Mobile Sources Subcommittee Report to the Air Toxics Advisory Committee (ATAC)

Recommendations for Air Toxics Reductions from Mobile Sources

Revision of June 7, 2007

I. Summary

The Mobile Sources Subcommittee (MoSS) recommends that the full Air Toxics Advisory Committee (ATAC) promote the following air toxics reduction options for the mobile sources sector. These options are "no cost or low cost" strategies, and are listed in the order of the greatest potential reductions of air toxics:

1. Expand to statewide the **On-board Diagnostics** testing as part of the vehicle safety inspection program.

2. Reduce vehicle miles traveled from light-duty-gas vehicles, increase vehicle occupancy and improve opportunities for walking, biking and using public transit by implementing, among other things, **Transit Oriented Development, Expanding Public Transit**, **Telecommuting,** and **Increasing Carpool Lots**.

3. Adopt a **No-idling Regulation** in combination with an education and outreach campaign on the benefits to public health and the environment from not idling vehicles.

MoSS bases these recommendations on semi-quantitative calculations of air toxics reductions and associated implementation costs from forty identified control options. The subcommittee targeted emissions from light-duty gas vehicles and heavy-duty diesel engines and vehicles.

II. Purpose

The Mobile Sources Subcommittee explored cost-effective strategies for air toxic reductions from mobile sources in both the on-road and non-road sector. Also, the subcommittee considered the impact from land use development on transportation and resultant air toxics emissions. Specifically, the ATAC charged the subcommittee with the following:

1. Work with the Science Advisory Subcommittee to quantify a timeline of emission reductions, and corresponding theoretical risk reductions expected to be achieved by existing programs within the next ten years. Programs explored should include new diesel engine performance standards, new diesel fuel specifications and changing composition of the motor vehicle fleet that could affect emissions of air toxic compounds.

2. Review the list of priority toxics and identify common sources and potential no-cost options for control. Then identify no-cost, low cost and co-benefit solutions to reduce emissions from the highest risk air toxics. The cost and effectiveness in reducing actual risks must be considered in the evaluations of costly risk reduction strategies.

III. Mobile Source Air Toxics Inventory

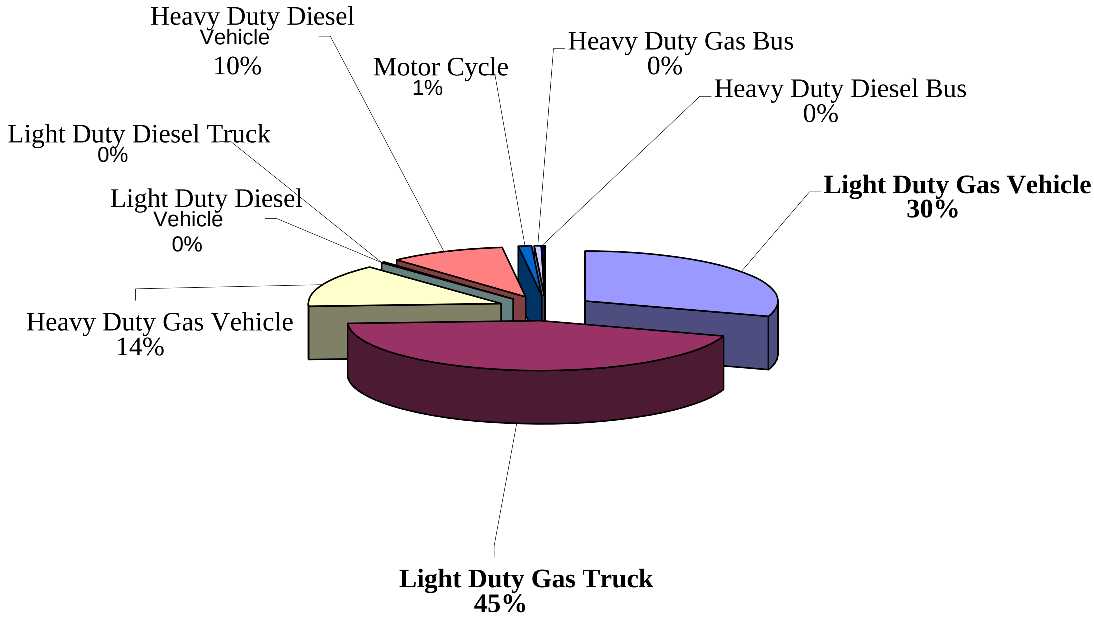
Information provided to the Mobile Sources Subcommittee from the Science Advisory Subcommittee on May 15, 2006 indicated that Mobile Sources comprise 35% of the toxicity-weighted air toxic emissions in Maine. The following air toxics are from mobile sources and are a priority for evaluating reduction strategies:

Pollutant Category Name	Toxicity-Weighted Tons Emitted in 2005	Percentage of Toxicity-weighted Inventory
Polycyclic Organic Matter	135,306	36%
Acrolein	84,463	23%
Benzene	68,809	18%
Formaldehyde	39,658	11%
1,3-Butadiene	29,684	8%
Chromium Compounds	4,315	1%
Arsenic Compounds	3,810	1%
Acetaldehyde	2,325	1%

The subcommittee requested better information as to the source of pollutants that made up the mobile sources inventory based on toxicity-weighting. This information would direct the subcommittee on which source categories to focus on for emission reduction strategies.

Based on the 2005 Mobile Sources Inventory, light-duty gas vehicles and trucks make up 75% of the air toxics emissions from the on-road sector. Passenger cars and light-duty gas trucks comprise 92% of the volatile organic compound emissions which are precursors to harmful ground level ozone. Therefore, we focused our efforts in identifying strategies that would reduce vehicle emissions from gasoline powered light-duty vehicles and trucks.

2005 Air Toxic Emissions from On-Road Mobile Sources (Tox-Weighted)



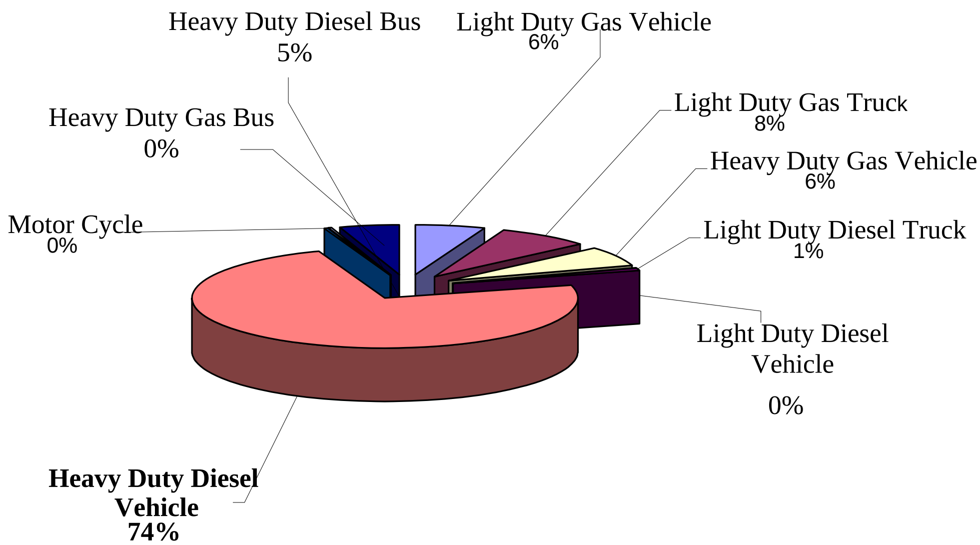
Diesel exhaust contributes to ozone formation (smog), acid rain, and global climate change.

According to U.S. EPA, diesel exhaust is likely to cause cancer in humans. Diesel exhaust contains significant levels of small particles known as fine particle matter. Fine particles pose a significant health risk because they can pass through the nose and throat and lodge themselves in the lungs. These fine particles aggravate respiratory conditions such as asthma and bronchitis and can cause lung damage, even premature death. Nationwide, particulate matter is responsible for more than 15,000 premature deaths each year.[1]

The pie chart below demonstrates heavy-duty diesel trucks are responsible for 74% of Maine's PM 2.5 emissions. Therefore, in addition to the light-duty gas sector, the subcommittee also focused on diesel emission reduction strategies.

[1] U.S. EPA publication, *Diesel Exhaust in New England*, March 2002 pamphlet.

2005 PM 2.5 Emissions from On-Road Mobile Sources



The subcommittee also recognized that hot spots caused by vehicle congestion in urban areas, would also require additional analysis (see Science Advisory Subcommittee Report).

