPA should definitely settle the agency's view on the overwhelming ozone transport in the Lake Michigan region. The MDEQ urges the EPA to address all of the West Michigan shoreline instead of limiting the geographic area to Southwest Michigan.

One might say that the EPA has been negligent in its failure to differentiate between overwhelming ozone transport and the more common regional transport in both policy and actions over the past decade. The EPA has gone to great lengths to develop policy and rules to address the generalized regional transport of ozone affecting nonattainment areas in the Northeast states. Meanwhile, the EPA fails to act with any consistency on the overwhelming ozone transport issue faced by West Michigan, even though the EPA has publicly acknowledged that incoming ozone levels have exceeded 100 parts per billion at monitor sites located near the Lake Michigan shoreline.

The MDEQ agrees that less analysis has been done on the transport impacts on Huron County, although clearly the area is affected by lake impacts similar to those experienced by Door County, Wisconsin.

These counties do not have major interstate roadways, have low population and emission levels, and onroad mobile source emissions are projected to be extremely insignificant in 2018. Does the EPA truly believe that the expenditure of public money for transportation conformity analyses for Huron, Benzie, and Mason Counties is a vital air quality safeguard for these rural communities?

COMMENT FROM GUN LAKE TRIBE: The attainment monitoring criteria for redesignation leads to situations where common sense in interpretation of data is lacking. Allegan County, although not a big emitter of ozone precursor pollutants, does not qualify for redesignation, while nearby counties, such as Ottawa, do. The criteria relied upon for designation and redesignation criteria leads to punishing areas that have shoreline monitors.

RESPONSE: Allegan County has one monitor located in the city of Holland, near the Lake Michigan shoreline. This monitor does not show attainment of the 8-hour ozone standard at this time. A data table for the Holland monitor is included below. Areas must have a 3-year average meeting 0.08 ppm to qualify as attainment.

The MDEQ is in agreement with the Gun Lake Tribe about the irrational scenario set up by the attainment/nonattainment provisions in the Clean Air Act, and the practical interpretation of these provisions by the federal agency. The city of Holland straddles Allegan and Ottawa Counties. Ottawa qualifies for redesignation and Allegan does not. Ottawa has a larger population and more emissions than Allegan. The crucial difference is that the monitor for Ottawa County is further inland from the lake than the monitor in Allegan County. Therefore, it is less impacted by overwhelming ozone transport. Ozone formation is amplified by the effects of the lake on the air mass traversing 40-50 miles of water. Ozone concentrations begin to dissipate as the air mass moves a distance across land. If Ottawa County had a second monitor closer to the shore that was not attaining, Ottawa County and Kent County would be disqualified from redesignation. It is the EPA's policy not to split areas for purposes of redesignation, whether or not local emissions affect ozone levels in that area. Van Buren County is also a shoreline area and is adjacent to Allegan County. There is no monitor in Van Buren County. This county was designated as nonattainment because the EPA considers it to be part of the Kalamazoo area. The monitor in Kalamazoo, which is also further inland, is now attaining the ozone standard; thus Van Buren County is also qualified to be redesignated. This disparate situation does lead to inequitable treatment of Allegan County in the form of mandatory measures to constrict growth throughout the county.

There are many schools of thought about the treatment of the counties bordering Lake Michigan. It is the opinion of some that all of the counties should have been designated nonattainment whether or not a monitor was sited in the county. Others believe that the EPA should have exempted the shoreline counties from a nonattainment designation in the first place because of ozone transport. Still others believe that the EPA should have designated only portions of these counties to reflect that only the near-shore areas have high concentrations of ozone. The EPA refused to designate subcounty ozone nonattainment areas in Michigan.

The shoreline monitors were first placed in every other county along the shoreline to aid in the development of scientific knowledge about the formation and transport of ozone in the Lake Michigan region. An extensive research project, the Lake Michigan Ozone Study, was conducted in the early 1990s. A photochemical model was developed to replicate ozone formation in the region. Modeling was submitted to the EPA showing that Michigan's shoreline communities are being overwhelmingly impacted by transport. Zero-out modeling showed that completely eliminating all local emissions in shoreline communities would not result in lower ozone levels at those monitors. Still, the EPA has not adjusted its policies or interpretations to apply the acquired scientific knowledge to the treatment of communities along Lake Michigan. The latest amendments to the Clean Air Act in 1990 impose the presumption that nonattainment areas are culpable for their own ozone levels and responsible for reducing their local emissions to reach attainment. Penalties and growth restrictions are mandated in the law.

