Legislative Budget and Finance Committee

A JOINT COMMITTEE OF THE PENNSYLVANIA GENERAL ASSEMBLY

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FINAL REPORT

PENNSYLVANIA'S ENHANCED VEHICLE EMISSIONS INSPECTION PROGRAM

(In Response to Senate Resolution 116)

June 1994

Table of Contents

Table of Contents
(Continued)

Table of Contents
(Continued)

I. Introduction

Senate Resolution 116 calls for the Legislative Budget and Finance Committee to conduct a study on the Commonwealth's planned enhanced vehicle emissions inspection and maintenance (I/M) program. The resolution requires a preliminary report be completed on or before June 15, 1994, and a final report be completed on or before June 30, 1994.

This resolution was introduced on April 20, 1994, and passed the full Senate on April 26. At a meeting held on April 27, 1994, the Legislative Budget and Finance Committee adopted the study called for in the resolution.

Study Objectives

The resolution (see Appendix A) cites many specific areas the report is to address. We have condensed these various requirements into seven study questions.

1. What are the requirements of the federal Clean Air Act, particularly regarding enhanced vehicle emissions inspection programs?

2. What is Pennsylvania's current plan to meet these federal mandates?

3. How are other states planning to meet the enhanced vehicle emissions inspection requirements of the federal Clean Air Act?

4. What costs have been incurred to date under existing contractual commitments, and what is the Commonwealth's likely liability for reimbursing those costs if the contract were terminated?

5. What are the advantages and disadvantages of test-only and test-and-repair approaches to an enhanced vehicle emissions inspection program?

6. To what extent do recent studies support or refute the EPA's model for an enhanced emissions inspection program?

7. What options are available to Pennsylvania?

The preliminary report addressed the first three study objectives. This report addresses the remaining objectives and includes updated information on topics covered in the preliminary report.

Methodology

We addressed the study objectives primarily through the review and analysis of existing documents. These include federal and state laws and regulations; Pennsylvania's State Implementation Plan (SIP); the EPA's Final Inspection/Maintenance Rule; pertinent court decisions; the contract between the Pennsylvania Department of Transportation and Envirotest (the contractor responsible for implementing the Commonwealth's inspection program); correspondence between state and federal officials; and numerous other I/M related publications, journal articles, position statements, and hearing testimony. We are also examining pertinent studies conducted by federal and state agencies and private organizations. We obtained these documents from the Pennsylvania Departments of Transportation and Environmental Resources, the U.S. Environmental Protection Agency, legislative staff and committees, national and state associations, and air quality and transportation agencies in other states.

In addition, we conducted extensive interviews with many federal and state officials, Pennsylvania House and Senate legislative staff, and representatives of various national and state associations. Information in the report on other states has been verified with appropriate officials in these states.

Acknowledgements

We thank everyone who assisted us in this study. We especially thank Secretary of Transportation Howard Yerusalim and Deputy Secretary Mario Pirritano and his staff for their outstanding cooperation and timely responses to our information requests. Officials of the PA Department of Environmental Resources, particularly James Salvaggio and Wick Havens, and officials of the Environmental Protection Agency, particularly Eugene Tierney, David Arnold, and Kelly Bunker, were also very helpful. Although too numerous to mention individually, we also gratefully acknowledge the assistance we received from the Pennsylvania House and Senate legislative staff, officials in other states, and national and state organizations.

IMPORTANT NOTE

This report was developed by the Legislative Budget and Finance Committee staff. The release of this report should not be construed as indicating that LB&FC members necessarily agree with all of the report's content.

Any questions or comments regarding this report should be directed to Philip R. Durgin, Executive Director, Legislative Budget and Finance Committee, P.O. Box 8737, Harrisburg, Pennsylvania 17105-8737.

II. Federal Clean Air Act Requirements

SECTION II-A

Because Pennsylvania Is in the Northeast Ozone Transport Region, It Must Implement an Enhanced I/M Program in 25 Counties, Regardless of the Quality of Air in Those Counties

Summary: **The 1990 amendments to the federal Clean Air Act impose strict requirements on states to clean the air, particularly in polluted urban areas. The Clean Air Act requires that in counties with serious or worse ozone problems several steps be taken to reduce emissions, including implementing an enhanced vehicle emissions inspection and maintenance (I/M) program. The only area in Pennsylvania classified under the 1990 Clean Air Act Amendments as having a serious or worse ozone problem is the five-county Philadelphia area.**

However, the Clean Air Act also created the Northeast Ozone Transport Region, a group of 12 states (plus the District of Columbia) with a large concentration of people, motor vehicles, and air pollutants. States in this Region, which includes Pennsylvania, must implement enhanced I/M programs in most urban areas with a population of 100,000 or more, regardless of the quality of the air in those counties. As a result, Pennsylvania must implement an enhanced I/M program in 25 counties, not just the five-county Philadelphia area.

In adopting the Clean Air Act Amendments of 1990, Congress made sweeping changes to the way air quality will be regulated in the United States. The 1990 amendments require the U.S. Environmental Protection Agency (EPA)[1] to implement strong environmental policies and regulations that will ensure cleaner air. The amendments have 11 sections or "titles" that outline how the federal

[1]The EPA has had oversight and policy development responsibility for I/M programs since the passage of the Clean Air Act in 1970, which included I/M as an option for improving air quality. With the passage of the 1977 amendments to the Clean Air Act, I/M was mandated for certain areas with long-term air quality problems. The 1990 amendments to the Clean Air Act expand I/M's role as an attainment strategy and require EPA to develop different performance standards for "basic" and "enhanced" I/M programs.

government and the states must approach cleaning the air. The two key titles, for the purposes of this study, are Title I and Title II.

Title I of the Clean Air Act authorizes the EPA to establish national air quality standards for ozone. Ground level ozone[2] is an air pollutant which causes throat irritation, congestion, chest pains, nausea, labored breathing, and related respiratory problems. It is particularly harmful to older people and those with chronic heart and lung conditions.

The EPA established the National Ambient Air Quality Standard for ozone at 0.12 parts per million. Areas not in compliance with this standard are considered "nonattainment areas," and are ranked by the severity of their problem as marginal, moderate, serious, severe, or extreme. Exhibit 1 shows the ranking of Pennsylvania's counties. States with nonattainment areas must take specific emissions reduction measures based on the severity of their ozone problem.

Title I also permits the creation of ozone transport regions. An ozone transport region is a group of states or parts of states that adjoin each other and that comprise a geographical area where air currents carry pollution from one part of the region to another, thus affecting the air quality of neighboring areas. Pennsylvania is part of the Northeast Ozone Transport Region, the only region specifically established in the Act. The Northeast Ozone Transport Region also includes the District of Columbia (which includes northern Virginia), New York, Maryland, Delaware, New Jersey, and the New England states (see Appendix C). States in an ozone transport region must implement more stringent programs for reducing both mobile and stationary sources of pollution. For example, the Act requires that states in the Northeast Ozone Transport Region implement an enhanced vehicle emission inspection program in metropolitan statistical areas with a 1990 population of 100,000 or more, regardless of their ozone attainment status.[3]

Title II establishes new, stringent emission standards for automobiles and trucks. Although motor vehicle manufacturers have made many advances in emission control technology, cars and trucks still account for about half of the ozone air pollution and nearly all of the carbon monoxide (CO) air pollution in United States cities.[4] The Clean Air Act Amendments of 1990 also recognize the contribution motor vehicles make toward ozone formation and requires many states, including Pennsylvania, to develop enhanced vehicle emission inspection and maintenance

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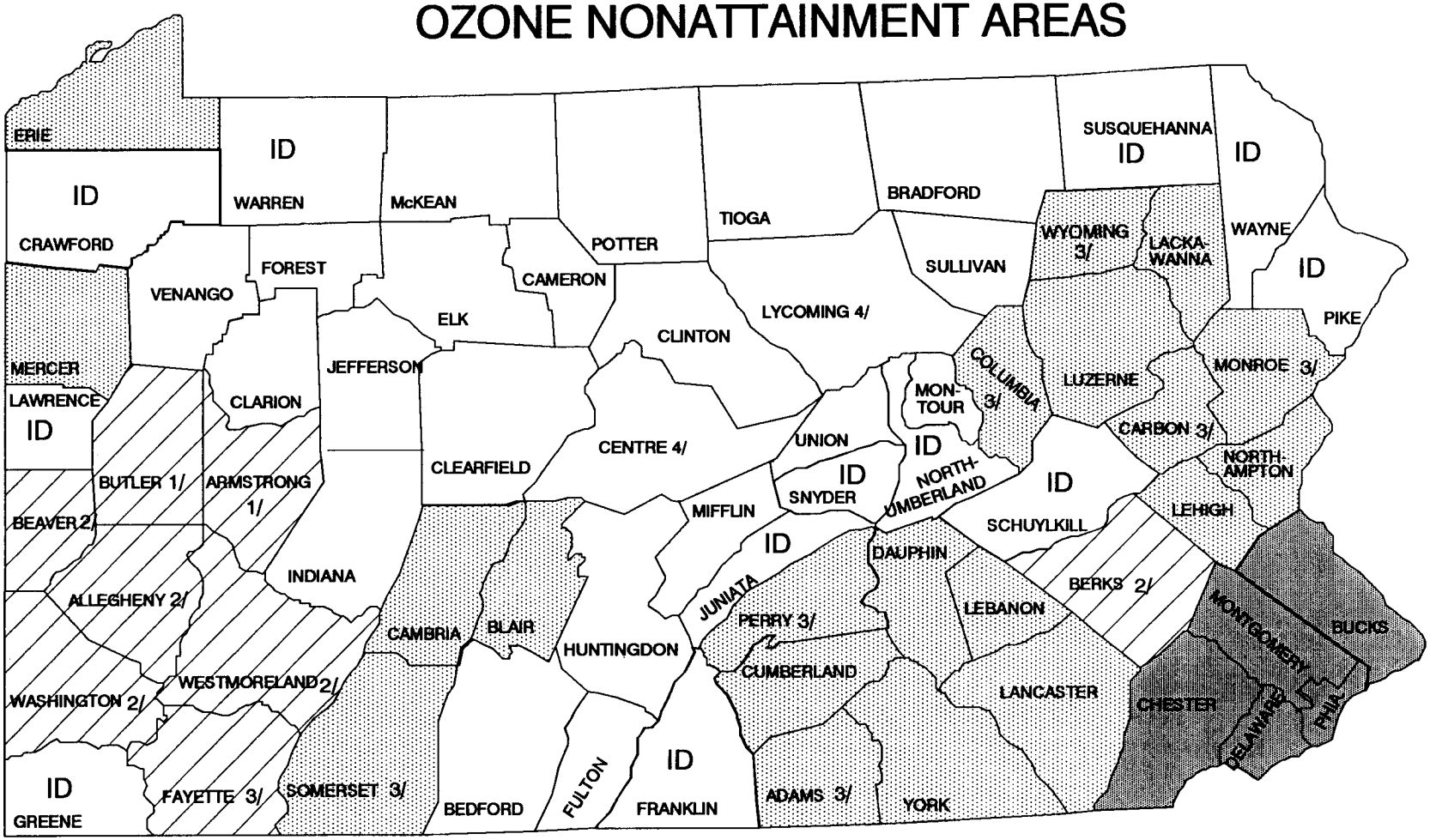
[2]Ground level ozone should not be confused with stratospheric ozone which is beneficial and needed in the upper levels of the atmosphere to block harmful radiation from the sun.

