

## EXECUTIVE SUMMARY

### Introduction

The Air Quality Management Plan (Plan) for the Town of Mammoth Lakes is an in-depth examination of the problems and solutions to Mammoth Lakes' winter-time air pollution episodes. The Plan is intended to satisfy a Federal Clean Air Act requirement to develop a State Implementation Plan to demonstrate how the Mammoth Lakes area will attain and maintain the National Ambient Air Quality Standard for fine particulate matter, known as PM-10. The Plan includes analyses of PM-10 sources, their impact and the effectiveness of control measures to improve the air quality.

The air pollution problem in the Town of Mammoth Lakes is primarily associated with the large influx of visitors to the area during the winter ski season. With the increase in area population and vehicle traffic, there is a sharp increase in the PM-10 emissions from wood stoves, fireplaces, and from traffic-related road dust and cinders. On occasions when peak visitor periods coincide with extended periods of low wind speeds, the air pollution levels build up to concentrations that violate the National PM-10 Standard. Based on ambient PM-10 monitors, the Town of Mammoth Lakes averages about 12 violations of the 24-Hour PM-10 Standard each winter.

### PM-10 Standard and Health Effects

PM-10 stands for particulate matter less than 10 microns in diameter. For comparison a human hair is about 100 microns in diameter. The National Ambient Air Quality Standard for PM-10 was set July 1, 1987 at 150 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) for the 24-Hour standard and 50  $\mu\text{g}/\text{m}^3$  for the annual average standard. The levels for the PM-10 Standard were selected to protect the health of people who are sensitive to exposure to fine particles (OAQPS Staff Paper, 1982 and Addendum, 1986).

Fine particles less than 10 microns are easily inhaled and retained in the deepest parts of the lungs. Children, the elderly, those with cardiovascular and respiratory problems, and those with influenza are especially susceptible to increased respiratory problems and illnesses due to exposure to high levels of PM-10. In addition, some PM-10 sources emit particles which contain toxic and carcinogenic compounds.

Wood smoke, which is a major contributor to the high PM-10 levels in Mammoth Lakes, includes several air pollutants aside from PM-10 that contribute to the health effects problem. These are

carbon monoxide, hydrocarbons and polycyclic aromatic hydrocarbons (PAH's). Wood burning is a major source of PAH's which has been identified as a class of compounds containing carcinogens (Davis and Read, Guidance Document for Residential Wood Combustion Emission Control Measures, 1989).

### Sources Contributing to Violations of the PM-10 Standard

Through an analysis of ambient filter samples and an inventory of PM-10 sources it was determined that there were only two major sources of PM-10 that contributed to violations; wood burning and resuspended road dust and cinders. Information on the chemical fingerprints of PM-10 sources and the chemical elements found on the filters was used in a Chemical Mass Balance Model (CMB) to determine the contributions from different PM-10 sources. The CMB modeling analysis showed that days with poor air quality could be caused by either;

- 1) wood burning as the primary contributor with minor contributions from resuspended road dust & cinders and tail pipe emissions, or
- 2) both wood burning, and resuspended road dust & cinders as major contributors.

Table 1 shows these two cases with their estimated source contributions for the design day concentration. An examination of the high PM-10 days showed that both situations could result in PM-10 violations. As a result of the possibility that either situation could occur, the selected control strategy must consider both peak wood burning days and peak road dust and cinder days to be successful.

### Growth Projections

In the General Plan for the Town of Mammoth Lakes, it is anticipated that the peak number of residents and visitors will increase over the next 15 years. Presently the peak winter-time population-at-one-time is estimated at 29,000 residents and visitors. The peak population is expected to reach about 48,000 by the year 2005. This increase in population growth will of course increase the total PM-10 emissions if controls are not implemented.