The MDEQ would encourage the Gun Lake Tribe and all other interested parties to provide comments to the EPA on its March 27, 2006 proposed overwhelming ozone transport classification for 8-hour ozone nonattainment areas. Comments must be received by May 12, 2006. As proposed, Allegan County would not be eligible for an overwhelming ozone transport classification, even though evidence of this overwhelming transport is clear.

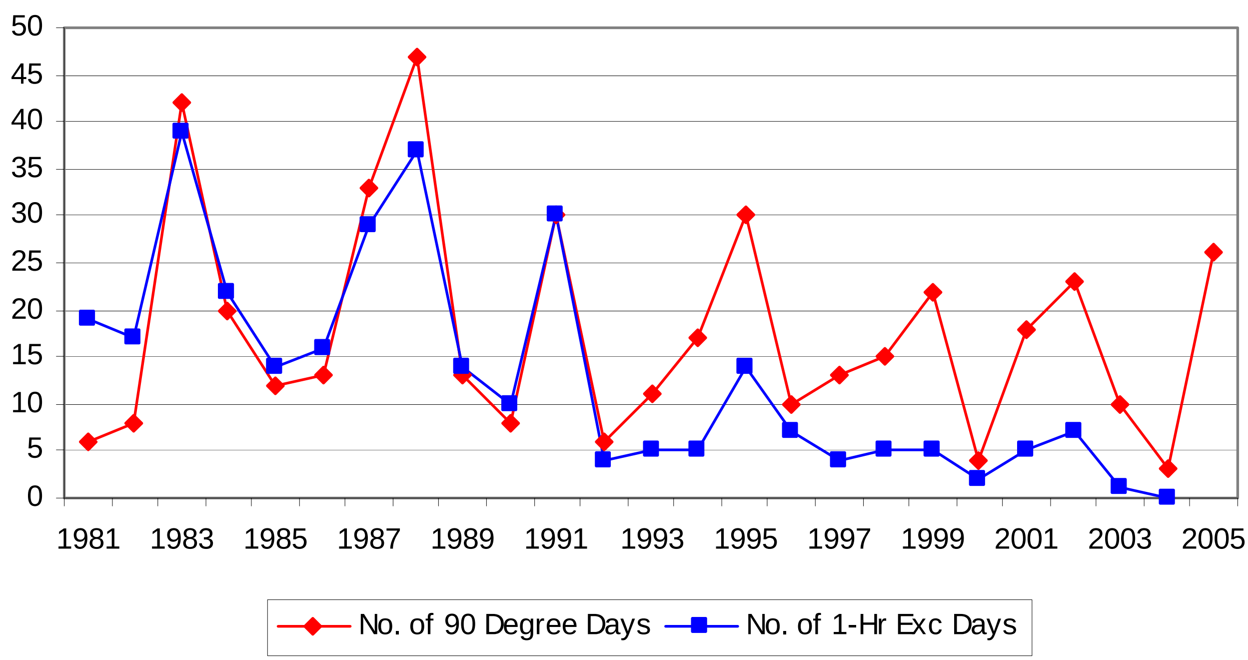
| | | | | **4th Highest*** | **Design Value Site *** | **Rounded to 2 Decimals Site**** |
|---|---|---|---|---|---|---|
| **Site** | **AirsID** | **POC** | **Year** | **8HrMax, ppm** | **Avg, ppm** | **Avg, ppm** |
| Holland | 260050003 | 1 | 1992 | 0.058 | 8-25-92 sampling began | |
| Holland | 260050003 | 1 | 1993 | 0.081 | | |
| Holland | 260050003 | 1 | 1994 | 0.092 | | |
| Holland | 260050003 | 1 | 1995 | 0.110 | **0.094** | **0.09** |
| Holland | 260050003 | 1 | 1996 | 0.090 | **0.097** | **0.10** |
| Holland | 260050003 | 1 | 1997 | 0.095 | **0.098** | **0.10** |
| Holland | 260050003 | 1 | 1998 | 0.097 | **0.094** | **0.09** |
| Holland | 260050003 | 1 | 1999 | 0.091 | **0.094** | **0.10** |
| Holland | 260050003 | 1 | 2000 | 0.080 | **0.089** | **0.09** |
| Holland | 260050003 | 1 | 2001 | 0.092 | **0.088** | **0.09** |
| Holland | 260050003 | 1 | 2002 | 0.105 | **0.092** | **0.09** |
| Holland | 260050003 | 1 | 2003 | 0.095 | **0.097** | **0.10** |
| Holland | 260050003 | 1 | 2004 | 0.079 | **0.093** | **0.09** |
| Holland | 260050003 | 1 | 2005 | 0.094 | **0.089** | **0.09** |