[3]EPA regulations permit counties within such an MSA to be exempted from the enhanced I/M program if they have a population density of less than 200 persons per square mile (based on the 1990 census), provided that at least 50 percent of the MSA population is included in the program. EPA has approved PennDOT's request to have eight counties excluded from the enhanced I/M program based on this provision.

[4]Motor vehicles do not exhaust ozone directly. Rather, they exhaust other pollutants, particularly VOCs (hydrocarbons) and nitrogen oxides, which then combine in sunlight to form ozone. Vehicle exhaust also contains carbon monoxide.

Exhibit 1

OZONE NONATTAINMENT AREAS



1/ Non metropolitan area, no I/M program required.

2/ Request to redesignate as attainment pending before EPA.

3/ EPA waiver for "rural" counties no I/M program required.

4/ Centre & Lycoming Co. are part of the enhanced I/M program due to population.

Source: PA Department of Transportation

(I/M) programs in serious or worse ozone nonattainment areas.[5] Enhanced I/M programs can reduce emissions by identifying vehicles in need of engine or emission control repairs.

In general, the Clean Air Act requires that the nation's most severely polluted cities, including the five-county Philadelphia area, achieve at least a 24 percent reduction in volatile organic compounds (VOCs) by the year 2000 (a 15 percent reduction by 1996 and a 3 percent average annual reduction for each of the next three years). Moderate ozone nonattainment areas must also achieve a 15 percent reduction in VOC emissions by November 1996. Marginal ozone nonattainment areas are to be in compliance with national standards by November 1993.

To meet these and other goals, the 1990 amendments require each state to submit revisions to its State Implementation Plan (SIP). This plan, however, is really a series of smaller plans, each of which has its own requirements and deadlines.[6] The I/M SIP, which is the state's plan for implementing an enhanced vehicle emission inspection program, is one of these plans. Pennsylvania's I/M SIP is discussed in detail in Section III-B of this report. Two other plans are also directly affected by the state's enhanced I/M program. These are the 15 Percent Rate of Progress Plan and the Urban Airshed Model SIP.

The 15 Percent Rate of Progress Plan, sometimes referred to as the 15 Percent SIP, is the state's plan for reducing VOCs by 15 percent from 1990 to 1996 in the five-county Philadelphia ozone nonattainment area.[7] Under this plan, DER projects VOC emission reductions of 137 tons per summer day, 31 tons of which are to come from stationary, or point, sources (large commercial and industrial operations); 31 tons from area sources (mostly smaller commercial and industrial operations); 46 tons as a result of the enhanced I/M program; and 28 tons from other mobile sources (e.g., reformulated fuels, employer trip reduction programs, and Stage II refueling controls). The enhanced I/M program accounts for one-third of total VOC reductions and is therefore critical to the success of the 15 Percent SIP. The 15 Percent SIP assumes the Commonwealth will adopt the centralized, test-only program described in the I/M SIP.

The 15 Percent SIP was submitted to the EPA in November 1993. The EPA found the plan incomplete in part because it did not contain enforceable regulations for architectural and industrial maintenance coatings. These are field-applied

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[5]EPA regulations also provide for a "basic" I/M program. Basic programs remain essentially unchanged from pre-1990 Clean Air Act requirements. Under the 1990 amendments, no Pennsylvania counties are subject to basic I/M programs.

[6]A state's regulations and/or programs to achieve the national air quality standards are referred to as the state implementation plan (SIP). The SIP is comprised of a variety of materials--plans, schedules, program agendas, and regulations.

[7]The Commonwealth did not submit a 15 Percent SIP for the Pittsburgh and Reading nonattainment areas because it had submitted a redesignation request to the EPA that, if approved, will not require a 15 Percent SIP for these areas.

coatings used by industry, highway surfaces, and home owners for decorative and protective purposes. This part of the SIP was incomplete because EPA had not yet finalized its requirements in this area.

The other key element of the State Implementation Plan that directly incorporates the state's I/M program is the Urban Airshed Model (UAM) SIP, also known as the demonstration attainment SIP. The UAM SIP, which is due on November 15, 1994, is required for the Metropolitan Philadelphia Interstate Air Quality Control Region. This Region includes Berks County and the five-county Philadelphia area as well as portions of New Jersey and Delaware.

The UAM SIP must demonstrate that all areas in the Philadelphia Interstate Region will attain compliance with the National Ambient Air Quality Standards by the year 2005. To develop this plan, the affected states are submitting data to Rutgers University, which is under contract with the EPA to do computer modeling of the data. The computer model--called the Urban Airshed Model--provides the information necessary to determine if the states' plans will accomplish the region's air quality goals. The information Pennsylvania has submitted to Rutgers University assumes implementation of a centralized, test-only enhanced I/M program as described in the state's I/M SIP.

SECTION II-B

States Can Implement I/M Programs That Vary From EPA's Test-Only Model, But EPA Has Made It Difficult to Take Advantage of These Options

Summary: **While EPA's regulations provide some flexibility in how states can design their enhanced I/M programs, the EPA has imposed very demanding requirements that states must satisfy to take advantage of this flexibility. For example, EPA regulations allow states to adopt decentralized, test-and-repair networks but, absent evidence to the contrary, the EPA imposes a 50 percent discount in emissions reduction credits for vehicles tested in such networks. The EPA justifies this reduction based on past problems with test-and-repair networks, particularly poor quality control and lax enforcement. This regulation makes it difficult for states to implement even a hybrid program that includes a test-and-repair component. This regulation has been challenged in federal court, but on May 6, 1994, the court upheld the EPA regulation. The Service Station Dealers of America plans to appeal this decision.**

Neither the Clean Air Act nor EPA regulations specify exactly the type of enhanced I/M program states must implement. However, the Clean Air Act specifies that enhanced I/M programs must include at a minimum:

- computerized emission analyzers,
- provisions for on-road testing devices,
- denial of waivers for warranted vehicles or repairs related to tampering,
- a $450 expenditure (in 1989 dollars) to qualify for waivers not covered by warranty,
- enforcement through registration denial,
- annual inspections (unless a state can demonstrate that less frequent testing is equally effective),
- centralized testing (unless the state can demonstrate that decentralized testing is equally effective), and
- inspection of the vehicle's emission control diagnostic system.

Using the Clean Air Act requirements as a starting point, the EPA has developed a performance standard achievable through a model, or benchmark, program. Key features of the EPA model program are summarized on Exhibit 2.

Exhibit 2

Key Features of the EPA's Enhanced Model Program

- Centralized "test-only" facilities.
- Annual testing.[a]
- Testing of 1968 and later light duty vehicles and light duty trucks up to 8,500 pounds GVWR.
- On-road testing of at least 0.5 percent of the vehicle population (or 20,000 vehicles, whichever is less).
- Transient IM240 testing on 1986 and later models, two-speed testing of 1981-85 model year vehicles, and idle testing of pre-1981 vehicles.
- Visual inspection of the catalyst and fuel inlet restrictor on all 1984 and later models.
- Evaporative system integrity (pressure) test on 1983 and later models and an evaporative system purge test on 1986 and later models.
- A 20 percent failure rate for pre-1981 models (tested with idle tests).
- A 3 percent waiver rate, as a percentage of failed vehicles.
- A 96 percent compliance rate.

[a]The Act requires EPA to establish a performance standard based on an annual test program. However, EPA recommends biennial testing because it believes it to be nearly as effective as annual testing and involves significantly less cost to consumers and state governments. EPA recommends states take other steps, such as testing earlier model years, to make up for the losses incurred by biennial rather than annual testing.

Source: EPA's November 5, 1992, regulations (40 CFR Part 51).

The EPA's performance standard allows states flexibility in designing I/M programs as long as such programs result in the same or greater emissions

reductions from the I/M program as that achieved by the model program. Thus, a state may choose to vary any of the design elements (except those required by the Act) of the model program provided the overall effectiveness is at least as great as what would be achieved by the model program. The EPA has calculated that its model program will achieve approximately a 28 percent reduction in VOCs, a 31 percent reduction in carbon monoxide emissions, and a 9 percent reduction in nitrogen oxide emissions from motor vehicles by the year 2000, when compared to what the area would have experienced without an I/M program.

EPA's Rationale for Preferring Centralized, Test-Only Programs

EPA's performance standards strongly encourage states to adopt centralized, test-only programs. Under a test-only program, the inspection facility is legally barred from making repairs to the vehicle. Under a test-and-repair program, dealers, fleet operators, and independent garages could officially test the vehicle, make any necessary repairs, and then retest the vehicle to determine if it passes. The EPA strongly prefers centralized, test-only facilities because of two key problems it has found in existing test-and-repair programs: (1) deficiencies in test equipment and procedures and (2) poor quality control and enforcement.

Test equipment and procedures. Since June 1, 1984, motorists in some areas of Pennsylvania have been required to have tailpipe emissions tests as part of their vehicle's annual safety inspection. The current tailpipe test is normally an idle test. The idle test works well for pre-1981 carbureted, noncomputerized vehicles because typical emission control problems involved "rich" air/fuel mixtures that affect idle as well as cruising emissions.

A second, more sophisticated test involves a dynamometer, which permits the vehicle to be put under "load" while operating at higher engine speed than idle. A dynamometer acts as a treadmill to allow the wheels to turn while the vehicle remains in place. The vehicle's exhaust is then measured while "traveling" at a steady speed. However, according to the EPA, today's high-tech vehicles, with sensors and computers that continuously adjust engine operations, cannot be effectively tested unless procedures include cycles of acceleration and deceleration under loaded conditions.

To test vehicle emissions as they would occur when the vehicle is in use, the EPA developed the IM240 exhaust test, which involves a driving cycle lasting about 240 seconds. At the test site an emission inspector places the vehicle on a special dynamometer with inertia weights that allows the simulation of several speeds and loads. The IM240 test also allows accurate testing for nitrogen oxides and provides safeguards against the test-defeating strategies that might work with steady-state tests, such as disconnecting vacuum hoses. Such strategies would generally

increase emissions of at least one pollutant on the IM240 test. The IM240 test equipment costs about $106,000 per lane.

Some groups have suggested that alternative test procedures are available that could possibly achieve similar emission reductions at lower cost than the IM240 test. A loaded, steady-state test, known as the Acceleration Simulation Modes test or ASM test, has been suggested as one such alternative, with the claim that it can identify NO_X emitters. The equipment used in this alternative test, which includes a dynamometer and the purge and pressure test, would be less expensive than the IM240, costing approximately $41,000.[1] However, both would be more expensive than the most expensive current idle test equipment, which ranges from $15,000 to $20,000 per lane.

The EPA permits states to seek approval of alternative tests if the tests can be demonstrated to achieve effectiveness comparable to the IM240. The alternative tests must also have a low false failure rate and be resistant to test-defeating strategies. Although several groups have claimed varying degrees of success with alternative tests, such as those discussed above, to date the EPA has said that the test results are not consistent and do not provide the degree of accuracy in identifying high emitters of all types of pollutants as does the IM240 test. (Information on research on new emission testing techniques and results is presented in Appendix M.)