IV. Existing and Pending Regulations

The first step for the subcommittee was to identify the existing and pending state and federal programs that reduce air toxics emissions. Please see Appendix I for a compilation of existing and pending state and federal regulations. As examples:

1. In 2007, significant reductions (90%) in diesel particulate emissions will be achieved with the phase-in of ultra low sulfur diesel of 15 ppm in combination with advanced pollution control technologies used for meeting the 2007 heavy-duty diesel engine standards.

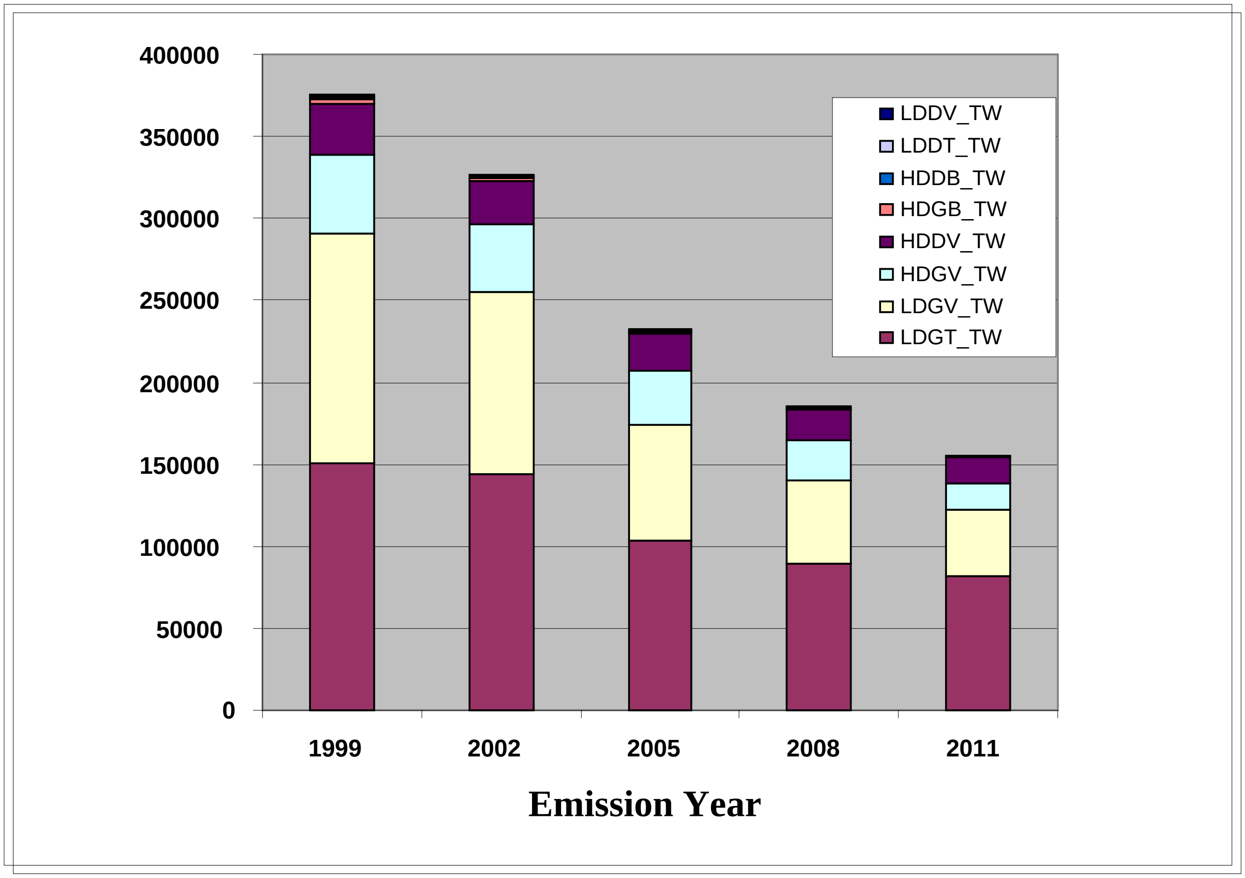
2. The federal Tier 2 standard for gasoline was phased-in on January 2006 requiring the average national standard for sulfur be reduced to 30 ppm, achieving a 90% reduction in sulfur levels in gasoline. This should result in reduced Polycyclic Organic Matter (POM) and metal emissions from mobile sources.