An analysis was performed to determine the effect of population and traffic increases on the peak PM-10 concentrations. The analysis showed that the uncontrolled peak PM-10 concentration would increase from 210  $\mu\text{g}/\text{m}^3$  to 381  $\mu\text{g}/\text{m}^3$  for the worst case road

**TABLE 1**  
**DESIGN DAY SOURCE CONTRIBUTIONS FOR**  
**WOOD BURNING AND ROAD DUST DOMINATED DAYS**

Source	Contributions Assuming:	
	93% Wood Burning	44% Road Dust
Fireplaces	94 $\mu\text{g}/\text{m}^3$	54 $\mu\text{g}/\text{m}^3$
Wood Stoves/Inserts	101 $\mu\text{g}/\text{m}^3$	58 $\mu\text{g}/\text{m}^3$
Road Dust/Cinders	5 $\mu\text{g}/\text{m}^3$	93 $\mu\text{g}/\text{m}^3$
Vehicle Tailpipes	5 $\mu\text{g}/\text{m}^3$	negligible
Background	5 $\mu\text{g}/\text{m}^3$	5 $\mu\text{g}/\text{m}^3$
Design Concentration	= 210 $\mu\text{g}/\text{m}^3$	210 $\mu\text{g}/\text{m}^3$

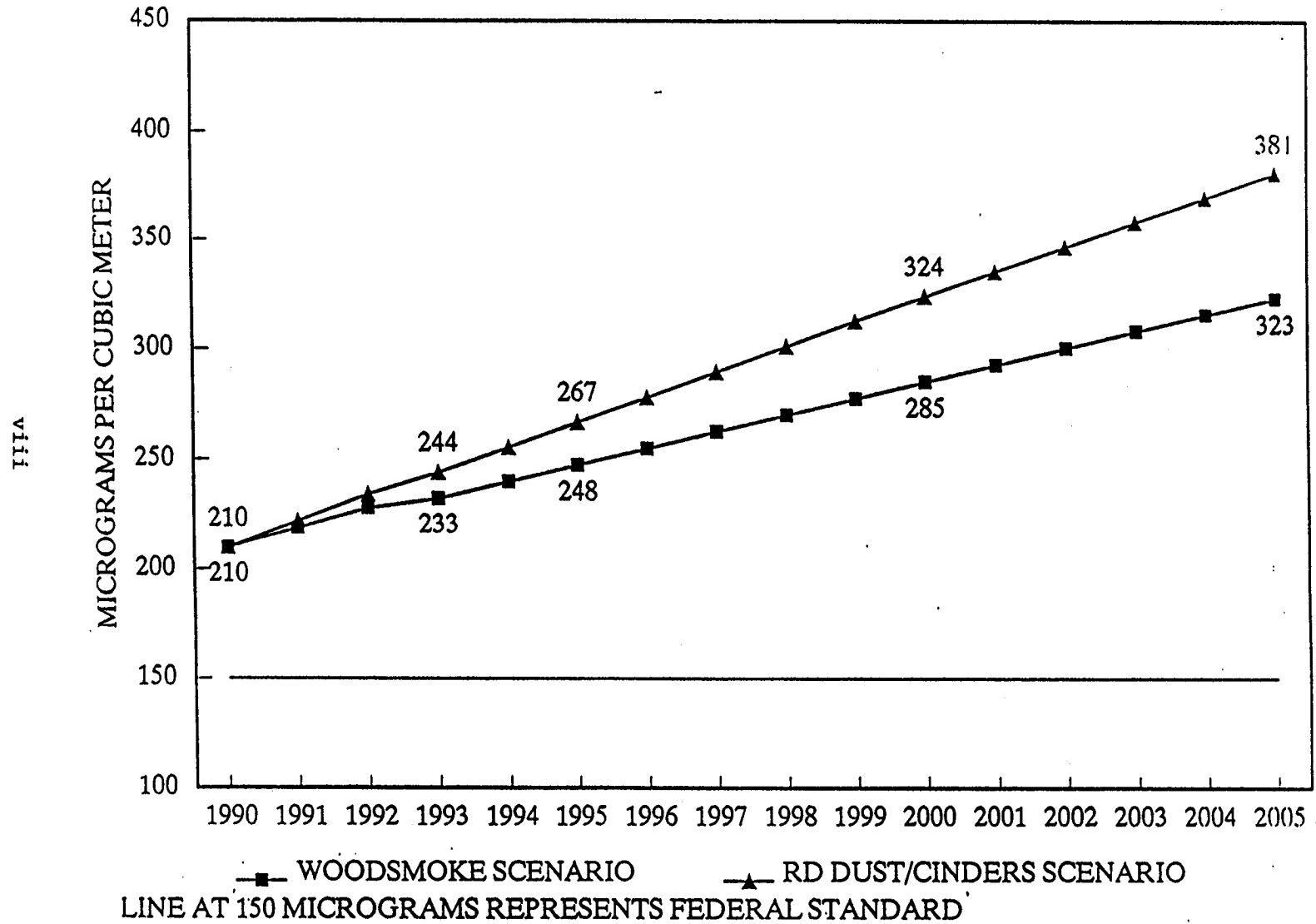
dust and cinders scenario, and from 210  $\mu\text{g}/\text{m}^3$  to 323  $\mu\text{g}/\text{m}^3$  for the worst case wood burning scenario. The forecasted, uncontrolled PM-10 concentration is shown in Figure 1.