In addition to the IM240 test of tailpipe exhaust, enhanced I/M programs must also conduct tests to detect excessive evaporative emissions. The EPA has found that vapors which escape from various points in the vehicle's fuel system present a major source of hydrocarbon emissions, often greater than emissions from tailpipe exhaust. The EPA has developed two new tests to determine whether a vehicle's evaporative control systems are working properly: the pressure test and the purge test.

The pressure test is designed to find vapor leaks in the sealed, pressurized fuel systems of most newer vehicles. During the pressure test, the vehicle's fuel tank and evaporative system is pressurized and checked for leaks. The purge test checks the operation of the charcoal-filled evaporative canister that captures gasoline vapors. When the vehicle is moving, these vapors are routed to the engine, where they are burned. The amount of vapors sent from the evaporative canister to the engine can only be measured during the drive cycle because vapors are not transferred while the engine is idling.

Quality control and enforcement. Another problem the EPA identified in current state I/M programs is the failure of many inspectors to perform the emission

[1]Costs could be in the $30,000 to $35,000 range for Repair Grade 240 equipment, which is another possible alternative test.

inspection properly. For example, when the EPA audited the Commonwealth's emission inspection program in May 1989 it found that 50 percent of the emission mechanics observed were not following proper test procedures. In addition, several of the mechanics made the covert test vehicle pass the emission inspection even though it had been set to fail by Department personnel. As a result of these findings, the Commonwealth developed a covert audit program. During the first nine months of this program, PennDOT reported that 33 percent of the stations audited committed major infractions of the inspection regulations, including offering to sell inspection stickers without actually inspecting the vehicle.

The EPA also believes that many emission inspectors pass vehicles that should fail because they are unable to repair the vehicles and are afraid to lose customers if they acknowledge their shortcomings. According to the EPA, repair industry personnel have confirmed that many repair shops currently lack proper repair equipment and personnel trained to diagnose and repair newer vehicles.

The EPA therefore believes there are fundamental problems with test-and-repair programs and has concluded that test-and-repair programs will not achieve emission reductions equal to that of a centralized test-only program.

Decentralized Test-Only and Test-and-Repair Programs

The Clean Air Act and EPA regulations do, however, allow states to adopt a decentralized approach to enhanced I/M programs or hybrid programs combining elements of both a centralized and decentralized approach. Specifically, the EPA regulations state:

> Enhanced I/M programs shall be operated in a centralized test-only format, unless the state can demonstrate that a decentralized program is equally effective in achieving the enhanced I/M performance standard.

Such a decentralized approach can involve either test-only or test-and-repair networks.

Decentralized test-only networks. EPA regulations (40 CFR §51.353 (a)) state that decentralized inspection systems, so long as the stations are contractually or legally barred from performing repair work or referring to particular providers of repairs, are presumed to be equivalent to a centralized, test-only system. Nevada plans to use such a system for its enhanced I/M program. This will allow privately owned stations to compete for inspection business based on factors such as price, hours, and location.

Decentralized test-and-repair networks. EPA's November 5, 1992, regulations also allow states to implement a decentralized test-and-repair network. However, the EPA has stated that it is not willing to accept any of the nation's currently operating decentralized test-and-repair programs as equally effective to the EPA's centralized test-only model program.

Moreover, EPA regulations (40 CFR §51.353 (b)) specify that it will impose a 50 percent discount in emission reduction credits for the tailpipe emission test, purge test, evaporative system integrity test, catalyst check, and gas cap check and a 75 percent discount for the evaporative canister check, PCV check, and air system checks. These discounts reflect the EPA's conclusion that test-and-repair networks are substantially less effective at identifying noncomplying vehicles than test-only networks. The regulations provide for smaller reductions in credits if the state can demonstrate, based on past or future performance, that its test-and-repair system will exceed these levels. In other words, absent evidence to the contrary, the EPA considers decentralized test-and-repair networks to be 50 percent less effective than centralized or decentralized test-only networks in reducing emission pollutants.

The 50 percent credit reduction provisions make it difficult for states to implement test-and-repair programs. States that opt for a test-and-repair network need to make up the lost credits by being stricter in other aspects of their I/M program.[2] Such steps might include inspecting vehicles manufactured prior to 1968, allowing no waivers on gross polluting vehicles, including heavier trucks, and extensive use of remote sensing to identify gross polluters.

California, the only state to date that has entered into an agreement with EPA to develop a test-and-repair component to its program, plans to take these and other steps. (The California hybrid program is discussed further in Section IV-B.) California has also begun a study, to be completed by the end of 1994, to demonstrate if alternative equipment and procedures can meet EPA's performance standards. The EPA has agreed to use the results of this study to consider whether the credit reductions can be reduced.

In October 1993 the U.S. General Accounting Office testified before a subcommittee of the House Committee on Energy and Commerce on problems in implementing the 1990 Clean Air Act Amendments. Part of this testimony was an analysis of the EPA's decision to reduce emission credits for test-and-repair networks. In this testimony, the GAO reported problems with the data EPA used to justify setting the credit reductions at 50 percent and that the Clean Air Act does not provide explicit authority for the EPA to impose the 50 percent reduction on test-and-repair networks. However, the GAO concluded that the Clean Air Act gives the EPA discretion to assign the credits it determines to be appropriate, as long as the credit reductions are not arbitrary and capricious. According to the

[2]Credits cannot be taken from stationary or other area or mobile sources to offset lost I/M credits.

GAO, whether or not the problems with the EPA data used to justify the 50 percent reduction are sufficient to overturn the rule depends on the application of the "arbitrary and capricious" standard courts use to determine the legality of agency rules.

The National Automobile Dealers Association and the Service Station Dealers of America filed a lawsuit against the EPA challenging the 50 and 75 percent credit reductions as being arbitrary and capricious. The suit also claimed that the EPA exceeded its authority in this aspect. On May 6, 1994, the federal appeals court in Washington, D.C., ruled on this suit and upheld the EPA regulation. The counsel to the Service Station Dealers of America told us they plan to appeal the decision.

SECTION II-C

States That Fail to Comply With Federal Requirements Are Subject to Several Sanctions, but Parties Differ on Exactly How and When Some of These Sanctions Can Be Applied

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Summary: **The Clean Air Act requires the EPA to impose at least one of two sanctions on states 18 months after finding a deficiency, such as failing to submit a required plan. These sanctions are withholding federal highway funds for certain projects and a two-for-one credit offset for new sources of pollution. The EPA is also required to implement a Federal Implementation Plan (FIP) 24 months after the deficiency if the deficiency has not been cured and the state's plan has not been approved. The EPA can also impose discretionary sanctions and, under another federal law, can severely curtail the use of federal funds for new highway projects. The Clean Air Act also specifically provides for citizens to bring a court action to force the EPA and states to comply with the act.**

Because Pennsylvania never submitted a "committal" I/M SIP, an 18-month sanctions clock began in January 1993, when EPA informed the Governor of this deficiency. Pennsylvania submitted its full I/M SIP in November 1993, and the EPA found it complete in December 1993, stopping the sanctions clock with seven months remaining. EPA must make a final decision on the I/M SIP by September 15, 1994.

How the EPA sanctions would apply if Pennsylvania withdrew its I/M SIP or took action to render it impossible to implement could be subject to litigation. The EPA's position is that under such a scenario, it would find the state's I/M SIP void, and would restart the sanctions clock with 7 months remaining. Potential litigants might argue that sanctions should be imposed in July 1994, 18 months after the original deficiency finding. If the EPA disapproves Pennsylvania's I/M SIP, the EPA might not be able to impose sanctions until March 1996.

The 1990 amendments to the Clean Air Act required that enhanced I/M programs "take effect" by November 15, 1992, in compliance with EPA's enhanced I/M guidance. However, the EPA did not provide such guidance until November 5, 1992, when it published its final I/M program regulations in the *Federal Register*. Because of this delay, the EPA interpreted the Clean Air Act as giving it the

authority to conditionally approve all I/M SIPs received by November 15, 1992, so long as the plan included a formal commitment by the Governor to adopt and implement an I/M program meeting all the requirements of the EPA's final regulation (known as a committal SIP). As a condition of this approval, the regulations required that states submit a complete I/M SIP, including authorizing legislation and implementing regulations, by November 15, 1993. Once a SIP element receives final approval from the EPA, it is federally enforceable.

EPA regulations further require that enhanced I/M programs be fully implemented with respect to all administrative details by January 1, 1995. The regulations require that at least 30 percent of the affected vehicles participate in the enhanced I/M program beginning in January 1995. The remaining vehicles must participate in the program beginning in January 1996.

The Clean Air Act provides for two types of sanctions: mandatory sanctions and discretionary sanctions. These sanctions are applicable for many violations of the Clean Air Act, not just the I/M program.

Mandatory Sanctions

There are two types of mandatory sanctions under Section 179 of the act. The first mandatory sanction is the withholding of federal highway funds. Federal highway monies cannot, however, be withheld for:

- any project that the U.S. Secretary of Transportation determines is a safety project,
- capital programs for public transit,
- projects to construct/restrict roads or lanes solely for passenger buses or high occupancy vehicles,
- planning requirements for reducing employee work trip-related vehicle emissions,
- programs that improve traffic flow and achieve a net emission reduction,
- parking facilities serving multiple occupancy vehicle programs,
- programs to limit or reduce vehicle use in areas of emission concentration (e.g., downtown areas),
- programs to reduce congestion and emissions, and
- other transportation-related programs to improve air quality without encouraging single occupancy vehicle capacity.

If federal money has already been authorized for a project, the imposition of the highway sanction would not require that project to be stopped. If such a project needed to be approved in several stages, it could be stopped because no part of the

project could be approved after the highway sanction is imposed. However, neither EPA nor the U.S. Department of Transportation has promulgated regulations describing exactly how this sanction would be imposed (e.g., whether the highway funds would be lost to the state or whether the funds would just be unavailable until the state came into compliance with the Clean Air Act). Depending on how the sanction was imposed, PennDOT has estimated that up to $900 million in federal highway funds might be placed in jeopardy annually. (In California, the EPA threatened a withdrawal of about half the state's federal highway funds, $800 million out of a total annual payment of $1.7 billion.)

According to Pennsylvania's Secretary of Transportation, the key issue is obligation authority (the ability to spend federal highway funds on specific projects) which is allocated to each of the states on a federal fiscal year basis. The Secretary notes this authority is highly coveted by the states, since the level of authority has been less than funds authorized in recent years, and the federal-aid program includes a provision to reallocate unused authority to other states. Also, unused authority cannot be carried from one year to the next. Therefore, if Pennsylvania were sanctioned and the sanctions lasted throughout a federal fiscal year the Secretary notes the obligation authority and consequently project funding would definitely be lost and could not be recovered.