COMMENT FROM LITTLE RIVER BAND OF OTTAWA INDIANS: The tribe urges the MDEQ not to petition the EPA to redesignate these counties, especially Mason and Benzie, because the data are misleading and redesignation would be premature. Weather has a larger effect on yearly ozone levels than control efforts, and 2004 ozone levels were abnormally low due to weather.

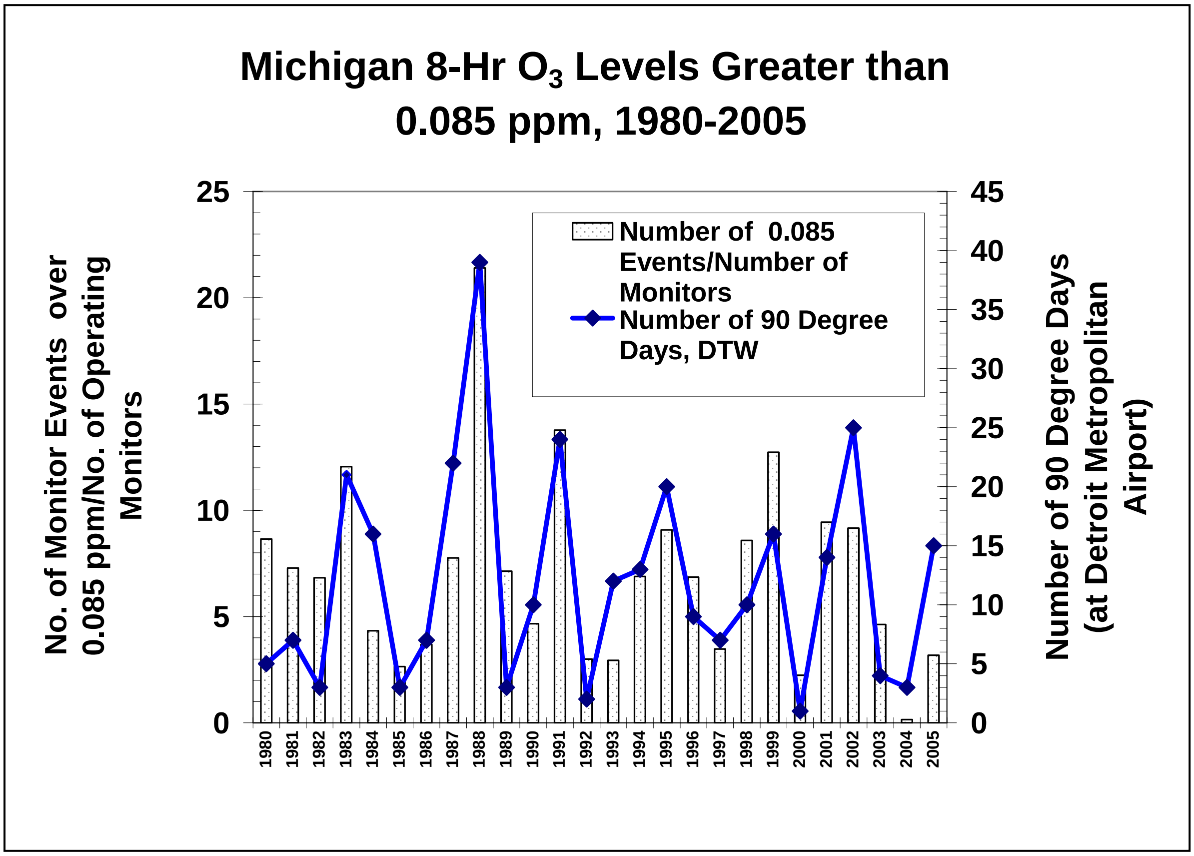
RESPONSE: Meteorology does influence the frequency and magnitude of peak ozone concentrations. Weather plays a role in the formation of ozone through such variables as the amount of sunlight, temperature, and incidence of air mass stagnation. Meteorology also is a key factor in the amount of emissions from certain sources, such as recreational boating, vegetation (biogenics), and power plants. Peak demand for electricity due to air conditioner usage is linked to temperature and humidity conditions. Regional power plant emissions contribute to ozone levels monitored in Benzie and Mason Counties even though demand for air conditioning is relatively low in Northern Michigan.