3. Despite the impressive progress made in developing and introducing clean vehicles and fuels, motor vehicles still contribute a significant portion of the emission inventory for ozone, fine particulate matter and air toxics. Therefore, Maine adopted the California LEV program in 1993 to reduce emissions from the on-road motor vehicle sector. California's LEV II standards for evaporative and tailpipe VOC emissions are more stringent than those of the federal Tier 2 program. In particular, risks associated with exposure to air toxics such as benzene, formaldehyde, and 1, 3-butadiene will be

significantly reduced by the California LEV II program. Additional reductions in toxic vehicle emissions under LEV II are estimated at approximately 12 percent in 2020, compared to the federal program.[2] NESCAUM modeling of the LEV II program using the MOBILE6.2 model indicates that nearly 50 tons of NOx+VOC per day will be reduced in the seven Northeast LEV II states in 2025.

The subcommittee found that these existing and pending regulations will significantly reduce air toxic emissions. Below is a table showing Maine Department of Environmental Protection (MEDEP)'s expected trend of air toxics reductions from the on-road sector due to existing and pending regulations.

Toxicity-Weighted Emissions (TPY)



V. Screening of Additional Reduction Alternatives

Next, the Mobil Sources Subcommittee developed a comprehensive matrix that identified the sector and vehicle category impacted and the estimated costs and benefits for approximately forty mobile sources emissions reduction strategies. The sectors identified were:

1. Non-road, including marine, locomotives and construction equipment, or

[2] Summary of NESCAUM Analysis Evaluating NOx, HC and CO Emission Reduction Potential from Adoption of the California Low Emission Vehicle (LEV II) Standards, June 2005, page 6.

2. On-road, including passenger vehicles, transit, heavy-duty diesel, and school buses.

The subcommittee qualitatively ranked emission reduction potential and the technical and financial feasibility of each scenario as high, medium or low (H, M, L). The subcommittee qualitatively considered cost, feasibility of the option, and the technological development stage of the alternative.

This matrix was used as the initial screening tool to select certain strategies for further analysis. It was decided that some of the strategies listed were actually funding mechanisms and should be evaluated separately from the control options. Some examples for options to fund air toxics emissions reduction controls included establishing a Clean Diesel Fund, assessing fees on new car sales or vehicle registrations, and funding from the MEDEP Surface Water Fund. The funding alternatives are shown in Appendix II.

Each subcommittee member ranked each mobile sources reduction strategy on a scale of 0-5, five being the best. Multiple subcommittee members from one organization such as the MEDEP and Maine DOT combined their scores for ranking each strategy. After tallying all the scores, the subcommittee agreed to consider the highest ranked control options that received twenty points or more, for an in-depth review of potential emission reductions and costs associated to implement. In addition, the subcommittee tabled further evaluation of funding mechanisms, since the subcommittee was focusing on no or low-cost options and any necessary funding mechanism might vary based on the control options employed.

Following the initial qualitative screening analysis of the Mobile Sources Control Options, the subcommittee undertook a semi-quantitative analysis of the air toxics reduction potential and costs to implement of the top ranking strategies, as shown in Appendix III. The Mobile Sources Control Options selected for a semi-quantitative assessment by the subcommittee are as follows:

Education and Outreach Efforts

- Develop a driver education module to include no-idling and fuel saving techniques
- Develop community outreach materials for a no-idling campaign
- Expand voluntary programs to reduce VMT and single occupancy vehicles
- Promote diesel retrofit technologies and programs, such as EPA's SmartWay

Voluntary Programs

- Establish workplace policies to allow employees to work at home i.e. telecommuting
- Expand public transit
- Increase carpool parking lots
- Provide incentives to retrofit older heavy-duty diesel engines
- Promote land-use development strategies that support alternative modes of transportation

Regulatory Programs

- Adopt statewide On-board Diagnostics program
- Adopt statewide a no-idling regulation

Fuels

- Purchase alternative fuels for transit buses
- Adopt statewide use of reformulated gas

VI. Costs and Benefits Analysis

The MEDEP inventory staff calculated potential emission benefits for those identified control options which were predicted to result in significant air toxics risk reductions and appeared economically feasible. The subcommittee agreed on the assumptions used to conduct the cost and benefits analysis. The subcommittee predicted the potential percentage of emission reductions from the hazardous air pollutant (HAPs) mobile sources inventory for that category which the strategy targeted (i.e. 20% reduction of air toxics for light-duty gas vehicles). Based on those assumptions MEDEP staff was able to calculate the potential toxicity-weighted tons per year reductions.