The second mandatory sanction is the requirement for at least a two-for-one emissions offset for new sources of pollution, meaning that any business seeking to install new capacity or add capacity that generates extra emissions in nonattainment areas must arrange an emission reduction of at least twice that amount elsewhere in the locale. For example, if a new factory generating 50 tons of pollutants per year was to be built in a nonattainment area, at least 100 tons of pollution would have to be eliminated by other sources, such as by closing a factory. Alternatively, a manufacturer could invest heavily in abatement controls for someone else, as well as his/her own plant, to get a permit for construction and operation.[1]

The EPA must begin the process to impose sanctions with respect to an I/M plan if it: (1) finds that a state has failed to submit a required plan, (2) disapproves a plan, or (3) finds that any requirement of an approved plan is not being implemented. After finding such a deficiency, the Clean Air Act requires that EPA begin an 18-month sanctions "clock." If after this 18-month period a state has not come into compliance, the act requires that EPA impose at least one of the two mandatory sanctions. The second sanction must be imposed six months later if the state has still not corrected the deficiency.

In a proposed rulemaking dated October 1, 1993, the EPA proposed implementing the "two-for-one" offset sanction first, followed in six months by the

[1]The Clean Air Act requires states to issue permits for the construction and operation of new or modified major stationary sources in a nonattainment area.

highway sanction.[2] If after 24 months (as measured from the start of the sanctions clock) the state has not cured the deficiency and the EPA has not approved the state plan, the act requires the federal government to implement a Federal Implementation Plan (FIP) for the state to ensure that the state meets the requirements of the Clean Air Act. Significantly, curing the plan's deficiency alone is insufficient to stop the 24-month FIP clock; EPA approval of the plan is also necessary.

On March 8, 1994, the U.S. Court of Appeals for the District of Columbia Circuit, in response to a petition by the Natural Resources Defense Council, struck down the EPA's conditional approval regulation (allowing states until November 15, 1993, to submit their complete State Implementation Plan) and found that the EPA had improperly delayed SIP submissions beyond the statutory deadlines. The court later ordered EPA to propose either approval or disapproval by no later than July 15, 1994, of all basic and enhanced I/M SIPs that have been submitted. Final approval or disapproval of all such SIPs must be completed by September 15, 1994. Those states that have not submitted a complete I/M SIP, as well as those states whose SIP has been or will be disapproved, will be subject to sanctions in accordance with the timetables outlined in the Clean Air Act. Some might argue that this court order means if Pennsylvania's I/M SIP was disapproved, mandatory sanctions could not be imposed until March 1996, 18 months after the September 1994 deadline for EPA's final approval.

Discretionary Sanctions

The EPA also has authority to impose discretionary sanctions under Section 110(m) of the Clean Air Act. The two primary discretionary sanctions are the same as the mandatory sanctions under Section 179: the withholding of federal highway funds and the two-for-one offset.[3] EPA has taken the position that it can impose discretionary sanctions at any time after finding a deficiency.[4] However, the U.S. General Accounting Office informed the Chairman of the House Subcommittee on Oversight and Investigations that it disagreed with the EPA position. The GAO believes that the EPA must give states 18 months to correct a SIP deficiency before it can impose either mandatory or discretionary sanctions.

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[2]The preamble to this proposed rule states that EPA will not impose mandatory sanctions on a state until the rule is published in final form, except through a separate notice-and-comment rulemaking. Once the rule is published in final form, which is expected to occur during the summer of 1994, EPA believes it can impose mandatory sanctions without further notice-and-comment rulemaking.

[3]EPA can also withhold all or part of its grants to states for implementing air pollution control programs. EPA officials told us that it was unlikely EPA would use this sanction as it might defeat EPA's overall mission.

[4]The EPA plans to impose discretionary sanctions through notice-and-comment rulemaking procedures, which would allow a public comment period. However, the EPA believes it has authority to publish notice of a proposed discretionary sanction before actually finding a deficiency. This would allow the EPA to then publish a final rule imposing the discretionary sanction soon after, or at the same time, it finds a deficiency. A GAO opinion disagreed with this conclusion. The GAO believes the EPA is not authorized to formally propose sanctions against a state until it finds a deficiency.

The EPA has stated that it does not anticipate imposing discretionary sanctions except in unusual circumstances (such as where a state "has indicated an explicit resistance to resolving a plan or program deficiency or to making a required plan or program submittal," 59 FR 1481 (January 11, 1994)). The EPA can impose the discretionary highway sanction on any portion of the state the EPA determines "reasonable and appropriate." However, the sanction cannot be imposed on a statewide basis within the first 24 months of finding a deficiency where one or more political subdivisions are primarily responsible for the deficiency.

Although the EPA has proposed discretionary sanctions for several states for failing to submit an enhanced I/M plan, it has not yet imposed discretionary sanctions under the 1990 act. Moreover, EPA decisions leading to discretionary sanctions could be challenged in court. For example, if the EPA disapproved a state's I/M SIP, the state or other parties could sue the EPA. Some proponents of test-and-repair networks have suggested that, given recent studies and evidence, a court might not uphold an EPA decision finding that a test-and-repair system is not as effective as the EPA's model program.[5] Additionally, as described above, if the EPA imposed discretionary sanctions within the first 18 months after finding a deficiency, a state could challenge the EPA's authority to do so.

Citizen Suits

In addition to the EPA's mandatory and discretionary sanctions, individual citizens and citizen groups can sue to force the EPA and state governments to comply with the Clean Air Act. The act specifically provides that any person can file suit against the EPA for failing to perform an act that is not discretionary. For example, a citizen group could bring a suit in federal court to force the EPA to impose mandatory sanctions if it failed to do so at the expiration of the 18-month sanctions clock.[6] The Clean Air Act also provides that citizens can sue the Commonwealth if it fails to implement a plan that has been approved by the EPA.

In addition to citizen suits under the Clean Air Act, a mandamus action could be filed in Commonwealth Court seeking to compel the Commonwealth to comply with any state or federal law, including the Clean Air Act. However, it is unclear who would have standing to bring such an action. In Sierra Club v. Hartman, the Pennsylvania Supreme Court dismissed a mandamus action filed by the Sierra Club for lack of standing. In this case, the Sierra Club sought to compel the Commonwealth to promulgate regulations designed to comply with federal environmental laws. The court found the Sierra Club lacked standing because it did not demonstrate their members had or would suffer direct or substantial injury.

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[5]See Appendices L and M for information on these studies.

[6]The Delaware Valley Citizens' Council for Clean Air previously sued the Commonwealth to force it to implement the state's basic I/M program. This suit ultimately resulted in a federal court order that prohibited PennDOT from receiving federal highway funds for southeastern Pennsylvania for a period of time in 1982.

ISTEA Sanctions

Finally, the federal Intermodal Surface Transportation Efficiency Act (ISTEA) reinforces the Clean Air Act by requiring states and metropolitan transportation planning organizations to carry out a comprehensive transportation planning process to better coordinate transportation projects that improve air quality. An area's Transportation Improvement Program (TIP) and Transportation Plan must be "in conformity" with its air quality plan. Under EPA regulations (40 CFR Part 51), a finding of a deficiency to implement certain requirements under the Clean Air Act--including failure to submit an I/M SIP--could result in no new transportation plans or TIPs being found in conformity in an ozone nonattainment region.

Without a conforming transportation plan or TIP, certain highway projects could not proceed. The only highway projects that can proceed are (1) projects exempt from the conformity rule[7], (2) projects that have completed all conformity determinations, and (3) non-federal projects that are not regionally significant and do not involve recipients of federal funds. (Federal highway funds that have already been obligated to a project are not affected.) EPA has recently used this transportation conformity provision to pressure the Commonwealth of Virginia to adopt an EPA-approvable enhanced I/M program. This EPA action against Virginia is discussed further in Section IV-B.

Pennsylvania's I/M SIP Deadlines and Sanctions

The Clean Air Act required states to submit their I/M SIPs by November 15, 1992. Because the EPA did not publish its final regulations on the I/M program requirements until November 5, 1992, the EPA allowed states until November 15, 1993, to submit complete I/M SIPs. The EPA, however, required states to submit "committal" I/M SIPs by November 15, 1992. Committal I/M SIPs had to include several documents, including a formal commitment by the Governor to the adoption and implementation of an I/M program meeting all the requirements of the EPA's regulations. Pennsylvania did not submit a committal I/M SIP and, on January 15, 1993, the EPA notified Governor Casey that it was making a finding of failure to submit a committal I/M SIP. This finding started the 18-month sanctions clock required under the Clean Air Act.

Pennsylvania never submitted a committal I/M SIP, but the state's full I/M SIP was submitted to the EPA on November 5, 1993. EPA found the I/M SIP to be administratively and technically complete on December 13, 1993, which cured the committal SIP deficiency and stopped the sanctions clock. As of December 13, 1993, 11 months had elapsed on the 18-month sanctions clock.

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[7]These exemptions are primarily for planning and technical studies and safety projects, such as guiderails and shoulder improvements. The exemptions are shown in Appendix D.

EPA's Region III Office recently completed its review of Pennsylvania's I/M SIP and has forwarded it to EPA headquarters, but the EPA has not yet given it final approval.[8] Because the EPA has not yet approved the state's I/M SIP, the 24-month Federal Implementation Plan clock continues to run and, unless the plan is approved, this clock will expire on January 15, 1995. At that point, the EPA is required to impose a Federal Implementation Plan to ensure Pennsylvania complies with the Clean Air Act. (Although the EPA has proposed an enhanced I/M Federal Implementation Plan for the Sacramento and Ventura areas in California, the EPA has to date never implemented an enhanced I/M FIP.)

Once an I/M SIP is finally approved by EPA, it is federally enforceable. If prior to final EPA approval, Pennsylvania should pass legislation halting implementation of its I/M SIP, the EPA's position is that they would consider Pennsylvania's I/M SIP as having been rescinded. According to the EPA, at that point it could impose discretionary sanctions and the 18-month mandatory sanctions clock would restart at the point it stopped, with 7 months remaining until EPA would be required to impose a mandatory sanction.

An alternative interpretation suggested to us is that the submission of a complete SIP that is later rescinded should have no effect on the sanctions clock. Under this argument, the EPA would be required to impose mandatory sanctions on July 15, 1994, 18 months after the original January 15, 1993, deficiency finding.

An April 22, 1994, federal court order suggests that if Pennsylvania's I/M SIP is disapproved by the EPA--which appears unlikely--a new 18-month sanctions clock would begin on the date of the finding of disapproval. This would give Pennsylvania until March 1996 to correct the disapproval deficiency. However, Pennsylvania would appear to remain subject to the imposition of a Federal Implementation Plan in January 1995 if an I/M SIP is not approved by that time.

If the EPA believes Pennsylvania is not following through on its enhanced I/M program plan, it also has the option to revoke the "protective finding" on the 15 Percent SIP for the Philadelphia area submitted in November 1993.[9] The EPA found the 15 Percent SIP incomplete, but issued a protective finding for purposes of transportation conformity. If this finding was revoked and if EPA took the same approach as it did in Virginia, no new transportation plans or TIPs could be found in conformity for the five-county Philadelphia area within 30 days of the notice of rescission. As discussed on page 20, this could severely curtail highway projects in this area.

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[8]The EPA is under a court order to propose approval or disapproval of submitted I/M SIPs by July 15, 1994, and to make a final determination by September 15, 1994.