#### Mammoth Lakes Particulate Emissions Regulations

An ad hoc air quality committee was formed to investigate potential control strategies to be included in a new particulate matter ordinance. The committee included representatives from the wood heating industry, real estate sales, developers, lodging industry, the general public, USDA Forest Service, air pollution control district and the Town planning department. A number of control measures that affected wood burning and resuspended road dust and cinders were investigated. The list of measures that were initially considered for the control strategy is included in Appendix F.

With the ad hoc committee's valuable input the pros and cons of each of the control measures were better understood by all parties. The strategy that was eventually sent to the Town Council for approval was a compromise between competing interests. This strategy formed the foundation of the ordinance that was finally adopted by the Town.

FIGURE 1  
FORECASTED AIR QUALITY - UNCONTROLLED



The final control strategy was adopted by the Mammoth Lakes Town Council on November 7, 1990. The strategy was incorporated in the Town of Mammoth Lakes Municipal Code as Chapter 8.30, Particulate Emissions Regulations. The regulations will reduce emissions from reentrained road cinders, will phase out non-certified wood burning appliances and will institute wood burning curtailments during periods of high PM-10 concentrations. The regulations include several contingency measures that will enable the Town to meet the Federal 24-hour PM-10 Standard within 3 to 5 years. A summary of the adopted regulations is listed in Table 2.

The regulations' primary measures will result in the eventual phasing out of all non-certified wood stoves and wood burning fireplaces. This will be accomplished by replacing non-certified wood stoves and fireplaces with certified wood stoves, pellet stoves, or gas log fireplaces before the resale of a dwelling. In addition to phasing out non-certified appliances, the Town will rely on a mandatory wood burning curtailment. This mandatory curtailment program will initially exempt certified wood stoves, but may include all wood burning if more reductions are needed to attain the Standard.

As a contingency, the replacement schedule may be accelerated if the Town does not attain the Federal PM-10 Standard by January 1, 1993. The accelerated schedule will require replacement of all non-certified wood burning stoves and fireplaces by November 1, 1994. This contingency measure may be instituted if the primary control strategy is insufficient to bring the Town into attainment with the Standard.

The control strategy relies on vacuum street sweeping to reduce 34% of the PM-10 emissions from re-entrained road dust and cinders. With the expected growth in the Town, the strategy must also address the problem of increasing traffic as it directly increases the road dust emissions. A cap of 106,600 vehicles miles travelled is included in the plan. This cap will provide for 60% growth from the present traffic estimates.