The ozone NAAQS was designed to be a robust standard. The rolling 3-year average form of the standard provides stability from year-to-year variability in meteorology. A 3-year time period to determine attainment is consistent with a 3-year time period that was considered in designating nonattainment areas. It is true that ambient temperatures and ozone levels were lower during 2004 than in many previous years. It is also true that 2005 had more typical summer weather in the region yet all 11 counties continued to attain the ozone standard for 2003-2005, as they did for the period 2002-2004. Ozone levels in the region are declining, especially in recent years, relative to the number of days when temperatures exceeded 90 degrees Fahrenheit, as depicted in the charts below.

Lake Michigan Region 1-Hour Ozone and 90° Day Chart, 1980-2005




Source: LADCO




Source: MDEQ

Ozone precursor emissions have declined both in Michigan and in upwind states. Emissions will continue to decline in future years as described in this petition. The MDEQ expects the trend in ozone levels to continue an overall decline in future years. If a violation of the ozone NAAQS should occur after an area is redesignated to attainment, the maintenance plan provisions are designed to address that scenario. Contingency measures to promptly reduce emissions will be implemented in affected areas.

COMMENT FROM MICHIGAN SUGAR COMPANY: Support is given for the ozone redesignation to attainment for Huron County.

LETTERS RECEIVED ON PROPOSED REDESIGNATION

Mary,
I have reviewed with dismay the redesignation proposal for the 11 counties to be included. My concern stems from the fact that Allegan County is NOT listed for redesignation while virtually all counties surrounding Allegan have been listed. The proposal on the website provides the monitoring results upon which the MDEQ recommendation is based. Can you please make that monitoring data available to us for Allegan County? I will need to report to our Tribal Council and want to have the appropriate materials to do so.

As you know, the monitor for Allegan is located in the extreme northwest corner of the county, less than 1/10 of a mile south of Ottawa County and very close to Lake Michigan. If the data illustrate that the Allegan County monitor has exceeded limits, I find it curious that an area less than 1/10 of a mile away remains capable of meeting the redesignation criteria especially when the prevailing winds are from the southwest! Science allows us to gather relatively precise data, which provides a wonderful tool to use. But with this comes an obligation to use common sense in the interpretation of data. If Allegan has levels that are too high, Ottawa almost certainly will as well. If we can not afford to provide as many monitors as we would like to see for more accurate measurements, we need to stop punishing this that have monitors present under extenuating circumstances. With the lack of industrial sites in Allegan, a small population and no extreme major highway traffic counts in the western half of the county, it is most difficult to assume the area is not suitable for redesignation. There are over 400 miles of dirt roads in Allegan County and most of them see only seasonal traffic.

I will look forward to your reply.
Mike

Michael Tenenbaum
Environmental Coordinator
Gun Lake Tribe
1743 142nd Ave. P. O. Box 218
Dorr, MI 49323
(616) 681-8830 (phn)
(616) 681-8836 (FAX)
mbtenenbaum@mbpi.org

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

APR 12 2006

REPLY TO THE ATTENTION OF:
(AR-18J)

Mary Maupin
Air Quality Division
Michigan Department of Environmental Quality
P.O. Box 30260
Lansing, MI 48909

Dear Ms. Maupin:

Thank you for providing us with a copy of the Michigan's proposed state implementation plan revision consisting of a request to redesignate 11 Michigan counties to attainment for the 8-hour ozone standard and the associated maintenance plan for these areas. We appreciate the opportunity to provide comments on the document. Our most significant comment relates to the transportation conformity portion of your submittal.

In general, maintenance plans establish Motor Vehicle Emissions Budgets (MVEBs) for an area. The MVEBs are the projected level of controlled emissions from the transportation sector (mobile sources). The MVEBs should be clearly defined for each area and analysis year. Michigan's proposed revision contained MVEBs for the Lannsing, Grand Rapids, and Kalamazoo areas. The submittal did not include MVEBs for Huron, Benzie, and Mason Counties. MVEBs should be established for these areas.