[9]See Section A for information about the 15 Percent SIP.

III. Pennsylvania's Current Enhanced I/M Program

SECTION III-A

Pennsylvania Currently Plans to Meet the Enhanced I/M Testing Mandate by Using a Centralized Test-Only Program Operated by a Private Contractor

Summary: **Pennsylvania's enhanced I/M program plan follows, in most respects, the EPA's model program. The plan provides for biennial testing, at a cost of $17-$22, for model year 1968 and later gasoline-powered vehicles with a GVWR of 9,000 pounds or less. Model year 1977 and later vehicles are to be tested using EPA-developed IM240 equipment and test procedures. One retest, if done within 30 days of the original test, will be free. Approximately 6 million vehicles will be subject to testing.**

In November 1993, the Pennsylvania Department of Transportation entered into a seven-year contract with Envirotest Systems of Tucson, Arizona, to implement the state's enhanced I/M program. The contract calls for 86 centralized test-only emission inspection stations with 287 lanes to be constructed throughout the 25 affected counties. Under the contract, Envirotest is to test 50 percent of affected vehicles in 1995 and the remainder in 1996. Vehicles are to be tested biennially thereafter. As of late June 1994 Envirotest had settled on 24 sites, had signed purchase agreements for an additional 53 sites, and reported having begun construction at 11 sites.

Statutory and Regulatory Basis for the Enhanced I/M Program

Pennsylvania's overall air pollution reduction statute is the Pennsylvania Air Pollution Control Act, 35 P.S. §4001 et seq. This act implements the provisions of the federal Clean Air Act in the Commonwealth. The Pennsylvania Department of Environmental Resources has primary responsibility for implementing the act, including issuing permits for factories and other stationary sources of air pollution. In 1997 and every five years thereafter, the Department is to conduct and submit to the General Assembly an evaluation of the effectiveness of the programs adopted to implement the Clean Air Act, including the enhanced I/M program.

Although DER has general responsibility for ensuring that the Commonwealth meets the requirements of the federal Clean Air Act, Act 1992-166 gives PennDOT specific responsibility for developing and implementing the Commonwealth's enhanced I/M program. Among the requirements of Act 166 are that:

- the enhanced I/M program only be implemented in counties required to comply with federal law,

- if the Department implements a centralized system, the system must meet certain requirements (e.g., vehicles be inspected on a biennial basis and no repairs or safety inspections be performed at centralized emission testing facilities), and

- no provision or requirement of the statutory section authorizing the enhanced I/M program can be more stringent or restrictive than required by the Clean Air Act.

The act also created a 16-member Vehicle Emission System Inspection Program Advisory Committee to provide advice and recommendations to PennDOT on establishing and implementing an enhanced I/M program.[1] The Committee has not issued any written reports, but it did submit suggestions to the Independent Regulatory Review Commission (IRRC) during its review of PennDOT's enhanced I/M regulation. These suggestions were largely technical in nature and did not challenge the fundamental concept of implementing a centralized test-only program operated by a private contractor.

Act 166 does not explicitly require PennDOT to develop a centralized test-only inspection program. However, the act specified certain elements of a centralized program if PennDOT decided to develop such a program. For example, the act authorizes PennDOT to enter into a contract for up to seven years to implement a centralized test-only program and contains many other references to a centralized program. On June 19, 1993, PennDOT published its final regulations implementing Act 166. As shown in Exhibit 3 Pennsylvania's enhanced I/M inspection program described in these regulations, which are included as part of Pennsylvania's I/M SIP, is a centralized test-only program that follows in most respects the EPA's model program.

The IRRC met on the Department's enhanced I/M regulations in June 1993. Comments were submitted by nine parties, including the Delaware Valley Citizens' Council for Clean Air, the Pennsylvania Automotive Association, and the Automotive Service Association of Pennsylvania. No changes were made to the regulations as a result of the IRRC meeting. In August 1993, PennDOT also held three public

[1]The Advisory Committee held 10 meetings during 1993 and met one time in 1994. The Advisory Committee's next meeting is scheduled for August 1994. The Committee sunsets on December 31, 1996.

hearings on the I/M SIP. These hearings were held in Pittsburgh, King of Prussia, and Harrisburg. The hearings were sparsely attended, with three citizens testifying in Pittsburgh; two in King of Prussia; and none in Harrisburg. We found no indication that changes were made to the I/M SIP as a result of these hearings.

In February 1994 the Pennsylvania General Assembly passed HB 299 (Act 1994-2). This act requires that Pennsylvania adopt a centralized test-only enhanced I/M program unless Congress changes the Clean Air Act and EPA changes its regulations "to permit the consideration and approval of either an enhanced or a basic decentralized emission inspection program for the Commonwealth." In that event, the act requires that PennDOT petition the EPA to allow it to revise its I/M SIP so as to study and pursue implementation of a decentralized program that meets the minimum federal standards. The act also provides, however, that any modification of the Clean Air Act, EPA's regulations, or Pennsylvania's I/M SIP cannot affect existing contracts.

We discussed this provision of Act 2 with officials in EPA and PennDOT. Both agencies noted that EPA's performance standard regulations have not changed since November 5, 1992. We also reviewed EPA regulations for the I/M program and found no changes since the November 1992 rule making. EPA officials also noted that decentralized basic and enhanced I/M programs have always been permitted under §51.353 of the EPA's November 1992 regulations. The EPA also contends that its memorandum of agreement with California does not involve any changes to the EPA's performance standard regulations. The California agreement is discussed further in Section IV-A.

PA's Planned Enhanced I/M Program

Program Overview

Pennsylvania has been conducting a "basic"[2] emission testing program in all or parts of 11 counties since 1984. These counties include Allegheny, Beaver, Bucks, Chester, Delaware, Lehigh, Montgomery, Northampton, Philadelphia, Washington, and Westmoreland. The 1990 Clean Air Act Amendments require Pennsylvania to implement an "enhanced" emission inspection (I/M) program in the 11 existing program areas, as well as an additional 14 counties. The 14 additional counties are: Berks, Blair, Cambria, Centre, Cumberland, Dauphin, Erie, Lackawanna, Lancaster, Lebanon, Luzerne, Lycoming, Mercer, and York. An enhanced I/M program is scheduled to begin in these 25 counties in January 1995.

[2]The "basic" program consists of measuring the emissions of a vehicle while at idle to determine if it exceeds federally established emission standards. The test is conducted by approximately 3,500 independent garages or service stations, who may also perform vehicle repairs under the current program.

As shown on Exhibit 3 Pennsylvania's enhanced I/M program plan follows, in most respects, the EPA's model program. Pennsylvania's plan provides for 86 centralized test-only emission inspection stations with 287 lanes located throughout the 25 affected counties. (See Exhibit 4 for the planned number of stations and lanes in each county.)

The plan provides for biennial testing for model year 1968 and later gasoline-powered vehicles with a GVWR of 9,000 pounds or less. About 5.9 million such vehicles are registered in the 25 affected counties and are thus subject to inspection.[3] Under the biennial inspection schedule, about 3 million vehicles will be tested each year. Vehicles that fail the inspection receive computer-generated diagnostic information that the owner can take to a repair facility to help the mechanic diagnose the problem.

The following are other important features of the planned program:

Motorist Notification - Vehicle owners will be notified of the requirement to get an emission test 80 to 90 days prior to the expiration of their current registration. At that time, the Bureau of Motor Vehicles will generate an "invitation to renew" (invoice) for the registration. The lower half of the form will resemble the current registration renewal invoice and will contain all of the information now on the form. The upper half of the renewal invitation will contain information regarding the enhanced emission inspection program. The applicant will take this portion of the form with him/her to the centralized inspection facility to obtain the emission inspection.

Vehicles Subject to Testing - All gasoline-powered passenger cars and light-duty trucks less than 9001 pounds gross vehicle weight rating and registered in a designated county are required to be tested. This also includes leased/rented vehicles that are operated primarily in affected areas. Vehicles operated on other fuels may be required to be tested in the future.

Vehicles Exempt From Testing - All pre-1968 vehicles; diesel-powered vehicles; electric vehicles; special mobile equipment; implements of husbandry; motor vehicles being towed; classics and antiques; motorcycles; motorized pedal-cycles; street rods; and vehicles being repossessed by a financier or collector.

Nature of the Testing - Vehicles with a model year of 1968 through 1976 will be given an idle test. Vehicles of a model year 1977 and newer will receive the transient emission (IM240) test which is conducted on a dynamometer. The transient emission test is capable of testing a vehicle under varied driving conditions and loads.

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[3]See Appendix E for the number of vehicles subject to inspection in each of the 25 counties.

Exhibit 3

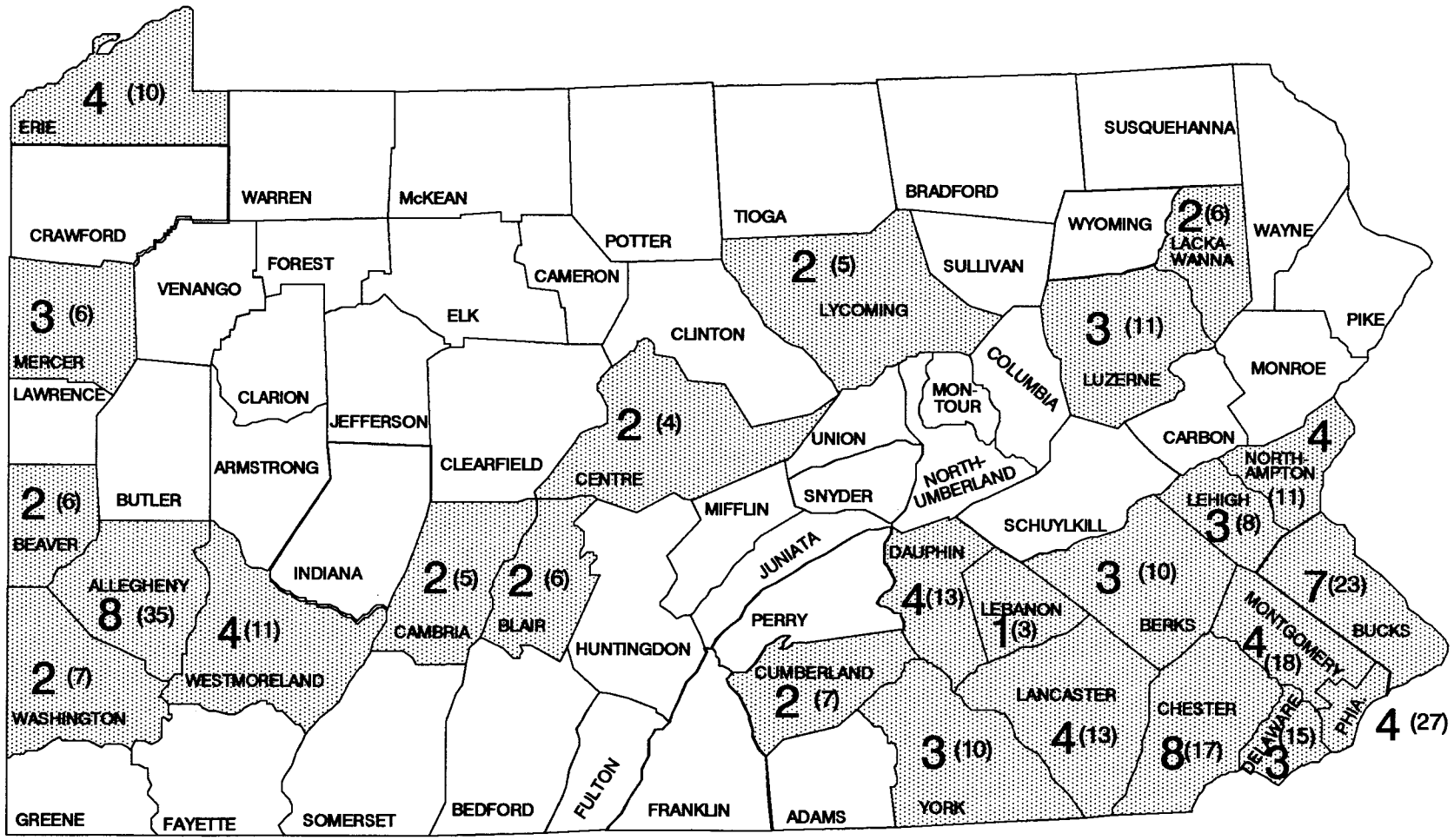
Comparison of Pennsylvania's Enhanced I/M Plan to the EPA Model