Figures 2 and 3 show the expected air quality impact of the adopted ordinance. The graphs show the projected impacts for each of the contingency measures that can be implemented. Figure 2 shows the air quality impact without the accelerated wood burning appliance change-over schedule. Figure 3 shows the air quality impact with the accelerated change-over, which requires replacement of all non-certified wood burning appliances by November 1, 1994. For each figure the graphs show the impact of the wood burning ban, with and without an exemption for certified wood stoves, as well as for the case where a wood burning ban is not called.

TABLE 2

LIST OF ADOPTED REGULATIONS

SECTION	REGULATION
8.30.020	DEFINITIONS
8.30.030	STANDARDS FOR REGULATION OF SOLID FUEL APPLIANCES <ul style="list-style-type: none"><li>- Limits installation of wood burning appliances after January 1, 1991 to EPA Phase II Certified Stoves or Pellet Stoves</li><li>- Allows 1 wood burning fireplace in hotel/condo common area</li><li>- Requires the Town to maintain records of certified stoves</li></ul>
8.30.040	DENSITY LIMITATIONS <ul style="list-style-type: none"><li>- Limits new wood stoves to one per dwelling, but allows one additional pellet stove per dwelling.</li><li>- New dwellings cannot use wood heat for primary heating</li><li>- Requires certified inspection of new installations</li></ul>
8.30.050	REPLACEMENT OF NON-CERTIFIED APPLIANCES UPON SALE OF PROPERTY <ul style="list-style-type: none"><li>- Non-certified wood stoves and fireplaces must be replaced, removed or rendered inoperable prior to the sale of property</li><li>- Requires a written exemption for property that does not include a wood burning appliance</li></ul>
8.30.060	SOLID FUEL BURNING APPLIANCE REPLACEMENT SCHEDULE <ul style="list-style-type: none"><li>- Contingency Measure: If monitoring does not show attainment by January 1, 1993, all non-certified solid fuel appliances must be replaced by November 1, 1994</li></ul>
8.30.070	OPACITY LIMITS <ul style="list-style-type: none"><li>- Limits wood smoke opacity to 40% till January 1, 1994 and 20% thereafter</li></ul>
8.30.080	PROHIBITED FUELS <ul style="list-style-type: none"><li>- Prohibits trash and coal burning</li></ul>
8.30.090	MANDATORY CURTAILMENT <ul style="list-style-type: none"><li>- Requires Town Council to appoint an Air Quality Manager</li><li>- Burn ban shall be called when PM-10 levels reach 130 <math>\mu\text{g}/\text{m}^3</math></li><li>- Notice shall be given on radio, TV, phone message &amp; posted</li><li>- Requires posting of notice to inform rental unit occupants that curtailments may be called.</li><li>- Renters shall be responsible on no burn days.</li><li>- Exempts certified appliances and pellet stoves from curtailment, total ban could be called if air quality compliance is not met.</li></ul>

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**TABLE 2, continued**  
**LIST OF ADOPTED REGULATIONS**

<u>SECTION</u>	<u>REGULATION</u>
8.30.100	POLLUTION REDUCTION EDUCATION PROGRAMS
8.30.110	ROAD DUST REDUCTION MEASURES <ul style="list-style-type: none"> <li>- Requires vacuum street sweeping of the cinders</li> <li>- Requires vehicle miles travelled (VMT) reduction measures for new developments</li> <li>- Limits peak VMT in the Town to 106,600 vehicle miles travelled</li> </ul>
8.30.120	FEES
8.30.130	PENALTIES