In the proposed revision, the Michigan Department of Environmental Quality (MDEQ) requests that the EPA make a finding of "insignificant motor vehicle emissions" for Huron, Benzie, and Mason Counties for ozone, as provided by the Transportation Conformity Rule, Section 109(k). MDEQ states that it is unlikely that these counties would experience enough motor vehicle emissions growth in volatile organic compounds (VOC) and Oxides of Nitrogen (NOx) to cause a violation of the National Ambient Air Quality Standard (NAAQS) to occur. MDEQ also notes that the ozone levels measured in these counties have historically reflected an overwhelming amount of ozone transport rather than locally generated ozone precursors. It should be noted that to pursue this provision of the conformity rule, at a minimum MDEQ would need to provide a more comprehensive analysis of the contribution and role of local vs. transported emissions with respect to each county's ozone levels.

In addition, we found a few errors in "Table 6.1 Maintenance Plan Emission Inventories 2002-2009-2018" which are as follows:

- the safety margin for Ottawa County NOx should be -4.37 tons per day (tpd) rather than -4.39 tpd;
- the safety margin for Kalamazoo County NOx should be 21.49 tpd rather than 9.04 tpd;
- the safety margin for Calhoon County VOC should be 7.36 tpd rather than 9.77 tpd;
- the total 2018 VOC emissions for Benzie County should be 4.55 tpd rather than 4.86 tpd; and
- the safety margin for Benzie County VOC should be 2.13 tpd rather than 1.82 tpd.

Finally, in the section of the document pertaining to transportation conformity budgets, it is stated that 90 percent of the safety margin for VOC and NOx are being allocated to each maintenance area. While the transportation conformity budgets listed in Table 7.1 are acceptable, it should be noted that the budgets for Grand Rapids and Kalamazoo do not reflect a 90 percent allocation of the safety margin.

If you have any questions regarding our comments, please feel free to call me at (312) 886-1767 or Michael Leslie at (312) 353-6680.

Sincerely,

Kathleen D'Agostino, Environmental Engineer
Criteria Pollutant Section

# MICHIGAN SUGAR COMPANY

*Herbert C. Wilson*
*Vice President of Operations*

RECEIVED
APR 20 2006
AIR QUALITY DIV.

April 18, 2006

Attention: Mary Maupin
MDEQ - Air Quality Division
P.O. Box 30260
Lansing, Michigan 48909

VIA FAX 517-335-6993

RE: Comments on Request to Redesignate to Attainment Status – March 2006
Ozone Redesignation Petition and Maintenance Plan
Huron County

Dear Ms. Maupin:

This is written in support of the MDEQ's *Request to Redesignate to Attainment Status* (March 2006) that is currently out for public comment.

Michigan Sugar Company has previously requested that MDEQ seek redesignation of Huron County, one of the five locations in the state of Michigan in which it operates a sugar beet processing plant, to Ozone attainment status. Having Huron County currently designated non-attainment for Ozone has a potentially negative effect on the current and future operations of this facility. Therefore redesignation is essential to the future business prospects of this farmer-owned cooperative company.

Michigan Sugar Company understands that the MDEQ has Ozone monitoring data for four years indicating that Huron County has meet the ambient air standards set by U.S. EPA. It further understands that only three years worth of data is necessary to show attainment.

The company urges MDEQ to process the comments to this proposed redesignation as quickly as possible after the April 18, 2006 hearing, and to submit it promptly to U.S. EPA. Michigan Sugar Company hopes that then EPA, in turn, processes the request quickly so that the attainment status of Huron County can be restored.

There is no need for MDEQ to respond to this comment letter.

Very truly yours,

Herbert C. Wilson

Cc: Mr. Vinson Hellwig, MDEQ
Mr. Tim McGarry, MDEQ
Mr. Jim Sygo, MDEQ

Pioneer · Big Chief
Michigan Sugar
GENERAL OFFICES
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Saginaw, Michigan 48605-1348
Telephone (989) 799-7300 - Fax (989) 799-1836

Mr. Steve Chester, MDEQ
Ms. Dana Debel, Governor's Office
Mr. Jeff Pfost, Environmental Partners

# *Review of MDEQ's*
# *Ozone Redesignation Petition and Maintenance Plan*

*Submitted by*
Patrick Wilson
Tribal Ogema
Little River Band of Ottawa Indians

*With the help of*
Jeremy Howe
Air Quality Specialist
Little River Band of Ottawa Indians