	EPA Model	PA Plan
Network Type	Centralized, Test-Only	Centralized, Test-Only
Start Date	1995	1995
Frequency	Annual	Biennial
Model Years	1968 and newer	1968 and newer
Vehicle Types	LDV, LDTI, LDT2[a]	LDV, LDTI, LDT2[b]
Emission Test	IM240 on 1986 and newer model years. Two speed 1981-1985. Idle pre-1981.	IM240 on 1977 and newer model years. Idle on 1968-1976 models.
Emission Standards	I/M 240 - For model years 1986-1993: 0.8 gpm HC/20 gpm CO/2.0 gpm NOx For model years 1994 and later: 0.7 gpm NMHC/15 gpm CO/1.4 gpm NOx	I/M 240 - Through the year 2000:[c] 0.8 gpm HC/15 gpm CO/2.0 gpm NOx After the year 2000: 0.6 gpm HC/15 gpm CO/1.5 gpm NOx
	Idle: 1.2% CO, 220 ppm HC	Idle: 1.2% CO, 220 ppm HC
Visual Checks	Visual inspection of catalyst and fuel inlet restrictor on all 1984 and later model year vehicles	Visual inspection of catalyst and fuel inlet restrictor on all 1977 and later model year vehicles
Functional Test	Pressure Test: 1983 and newer models Purge Test: 1986 and newer models	Pressure Test: 1977 and newer models Purge Test: 1977 and newer models
Failure Rate	20% for pre-1981 model years	20% for pre-1981 model years
Waiver Rate	3% of failed vehicles	3% of failed vehicles
Compliance Rate	96%	96%
On-Road Testing	At least 0.5% of vehicle population (or 20,000 vehicles)	Testing of 20,000 vehicles bienially (0.34% of vehicle population)

[a]Light-duty vehicle, light-duty truck (up to 6,000 lbs. GVWR), and light-duty truck (up to 8,500 lbs.GVWR).
[b]Same as EPA model except LDT2 up to 9,000 lbs.
[c]These are the current cutpoints, but PennDOT plans to change its regulations, in compliance with EPA regulations and Act 166 of 1992, to make them less stringent before the program begins operation in January 1995.
Source: Developed by LB&FC staff from EPA's Final Inspection/Maintenance Rule and Pennsylvania's I/M SIP and program regulations.

Exhibit 4

Enhanced I/M Program Areas and Planned Number of Testing Stations and Lanes



Note: The larger bold numbers indicate planned number of testing stations per county; the smaller numbers in parentheses indicate total number of lanes per county.

Source: Developed by LB&FC staff from information obtained from PA Department of Transportation.

Measurements of hydrocarbon (HC), carbon monoxide (CO) and oxides of nitrogen (NOx) will be compared to a standard for the vehicle's model year. Those vehicles subject to the transient test will also be required to undergo a test of the vehicle's fuel evaporative system. No repairs will be performed at the test stations.

Emissions Inspection Fee - $17 for non-peak days (the first 21 days of the month); $22 for the remaining days. One retest, if done within 30 days of the original test will be free. Late fees will be assessed for each month or part thereof beyond the registration deadline, a $10 late fee will be assessed to the vehicle owner/operator. This fee will not exceed $40. (NOTE: Unlike regular test fees which go to the contractor, late fees will be deposited in the Motor License Fund.)

Estimated Repair Costs - EPA estimates the repair cost to bring a vehicle into compliance will average about $120. However, this will be influenced by the condition of the vehicle.

Waivers - If a vehicle fails, one must expend a minimum of $450 in repairs to be eligible for a waiver. It should be noted, however, that cost of repairs covered by a warranty, insurance policy, or prepaid maintenance agreement will not be applicable towards the cost of a waiver. The $450 figure will be adjusted from year to year, based on the consumer price index.

Program Enforcement - EPA regulations require that registration be denied if a vehicle owner does not have his/her vehicle tested. Vehicle registration will not be renewed if the required emission inspection is not performed. In addition to registration denial as a means of enforcement, windshield stickers will also be affixed on the vehicles if they pass or receive a waiver.

The Envirotest Contract

On November 17, 1993, PennDOT entered into a contract with Envirotest/ Synterra Partners of Tucson, Arizona, to carry out the Commonwealth's enhanced I/M program.[4] The contract calls for Envirotest to build and operate 86 centralized test-only stations. As of late June 1994, Envirotest had closed on 24 sites, had signed purchase agreements for an addtional 53 sites, and reported having begun construction at 11 sites.

[4]On May 12, 1994, Envirotest Systems Corp. and Synterra Ltd. entered into a settlement agreement to terminate their joint venture to develop and operate Pennsylvania's enhanced I/M program. The settlement agreement, which PennDOT has approved, cited unspecified "disputes and controversies" as the reason for the termination. Synterra is an architectural and engineering firm that provides construction and project management, facility development, and transportation, facility and park design services. Envirotest does not anticipate any delays resulting from this termination.

Contractor Selection Process

PennDOT awarded the enhanced I/M contract to Envirotest as part of a competitively bid process. PennDOT issued a Request for Proposal (RFP) on June 21, 1993. Contractor responses were due September 3, 1993. PennDOT contracted with COMSIS Corporation, in conjunction with Konheim & Ketchalm, E.H. Pechan & Associates, Gary Hawthorn Associates, and a Yale University professor to assist in writing the technical aspects of the RFP and to advise the selection committee on technical matters.

Three firms responded to the Department's proposal: Envirotest (five alternative proposals); Environmental Systems Products, known as PennTest (one proposal); and Systems Control (two alternative proposals). Because the contract involves no direct expenditure of Commonwealth funds, the proposals cannot be ranked from low to high bidder.

An eight-person evaluation committee (five from PennDOT and one each from the Comptroller's Office, DER, and DGS) numerically ranked the eight proposals on nine technical factors, including the workplan, prior experience, staffing plan, and company profile (e.g., extent of company debt). The proposal that was finally selected was Envirotest's Alternative 3 for 86 stations and 287 lanes. This proposal was ranked first on the nine technical factors by five of the eight evaluation committee members and ranked second by the other three members.

The highest ranking proposal on the technical factors for each of the three contractors was then rated on two nontechnical factors, (1) cost and price and (2) socially and economically restricted business. Envirotest Alternative 3 ranked second on cost and price and last on socially and economically restricted business. The relatively low scores on the nontechnical factors were not great enough, however, to affect the final rankings, which showed Envirotest Alternative 3 having the highest overall point total.

Key Provisions of the Contract

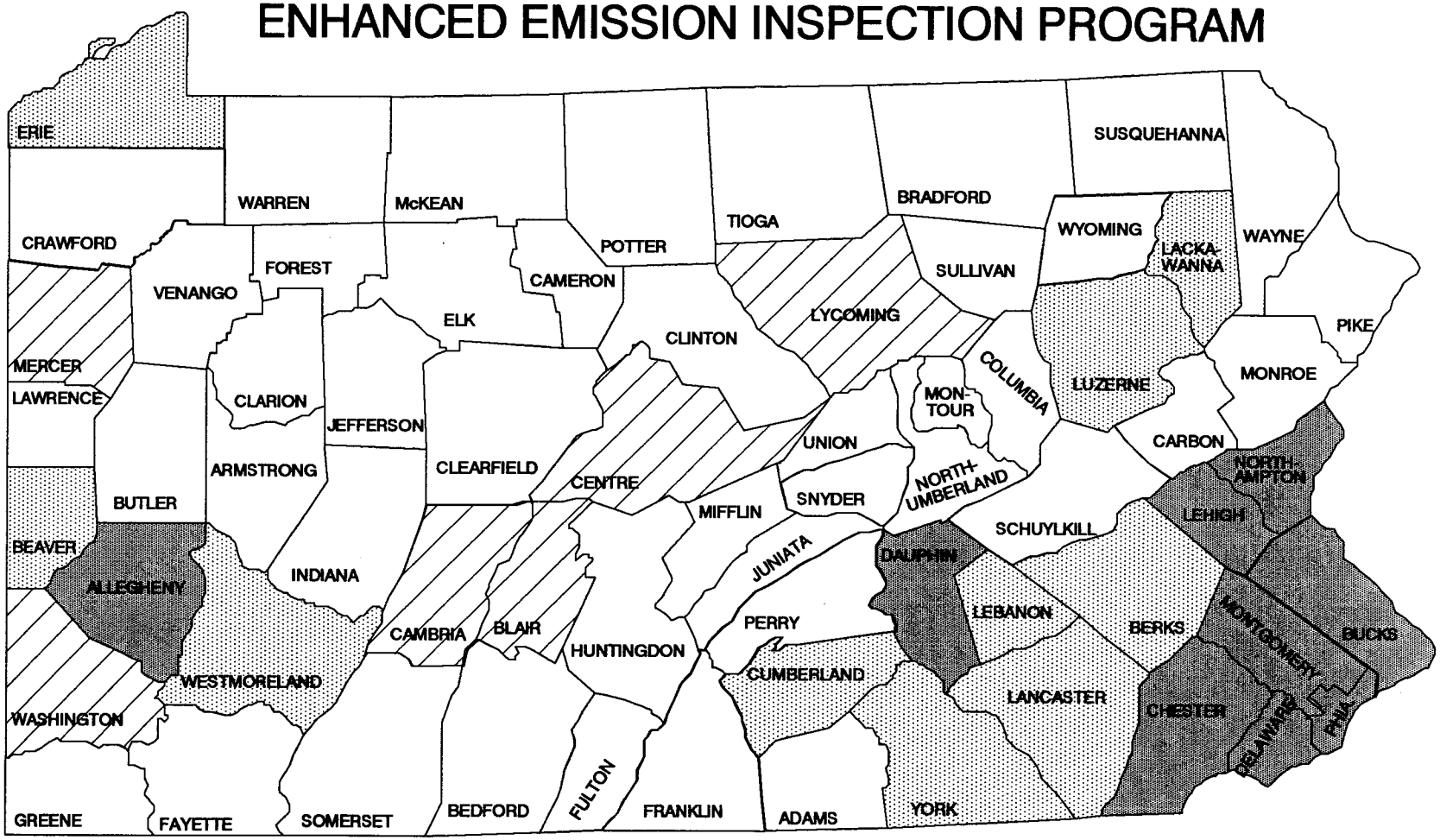
Driving time, waiting time, and operating hours. The contract requires Envirotest to build 86 stations with a total of 287 lanes distributed throughout the 25 affected counties. Exhibit 5 shows the estimated driving distances to an enhanced I/M inspection station in each county.