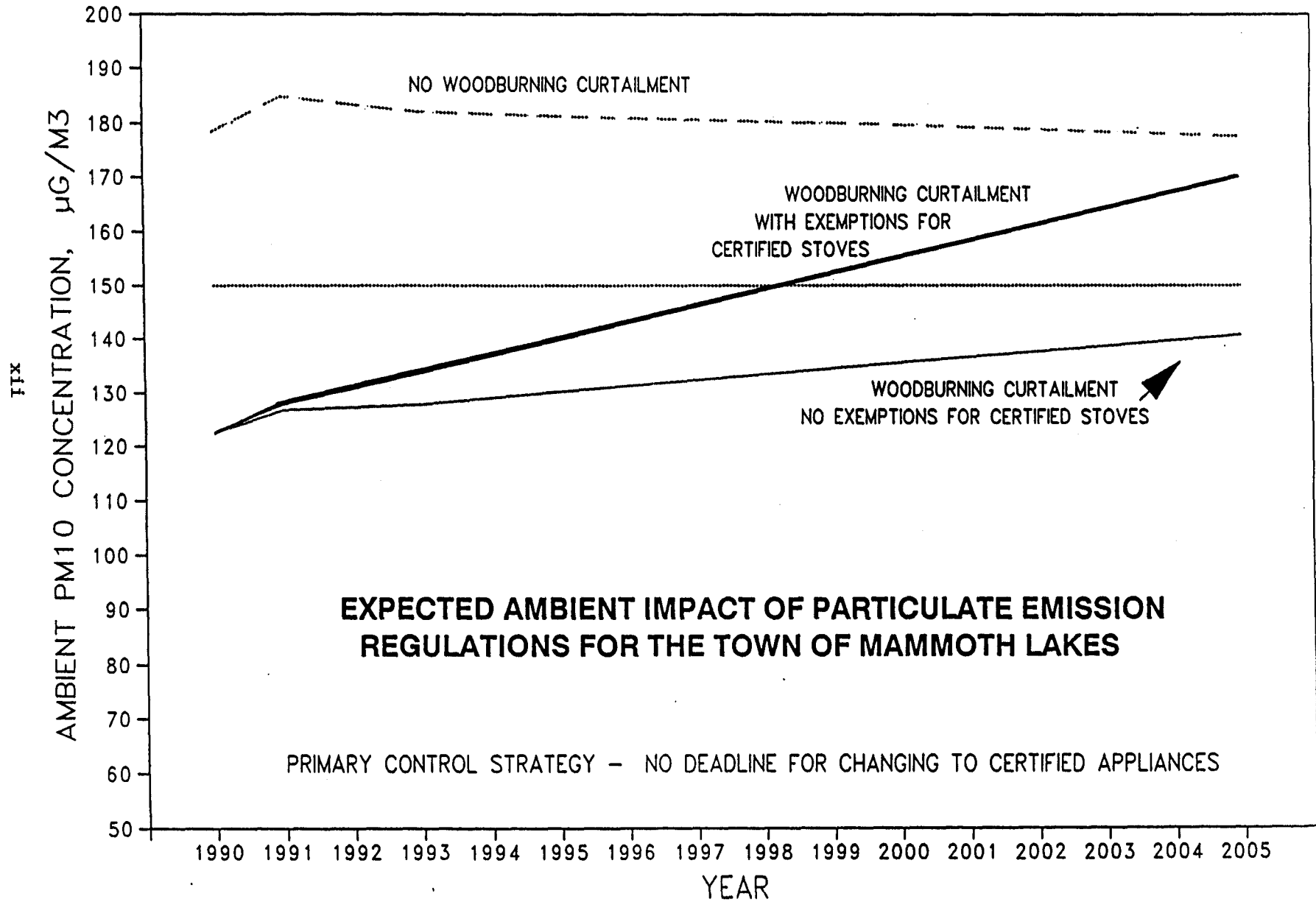
Appendix H includes an analysis of the effect of the ordinance on days that are dominated by wood smoke. It shows that the adopted strategy is adequate to meet the Federal PM-10 Standard on wood smoke dominated days.

### Conclusion

With the implementation of the Particulate Matter Regulations it is anticipated that the Town will be able to attain the National Ambient Air Quality Standard for particulate matter by 1995. Attainment may occur sooner if wood burning is reduced by the expected 50% reduction that can be achieved through the mandatory curtailment ordinance.