*And*
Frank Beaver
GAP Coordinator
Little River Band of Ottawa Indians

*And*
Jo Anne House
Attorney
Little River Band of Ottawa Indians

*On behalf of*
Tribal Members of
Little River Band of Ottawa Indians

April 12, 2006

Little River Band of Ottawa Indians
375 River St
Manistee, MI 49660

April 12, 2006

Honorable Steven E. Chester
Director
Michigan Department of Environmental Quality
Air Quality Division
P.O. Box 30260
Lansing, Michigan 48909-7760

Dear Director Chester:

After having read the notice that was published in the DEQ Calendar on April 3, 2006 regarding the proposed Ozone Redesignation Petition and Maintenance Plan for eleven Michigan counties, I have a list of concerns to register with the Michigan Department of Environmental Quality (MDEQ) before this plan is submitted to the Environmental Protection Agency (EPA) for consideration. While this letter deals with my concerns for the counties nearest to the tribe (Mason and Benzie), certainly the following arguments could be extended to the other nine counties that are affected by this plan.

First and foremost, I want to strongly urge you to not petition the EPA to redesignate Mason and Benzie Counties for the 8-hour National Ambient Air Quality Standards (NAAQS) for ozone. I am stressing that redesignation at this time would be premature because the data are misleading.

We agree the three year average for both counties during the period of 2002-2004 and 2003-2005 was less than 0.085 parts per million (ppm) which puts both counties into Attainment for the ozone 8-hour NAAQS. However, I would point out that 2004 was a statistical outlier. While the three year averages determine the NAAQS, and I am not disputing this whatsoever, we should be looking closer at the numbers that determine the three year averages with more scrutiny which are the single year 4$^{th}$ highest 8-hour average.

The yearly values show Non-Attainment for each county between 1998 and 2005, <u>except</u> for 2000 and 2004. Thus, <u>out of eight years only two are in compliance</u> for the ozone NAAQS. It is my belief that by using this statistic there is a 75% chance that both of these counties will have a 4$^{th}$ highest 8-hour average this year above the 0.085 ppm NAAQS. Furthermore, after this year MDEQ will not be able to use the abnormally low 2004 data any longer. In which case, if this occurs neither of these counties will meet the qualifications for redesignation.

This brings me to my second point. I maintain that the reason for the low yearly values for 2004 in both counties has little to do with the State of Michigan or other entities' control efforts to reduce pollution. This much is clear, the vast majority of ozone in these counties is coming across Lake Michigan from the Milwaukee – Chicago – Gary area. I don't think anyone has disputed this. However, if you were to look at the data it shows that in some years the ozone 4$^{th}$

highest 8-hour average increases from the previous year and some years it decreases from the previous year. Furthermore, both counties' values increase during the same year or decrease during the same year. Obviously the EPA did not relax its control efforts during the years that ozone was higher in these counties. Rather, I believe it has more to do with the weather than with control efforts as was stated in MDEQ's *2004 Annual Air Quality Report for Michigan.*

The 1st and 2nd paragraphs on page 39 of the Report in particular are very insightful. The following segment was exceptionally informative:

> *This comparison shows the influence of temperature with respect to elevated O3 levels. Over the past 22 years, a typical summer would have 12 1/2 days with the maximum daily temperature exceeding 90°F. Over the time period from 1980 through 2004, the highest number of 90°F days occurred in 1988 (39 days), while the lowest number occurred in 2000 (one day). For 2004, cooler temperatures prevailed again with only three 90°F days, giving all the monitoring sites, with the exception of three, the lowest readings since 1995. In addition, when the number of 8-hour O3 readings above 0.085 ppm was divided by the number of monitors that were in operation, 2004 had the lowest average (0.15) overall.* ***Also for 2004, when all the sites had their three-year averages calculated, there were only eight (out of 27) sites in Michigan that were above the 8-hour O3 NAAQS. ... In 2003, there were a total of 21 monitoring sites out of 27 that were above the 8-hour O3 NAAQS.*** *[Emphasis added.]*

Clearly, as was stated in your own agency's report, weather and not necessarily control efforts has a larger effect on yearly ozone values. Therefore since we can not control the weather, MDEQ should hold off on petitioning the EPA until there is a point in the future that it can better ascertain the true condition of air quality in these counties.

Clean air is a quality we both strive to maintain. While there are many actions that are out of our control in order to obtain clean air, this is not one of those actions. I urge you to look closely at what is causing air quality levels in Mason, Benzie and surrounding counties and determine that it is not in the best interests of the State, the Counties or the citizens living in those areas to request redesignation at this time.

Sincerely,

Patrick Wilson
Tribal Ogema