Waiting time is also specified in the contract. The contract requires that:

- 85 percent of all vehicles must begin testing within 15-minutes of arrival
- 95 percent of all vehicles must begin testing within 20-minutes of arrival
- 100 percent of all vehicles must begin testing within 25-minutes of arrival

Exhibit 5

REQUIRED DRIVE DISTANCE
ENHANCED EMISSION INSPECTION PROGRAM



80% of Pop. w/i 5 Mi.
95% of Pop. w/i 10 Mi.

80% of Pop. w/i 8 Mi.
95% of Pop. w/i 15 Mi.

80% of Pop. w/i 10 Mi.
95% of Pop. w/i 20 Mi.

Source: PA Department of Transportation

The contract provides for a fine of $200 each day one of the wait times standards are exceeded at a test lane.[5] Thus, if a test lane exceeded all three standards, PennDOT could levy a fine of $600 for that test lane. If a station had four test lanes and they all exceeded all three standards, the station could be fined $2,400 a day. Wait time is measured from when a vehicle enters a testing facility property to the time the test begins.

Operating hours are to be 7:30 a.m. to 6:00 p.m., Monday through Friday. Saturday hours are 7:30 a.m. to 3:00 p.m.

On-road testing. Envirotest is responsible for on-road testing, although this may be subcontracted. On-road testing is performed by a remote device capable of measuring vehicle exhaust gas content while the vehicle is in motion on the road or at roadside. The owner of a vehicle that is required to have an emission inspection and that fails an on-road test will have 30 days following notice of failure to pass an enhanced emission test or provide evidence that the vehicle has a valid emission test waiver. Envirotest must conduct on-road inspections of at least 20,000 vehicles each two-year period.

Phase-in period. In 1995 and every two years thereafter, vehicles in the affected counties with a VIN number ending in an odd number or letter must be inspected. In 1996 and every two years thereafter, vehicles in the affected counties with a VIN ending in an even number must be inspected. (In those counties where the basic emission inspection program already exists, PennDOT plans to require those vehicles that are not due for an enhanced inspection until 1996 to visit an inspection facility to receive a sticker valid until 1996, but the vehicles will not need to undergo a tailpipe inspection. The sticker will cost $3.)

Computer hook-up to PennDOT. The contract requires that Envirotest establish an EDP system to transmit to the Department, on at least a daily basis, all emissions test data collected from their inspection stations. Envirotest also must provide, at no cost to the Department, a minicomputer that will allow access between Envirotest's systems and PennDOT's mainframe computer. Envirotest is responsible for initial program development, supplying off-the-shelf software packages, and supplying all programs that are to be run on the minicomputer.

Contract termination. The contract provides that the Commonwealth has the unilateral right to terminate the contract, either in whole or in part, upon 30 days notice for the following reasons:

- Commonwealth abandonment or postponement of work set forth in the RFP
- Default (inadequate performance by the contractor)

[5]Ten minutes is added to each time limitation on peak days.

- Convenience of the Commonwealth

If the contract is terminated for convenience of the Commonwealth, the contractor must transfer title, assign leases, and deliver to the subsequent contractor all land and facilities at fair market value as initially determined by the Commonwealth.

If the Commonwealth terminates the contract as a result of a change in law or regulation, the Commonwealth must "request the state legislature to appropriate to the contractor equitable compensation for capital costs and other appropriate expenditures incurred prior to termination of the contract." The contract language also specifically provides that Envirotest "reserves all rights and remedies under the Contract and otherwise available to it in law or equity in the event of termination." The termination clause of the contract is discussed further in Section VI.

SECTION III-B

Envirotest, the Contractor Implementing PA's Enhanced I/M Program, Has Made Substantial Expenditures and Financial Commitments During the Start-up Phase of the Contract

Summary: **In November 1993, PennDOT entered into a contract with Envirotest Systems Corp. to implement the Commonwealth's enhanced I/M plan. Envirotest has begun the start-up phase of the contract, including purchasing land and entering into contracts for equipment and construction. Envirotest reports actual expenditures as of May 31, 1994, of $16.3 million and projects additional expenditures of $11.9 million during June. Envirotest also reports an additional $105.1 million in commitments as of May 31, 1994.**

As of June 15, Envirotest had settled on 19 sites, at a cost of $2.4 million, and had down payments, totaling $462,219, on an additional 57 sites. Most of Envirotest's $105.1 million in commitments is for test equipment, which has not yet been delivered, and for the manufacture and construction of the prefabricated steel-framed test facility buildings. As of June 24, 1994, Envirotest repoted having settled on a total of 24 sites, with purchase agreements on an additional 53 sites. Envirotest reported construction had begun on 11 sites.

Envirotest reports having incurred expenditures of $16.3 million as of May 31, 1994, and estimates that it will incur an additional $11.9 million in expenditures during June. Envirotest's total projected expenditures as of June 30, 1994, are, therefore, $28.2 million.[1] Most of these expenditures are for construction ($7.7 million), land ($6.7 million), and equipment ($5.8 million). In addition, Envirotest estimates it has commitments of about $105.1 million as of May 31, 1994.

Expenditures refer to the cost of goods and services received, whether or not these costs have actually been paid. Commitments refer to the cost of goods and services not yet received but for which the firm is under a contractual obligation. The bulk of Envirotest's commitments are for construction of the buildings where the emissions tests will be conducted ($71.7 million), equipment ($26.0 million), and

[1]Envirotest reports this amount does not include proposal development and lobbying costs, which are absorbed as selling expenses at the corporate level.

land ($7.3 million). A breakdown of these expenditures and commitments is shown on Exhibit 6.[2]

We reviewed Envirotest's vendor contracts, purchase orders, and other documentation we believed necessary to satisfy ourselves that the numbers presented on Exhibit 6, are reasonably accurate. We could not review projected June expenditures because this information will not be available until July.

The $14 million figure shown for total land purchases on Exhibit 6 is based on Envirotest's expectation to have closed or have under purchase agreements all 86 sites by the end of June. As of June 15, 1994, Envirotest has closed on 19 sites at a cost of $2,425,365 (not including closing costs, which average about 3 percent of the purchase price). As of June 15, Envirotest also has signed purchase agreements for an additional 57 sites. The down payments on these sites, which would be forfeited if Envirotest decided not to close on these agreements, total $462,219. On June 24 Envirotest reported having settled on 24 sites, with purchase agreements on an additional 53, and that construction had begun at 11 sites. Construction has not been completed at any of these sites, but Envirotest anticipates the first facility will be completed by mid-July.

The possible liability to the Commonwealth if the Envirotest contract were to be terminated is discussed beginning on page 84.

[2]Envirotest believes that, if the contract were to be terminated, it would also be owed termination costs and damages, which it estimates to be an additional $221 million. These potential costs are discussed further beginning on page 84 of the report.

Exhibit 6

Envirotest Estimate of Expenditures and Commitments Through June 30, 1994

	Actual Expenditures Through 4/30/94	Actual May Expenditures	Committed Expenditures Through 5/31/94	Projected June Expenditures[a]	Total
Project Support & General Expenses[b]	$ 2,297,511	$ 264,908	$ 43,743	$ 945,000	$ 3,551,162
Indirect Expenditures[c]	3,277,083	595,833	0	595,833	4,468,749
Test and Other Equipment[d]	1,180,723	2,493,843	26,029,345	2,095,500	31,799,411
Land Purchases	830,039	1,591,698	7,344,191	4,307,271	14,073,199
Construction[e]	1,348,345	2,402,657	71,688,268	3,923,367	79,362,637
Total Estimated Expenditures & Commitments, 6/30/94	$8,933,701	$7,348,939	$105,105,547	$11,866,971	$133,255,158
Termination Costs and Damages					+221,368,000[f]
					$354,623,158

Envirotest Note: The foregoing estimate of expenditures, costs, and damages are without admission, waiver or prejudice, and Envirotest specifically reserves all of its rights and remedies to recover all other and additional losses and damages to which it is entitled as a matter of law, contract, or otherwise.

[a] These expenditures are in addition to the Committed Expenditures Through 5/31/94 column.
[b] Includes public information and mechanics training materials.
[c] Indirect expenditures are calculated by applying Envirotest's 1993 corporate general and administrative expense ($9.9 million) as a percent of the total corporate contract revenues ($88.5 million) to anticipated annual Pennsylvania project revenues on a monthly basis. Envirotest estimates annual Pennsylvania project revenues to be about $65 million, which is then divided by 12 for a monthly figure and multiplied by 11.17 percent.
[d] Includes personnel and travel costs for hardware and software development. Other equipment includes, e.g., office computers and furniture.
[e] Includes architectural and engineering, site development and permits, and construction and site improvements.
[f] Envirotest believes that, if the contract was terminated, it would be entitled to receive this amount in termination costs and damages. These costs are described further beginning on page 84 of the report.

Source: Envirotest Systems Corp. (See text for information on LB&FC's review of these numbers.)

SECTION III-C

Pennsylvania's Emission Inspectors Must Be Tested and Certified; Repair Technicians Can Participate in a Voluntary Training Program

Summary: **Enhanced I/M emissions inspectors must be trained, tested, and certified. Repair technicians do not need such certification, but can participate in a voluntary training program. PennDOT's contract with Envirotest Systems requires the contractor to develop training courses. Envirotest's subcontractor has begun "train the trainer" seminars to prepare community college and votech school instructors to offer repair technicians training to begin in September. Emission inspector training is scheduled to begin in November 1994.**

If the Commonwealth adopted a hybrid enhanced I/M program, more emissions inspectors would need to be certified. For example, if a hybrid program allowed newer vehicles to go to test-and-repair facilities (model years 1989 through 1993), we estimated that roughly 2,300 repair facilities would offer I/M testing and repair. If each repair facility had three certified inspectors, this would require training of approximately 8,000 inspectors as compared to the 2,500 expected to be trained under the centralized test-only system.

Emission Inspector Certification

Federal regulations require that emission inspectors in the enhanced I/M program be tested and certified. Individuals seeking certification must be at least 18 years of age, have completed a PennDOT approved emission inspection training course, and have passed Commonwealth supervised written and hands-on examinations. As required by EPA regulations, the inspector training outlined in PennDOT regulations covers nine areas of training:

- The air pollution problem, including its cause and effects.
- The purpose, function, and goal of the inspection program.
- Emission inspection regulations and procedures of the Commonwealth.
- Technical details of the test procedures and the design rationale.
- Emission control device function, configuration, and inspection.
- Test equipment operation, calibration, and maintenance.
- Quality control procedures and their purpose.