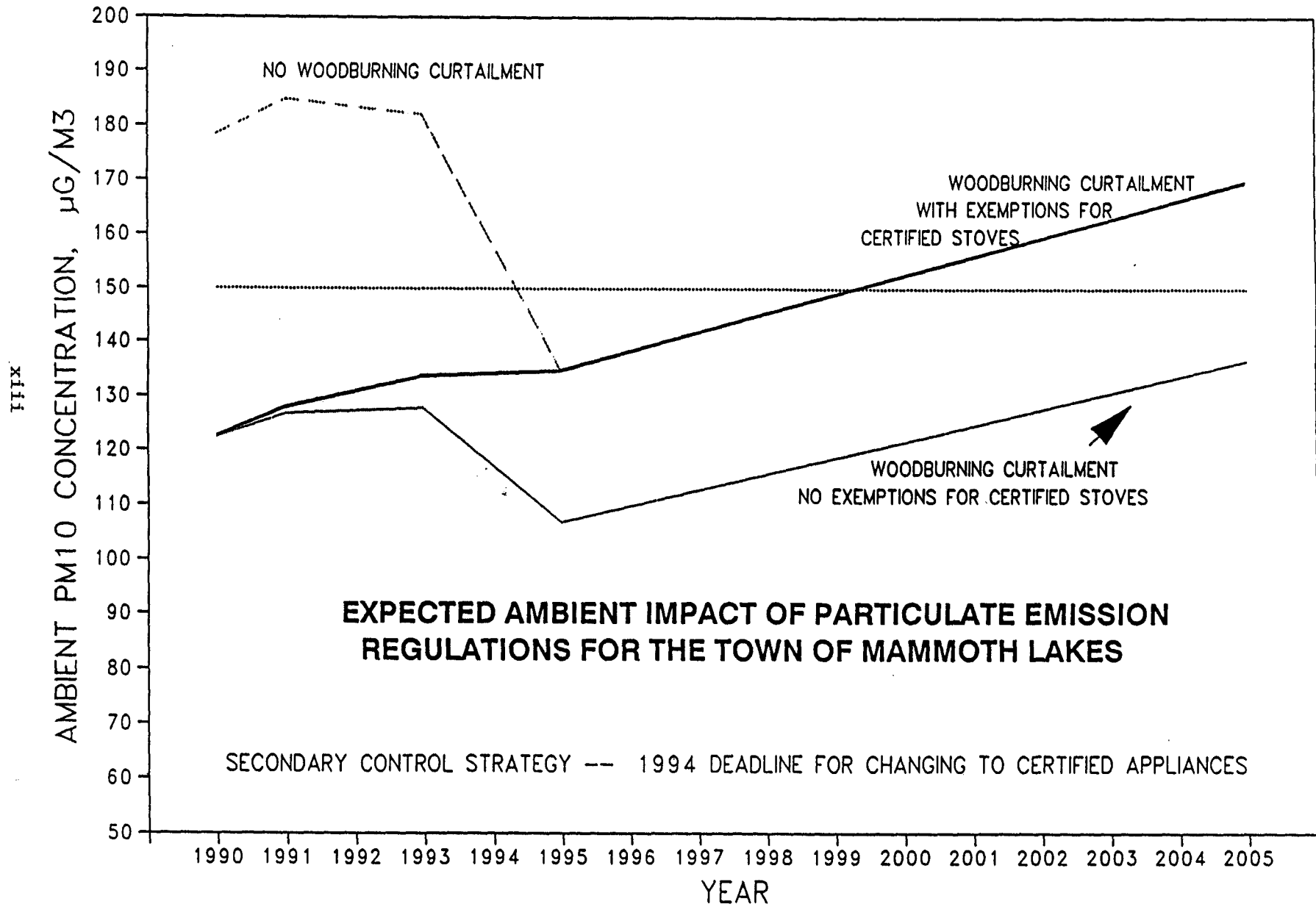
Since the plan also addresses emissions associated with general population growth, projections show that the National Ambient Air Quality Standard for PM-10 will be maintained into the future. The present strategy is expected to provide for maintenance of the Federal PM-10 standard till beyond the year 2005.

FIGURE 2



Adopted 11/7/90

FIGURE 3



Adopted 11/7/90