A matrix was developed of the identified alternatives for final evaluation. The matrix included:

(a) Identified targeted category, i.e. light-duty gas vehicles;
(b) An estimation % risk reductions by the alternatives in that sector, and the mobile sources sector as a whole;
(c) Tons per year reduction of air toxics;
(d) Annual cost and normalized annual cost (cost per toxicity-weighted ton reduced);
(e) Identification of whether the strategy is also a hot-spot strategy, or will also result in reductions in Greenhouse Gases.

The subcommittee gave the highest ranking to those Mobile Sources Control Options that could achieve the greatest air toxics emission reductions and which were also no cost or low cost strategies. Some options actually resulted in a net cost savings to Maine citizens. Those alternatives included education and outreach, voluntary programs with incentives, and a no-idling regulation. Consideration was also given to technical feasibility and ease of implementation in the short term.

Below are listed the top ranking control options in the order of the greatest potential for air toxics emissions reductions. The Mobile Sources Subcommittee's recommendations for mobile sources air toxics reduction strategies are as follows.

1. Expand On-board Diagnostics statewide

The greatest air toxics reductions of 35,660 toxicity-weighted tons per year were projected for expanding the Cumberland County On-board Diagnostics (OBD) program statewide. On-board Diagnostics refers to a computer-based system that monitors the performance of the vehicle engine and emissions control system. All model year 1996 and newer light-duty cars and trucks have a "check engine" light that alerts vehicle owners when there is a possible problem with the engine or emissions control system. By paying attention to this early warning and repairing the vehicle right away can often avoid more costly repairs, save fuel, reduce wear and tear on the engine, and reduce pollution. Depending on the age and mileage of the vehicle, these repairs may be covered under warranty.

Using the assumption that an additional 509,431 light-duty gas vehicles would pay the additional $6.00 inspection fee for an OBD test, the annual cost was $86 per toxicity-weighted ton. The analysis did not include the costs of vehicle repairs, since emissions control equipment could still be covered by warranties depending on the age of the vehicle.

The subcommittee determined that although there is a net cost associated with this strategy, expanding OBD statewide would result in significant HAP emissions reductions. The subcommittee believes that the costs are reasonable given the large HAP benefits gained from this strategy, and is therefore recommending that the full ATAC adopt this strategy as a "low-cost" option.

2. Reduce VMT and increase vehicle occupancy

The benefits predicted from the existing and pending regulations will be diminished if Vehicle Miles Traveled (VMT) increases beyond the modeled predictions. Therefore, the subcommittee explored several strategies aimed at reducing VMT, including changes to land use policy. A detailed evaluation of the impact of land-use policy and VMT was beyond the expertise of the Mobile Sources Subcommittee. Therefore, MEDEP contracted with the Center for Clean Air Policy (CCAP) to assess the reduction potential (and thus air toxic reductions) from changes to policies that govern land development in Maine. CCAP is currently supporting efforts to enact Vehicle Miles Traveled (VMT) -reduction actions identified in Maine's 2004 Climate Action Plan. These VMT reduction strategies will also have co-benefits of reducing air toxics from mobile sources. CCAP is working separately with the Climate Action Plan VMT Mitigation Work Group to refine smart growth policies and measures to reduce VMT growth along the Lewiston/Portland/ Brunswick Corridors. CCAP will quantify the greenhouse gas, energy and air pollution reduction potential from such policies and develop policy implementation strategies.

This work will provide additional analysis of Maine's Climate Action Plan's transportation sector recommendations and synergize air toxic and greenhouse gas reduction efforts to improve air quality.

CCAP provided the subcommittee a list of nineteen potential VMT reduction policy options, a brief description of each option, the transportation category that is targeted by the policy (e.g. light-duty vehicles, heavy-duty trucks, transit buses, freight trains, marine vessels, etc.), and a general description of the portions of the state that would be impacted by the policy (e.g. urban versus rural, statewide, Lewiston/Portland/Brunswick Corridors, Cumberland County, etc). CCAP developed the list by reviewing the Maine Climate Action Plan, discussions with Portland and Lewiston/Auburn Municipal Planning Organizations, the SmartGrowth Network, a literature search, and other appropriate review.

The subcommittee selected for screening analysis five development strategies, which included Targeted Infrastructure Development, Transit Oriented Development, Permitting and Zoning Reform, Bus Rapid Transit, and Comprehensive Smart Growth. CCAP's work products are included in Appendix IV.

After further consideration, the subcommittee determined that enhancing existing infrastructure rather than building new infrastructure would lead to more dense urban development, sustaining transit and reducing travel demand. Therefore, MoSS directed CCAP to undertake a detailed analysis on two options: Transit Oriented Development (TOD) and Targeted Infrastructure Funding (TIF). CCAP estimated VMT reductions from these strategies by looking at the effects these tools had in other States. MEDEP then estimated HAP reductions from these strategies, based on the VMT reductions.

Important strategies that reduce VMT and increase vehicle occupancy from the light-duty gas vehicle category include the following, in the order of the greatest potential for air toxics emissions reductions:

2(a) Promote Transit Oriented Development

Transit Oriented Development (TOD) is a strategy that promotes mixed use development around transportation stops. This, in turn, focuses new development and transportation investments on reducing VMT and mitigating public health impacts from air pollution, promotes physical activity, reduces greenhouse gas emissions and preserves open space resources and wildlife habitat. Generally increases in transit use, walking, and bicycling lead to local reductions in VMT of 20-30% from Transit Oriented Development. However, the reductions achieved from TOD in Maine will likely be lower than the general estimates because Maine has fewer centers with population densities that are high enough to support transit, and few destinations that are transit accessible. To ensure the highest benefit of TOD, Maine must make commensurate investments in new and improved transit infrastructure to serve and connect higher density, mixed use developments.

Based on a rough estimate of potential VMT reductions in Maine developed by CCAP, MEDEP estimates that this strategy could reduce air toxics emissions by approximately 9,399 toxicity-weighted tons per year, with a net savings to Maine citizens.

Maine DOT in cooperation with University of Southern Maine, MEDEP, State Planning Office, and local governments will be undertaking a refined study of the possibility of implementing TOD in the State of Maine. This study will give decision-makers more concrete data about the benefits of implementing TOD in their cities, towns and regions. Different build-out land use scenarios will be analyzed for a specific area in the State of Maine. One of these scenarios will include future land use development that implements the principles of Transit Oriented Development. Another scenario will assume “business as usual” development. The two scenarios will be compared to determine the difference in vehicles miles traveled and to identify any reduction in traffic congestion.

2(b) Promote Targeted Infrastructure Funding

Targeted infrastructure funding is a strategy that establishes additional criteria for awarding existing public funds, towards those projects that will help reduce VMT, usually by focusing on existing infrastructure rather than greenfield development. Developing a Maine specific quantification of VMT reduction potential associated with TIF development requires knowledge of the infrastructure likely to be targeted, understanding all the complementary policies, and estimates of development diverted from greenfield projects. Thus targeted infrastructure funding is more applicable to post-analysis. However, by using a general assumption that TIF could divert a development generating 5,000 trips per day from an urban edge greenfield site to a centrally located brownfield site, the approximate VMT savings would be 23 percent (2.1 million vehicle miles avoided annually) at a given location. These VMT savings would be based on increased transit use (from 0 to 1.5 percent), biking and walking, and shorter average vehicle trip lengths (from 5.0 to 3.9) miles per trip.

2(c) Expand public transit

Expanding public transit to reduce vehicle miles traveled by 5% from the targeted passenger cars and light-duty trucks would result in a net savings of $24,686 per toxicity weighted tons per year of air toxics. Based on the assumption that average rider ship equals 50% of capacity, each bus deployed removes approximately twenty cars from the road at any given time it is in service.

2(d) Promote telecommuting

This option would evaluate and promote workplace policies allowing employees to work at home. It has been successful at some large corporations and EPA has a model "Best Work Places for Commuters". The effectiveness of this program depends on the degree of penetration, but the subcommittee estimated that this option could reduce toxicity-weighted emissions of the on-road sector by almost 2%, at a net savings of $13,900 per toxicity-weighted ton.

2(e) Increase carpool parking lots

Based on the assumption that a commuter travels on average 18 miles roundtrip per day, if four people carpooled that would be equivalent to reducing on average 54 miles per day. Doubling the number of spaces available in current carpool lots from 2000 to 4000 would achieve a reduction of 183 toxicity-weighted tons of air toxics, at a net savings of $21 per toxicity-weighted tons. However, success is dependent on siting new carpool lots in the most congested areas of the state. Maine DOT should focus on leasing developed lots that have unused capacity during peak commuting hours, such as shopping malls.

3. Adopt a No-idling Regulation in combination with an education and outreach campaign

The first phase of further promoting no-idling in Maine should focus on education and outreach, followed by adoption of a no-idling regulation.

3(a) Develop voluntary no-idling campaign and driver education

A voluntary campaign would support community efforts with training and materials for a no idling campaign and develop a driver education module to include the benefits of not idling and fuel savings techniques. The estimated 15% reduction of idling emissions from approximately one million cars would have a net savings of $3,187/tons per year of toxicity-weighted air toxics. It was assumed that a driver education program could achieve 5% in fuel savings. Most of the education and outreach materials necessary for this option have been developed.

3(b) Adopt statewide no-idling regulations

While being more costly to implement and enforce than a voluntary program, the air toxics reductions would be more than three times greater from adopting a no-idling regulation than implementing only a voluntary program. The subcommittee estimated that a no-idling law in combination with community education and outreach could reduce idling emissions by 50%, for a net savings of $11,641 per toxicity-weighted ton per year. Maine should follow the other New England States and adopt a no-idling law that would target all transportation sectors and vehicle categories.

During this legislative session, LD 533 proposed establishing Clean Air Zones which required no-idling around public buildings, ferry landings and approaches to draw bridges. The legislature's Transportation Committee voted ought not to pass but directed the MEDEP and Maine DOT to study the feasibility of a state wide regulation and report back next session. The MEDEP has also been tasked with drafting a no-idling policy for state government fleets through the Clean Government Initiative legislation. Therefore, there is an opportunity for presenting a no-idling regulation to the legislature next session.

Adopt Reformulated Gas (RFG)

Adoption of a Reformulated Gas requirement is one option that the subcommittee is *not* recommending at this time, due to the relatively high cost of $1,831 per toxicity-weighted ton. However, given this option's high potential for air toxic reductions and the recent increase in air toxic emissions from the gasoline reaching the Maine market, this strategy should be reconsidered if additional air toxics emission reductions are necessary to reach Ambient Air Guidelines. The Governor can opt-in to requiring RFG at any time.

Some areas in the country with severe air quality pollution are required in the Clean Air Act to use RFG. Reformulated gas caps benzene at .95% by volume with the average level of benzene at .62%. Maine is not required to have reformulated gas and receives conventional fuel. However, during ozone season the Reid Vapor Pressure for gasoline is reduced from 9.0 to 7.8 in Maine's seven southern counties for reduction of volatile organic compound emissions. MTBE was widely used as a fuel oxygenate to reduce air toxic emissions and improve overall combustion efficiency. Because Maine did not have an MTBE ban in effect until January 2007, Maine did receive some RFG shipments during ozone season in southern Maine. In 2005, 35 out of 307 fuel shipments were RFG compared to 3 out of 315 shipments in 2006, in anticipation of Maine's MTBE ban.

The Energy Policy Act of 2005 passed without a ban on MTBE, but did include a renewable fuels standard as well as removing the oxygenate requirement from the RFG program. Because of the removal of the fuel oxygenate requirement and the state bans on MTBE, 10% ethanol has replaced MTBE in RFG to maintain the air quality improvements. All of the northeastern states with the exception of Maine and Vermont are receiving 10% ethanol in their fuel supply. Because Maine is not required to use RFG, we continue to receive conventional gasoline without MTBE or ethanol. As a result, in 2006 the average levels of benzene were 0.92 % by volume, which is higher than the levels of 0.81% vol. reported in 2005. The number of shipments with benzene levels above the federal cap of .95% by volume tripled from previous years with a maximum level reported as high as 4.03% by volume.

MEDEP used MOBILE 6.2 to model the air toxics reductions from using RFG. The analysis indicates that adoption of RFG statewide would achieve a 6% reduction in air toxics reductions from the on-road sector. However, the subcommittee raised concerns regarding the potential price increase of RFG and potential limited capacity to blend ethanol at the terminals, as well as storage and distribution issues. Handling of ethanol has unique requirements and would require a significant investment in infrastructure.

In addition, EPA's Mobile Sources Air Toxic Rule will go into effect in 2011 requiring a nation wide average level of benzene to not exceed .62% by volume. This requirement would apply to all fuels including the conventional fuel shipped to Maine.

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