- Public relations.
- Safety and health issues related to the inspection process.

Envirotest, as part of its contract with PennDOT, will implement an emission inspection training program. The emission inspector training program is outlined in Exhibit 7. An estimated 2,400-2,500 persons are expected to receive this training. PennDOT plans to monitor and evaluate the training program.

Envirotest is responsible for developing questions for the certified emission inspector test, but PennDOT will administer the test. Persons taking the written test must achieve a minimum score of 80 percent. The hands-on test is a pass/fail test. Persons taking the test must perform without assistance a complete emission inspection, must properly utilize test equipment, and must follow other required procedures. Persons unable to properly conduct the hands-on test procedures fail the test. Persons must complete the required training and pass both tests to be certified. Inspectors must take refresher courses and be recertified every two years.

Envirotest expects to have the training program developed and the certification test completed by September 1, 1994. Training for station managers, district managers, and PennDOT personnel is planned to begin at that time. Lane inspectors, whom Envirotest expects to hire in November, will be trained in November and December 1994. PennDOT officials indicated they believe Envirotest is on target with its training responsibilities under the contract.

Voluntary Repair Technician Training

67 Pa. Code §178.107 creates a voluntary repair technician training program for persons to become recognized repair technicians. EPA regulations require states to offer such training if not otherwise available and make other efforts to improve repair effectiveness in their I/M programs.[1] The training program includes:

- diagnosis and repair of malfunctions in closed-loop vehicles;
- application of emission control theory and diagnostic data to the diagnosis and repair of failures of the transient emission test and the evaporative system function tests;
- utilization of diagnostic information on systematic or repeated failures observed in the transient emission test and the evaporative system function tests; and
- generalized training on subsystems related to emission control.

[1]EPA's regulations call for two other initiatives to assure repair effectiveness. One is technical assistance: the oversight agency is to provide the repair industry with information and assistance for vehicle diagnosis and repair. To do this, Envirotest will establish a repair technician coordinator position and a toll-free phone number. The other EPA regulatory requirement is for performance monitoring: the oversight agency is to monitor the performance of individual repair facilities, and provide to the public a summary of local repair facility performance. PennDOT will be providing such information on individual repair facilities.

Exhibit 7

Pennsylvania Emissions Inspection Training Plan and Staff

Modules	PA Auditors	Headquarters Staff	Quality Assurance & Training Staff	Equipment & Facility Maintenance Staff	Facility Managers/ Assistant Facility Managers[1]	Lane Inspector[1]	Consumer Information Hotline	Repair Industry Coordinator	Time Allotted for Each Module
Introduction and Orientation: – History & Background – Management Organization – Commonwealth Enhanced Emissions Inspection Program	X	X	X	X	X	X	X	X	8 Hours
Human Resources Training	X[2]	X			X				16 Hours
Operations: – Inspection Network & Facilities – Inspection Requirements – Other Emissions Inspection Requirements	X	X	X		X	X	X	X	16 Hours
Lane Procedures: – Overview – Lane Operating Training – Hands-on Training	X	X	X		X	X	X	X	48 Hours
Safety Procedures	X	X	X	X	X	X			8 Hours
Test Equipment & Facility	X	X	X	X	X	X		X	8 Hours
Maintenance/Quality Assurance Customer Service/Complaint Handling/Public Relations	X	X			X	X	X		8 Hours
Enhanced Customer Services	X	X	X	X	X	X	X	X	8 Hours

[1]Certification required.
[2]If approved by the Department.

Source: Developed by LB&FC staff from information obtained from contract, Tab 9, Inspector and Auditor Training, Certification, Orientation Sessions, and Repair Technical Training.

As with the emission inspector training program, Envirotest is responsible for developing the voluntary repair technician program under its contract with PennDOT. Envirotest has subcontracted for these services. PennDOT has the property rights to the training course material developed by the subcontractor and will solicit community colleges and votech schools to offer the course.

After completing the training program, participants must pass a comprehensive examination with a minimum score of 70 percent on each segment. The schools will administer these tests. The training is divided into two 60-hour segments. One segment is on fundamental inspection repair (F.I.R.S.T.) and the other is advanced level training for emission diagnostician (E.D.G.E.). Appendices G and H contain more information on these courses.

By mid-February 1994, PennDOT had contacted about 60 community colleges and vocational technical schools across the state with information on the repair technician training program.[2] In response, 52 schools signed up a total of about 120 instructors for a "train the trainer" session on the first half of the training program (F.I.R.S.T.), scheduled to begin the week of June 20, 1994. The sessions will run for 6 consecutive days, 8 hours per day, with a maximum of 15 per class. Instructors can begin teaching this material to repair technicians as soon as they have completed the "train the trainer" course.[3] The schools will be required to sign an Agreement of Performance similar to that used in the basic I/M program before being allowed to offer the course.

According to PennDOT, schools are estimating that the cost of each 60-hour training segment will be approximately $200 to $400 per student. This contrasts with the $50 fee associated with training for the basic I/M program. PennDOT plans to periodically review course evaluation sheets and to monitor training performance in other ways, including having staff members attend training sessions.

The second phase of training materials (E.D.G.E.) is in rough draft, and the subcontractor is currently developing audio visual aids and a video tape. These materials are expected to be provided to PennDOT in draft form in the middle of August. E.D.G.E. "train the trainer" sessions are scheduled to begin in 1995.

Envirotest has also hired a Repair Industry Training Coordinator to act as a liaison between the schools offering the repair technician training courses and repair facilities. In addition, Envirotest plans to issue a quarterly newsletter for repair technicians to be distributed to all PA inspection stations, and the first one was mailed during the week of June 20.

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[2]PennDOT has also addressed groups such as new car dealers and service station associations.
[3]PennDOT requires that to be a certified trainer for the repair technician course, the "E.D.G.E." component be completed within a year of completing the F.I.R.S.T. training.

Two bills before the General Assembly address state regulation of vehicle repair personnel. House Bill 220 would require motor vehicle repair mechanics to pass a certification test and register with the Commonwealth. A newly created Motor Vehicle Repair Industry Board would issue these certificates depending upon the test passed (e.g., a certificate for persons generally skilled in motor vehicle repair and certificates for persons specially skilled in one or more areas of motor vehicle repair). A second bill, H.B. 2990, was referred to the House Consumer Affairs Committee on June 28, 1994. This bill would permit auto repair technicians to obtain state certification in different categories of automotive repair. This program would be voluntary.

Training and Certification Under a Hybrid Program

About 3,580 test-and-repair facilities are involved in the Commonwealth's basic emissions testing program, representing roughly half of the 7,384 safety inspection stations in the basic I/M counties. There are about 20,000 certified I/M inspectors in the basic program in PA. The basic emissions program covers about 3.6 million vehicles; the enhanced program will cover about 5.9 million vehicles.

An estimated 2,400-2,500 persons are expected to be trained under the test-only enhanced I/M program. If a hybrid program were implemented that allowed newer vehicles (model years 1989 through 1993[4]) to go to a test-and-repair facility, about 8,000 certified inspectors might seek certification, as compared to the 2,500 inspectors that Envirotest plans to train. (Hybrid programs are discussed in Section IV.) This would be based on approximately 2,300 stations and assumes that three certified inspectors would be used at each facility, compared to the 5.6 inspectors per facility under the basic emissions program.[5] It also assumes that a centralized test-only system would be required for vehicles six years and older.

[4]About 38 percent of Pa's gasoline-powered vehicles (under 9,000 lbs GVWR) are model years 1989-1993.
[5]We estimated 2,300 stations based on maintaining the ratio of approximately one emissions testing station for every two safety inspection stations in the basic I/M program, multiplying by 38 percent to account for the portion of vehicles that could go to a test-and-repair facility, and adding in 53 (62% of 86) stations that would remain as test-only.

IV. Approaches to Enhanced I/M in Other States

SECTION IV-A

California Has Negotiated With the EPA to Operate a Program With a Decentralized Test-and-Repair Component

Summary: **California is the only state in the nation to have received EPA approval to implement an enhanced I/M program with a test-and-repair component. Under the agreement reached between California and the EPA in March 1994, about 30 percent of the vehicles required to undergo an enhanced I/M inspection could go to decentralized test-and-repair garages. Vehicles six years old and older will be required to go to test-only stations unless California can demonstrate that it can meet the EPA performance standards using a selection process other than age.**

To make up for the emission credit reductions the EPA imposes on test-and-repair networks, California plans to eliminate waivers for gross polluting vehicles, implement aggressive remote sensing and enforcement programs and, based on EPA's computer modeling analysis, will need to impose tighter emission "cutpoints" (resulting in more failures). California is conducting a study, to be completed by the end of 1994, to determine what steps can be taken to improve the effectiveness of its program to reduce the credit discount. The study is also seeking to determine whether less expensive test equipment and procedures can be made comparable to the IM240.

On March 21, 1994, the U.S. EPA entered into an agreement with the California Environmental Protection Agency concerning the implementation of an enhanced I/M program, execution of a pilot demonstration program, and the use of the demonstration program's study results.

The agreement allows California to implement a hybrid inspection program wherein vehicles that are six years old and older (estimated to be about 60 percent of the affected vehicles) are tested at centralized, test-only facilities. The remainder

of the fleet can be inspected at decentralized, test-and-repair facilities.[1] As part of the agreement, the EPA agreed "to recognize good faith efforts by California pursuant to this agreement when reviewing the state's progress in implementing its SIP requirements, and when considering discretionary sanctions."[2]

The agreement followed passage of California legislation (SB 629) in January 1994 and, on March 9, 1994, additional "trailer" legislation that the EPA considered necessary to enable it to approve California's proposed SIP revisions. Additional legislation needed to conform with the agreement was signed on March 30, 1994.

Features of the California program include:

- Extensive use of remote sensing devices to identify gross polluters.
- Gross polluting and tampered vehicles cannot qualify for waivers. They will either have to be repaired (regardless of cost) or scrapped.
- Emissions test required when vehicle ownership changes.

Exhibit 8 shows the key features of California's proposed hybrid program.

The Memorandum of Agreement does not lessen the EPA's performance standards or grant California an extension of the EPA's implementation deadlines. California is still required to meet or exceed the emission reduction performance standards described in the EPA's November 5, 1992, regulations and must begin phasing in its program in January 1995. The agreement also requires California to send at least 30 percent of its fleet to test-only centers over the biennial period beginning in January 1995 (i.e., 15 percent annually), which is the same requirement imposed on all states. However, the agreement provides that California need only incrementally increase the number of test-only inspection stations once it has capacity to test 15 percent of the affected fleet at test-only facilities. This allows California time to demonstrate that test-only inspections for all or a portion of the vehicles are not necessary before having to construct a large number of test-only facilities.

As a key part of its agreement with the EPA, California has agreed to conduct a study with three basic objectives:

- To determine the emission reduction effectiveness of alternative loaded mode emission tests compared to the IM240.

[1]Except for new vehicles for which a specified mitigation fee has been paid at the time of purchase, estimated to be about 10 percent of the vehicle fleet. Such vehicles are exempt from inspection for a two-year period.
[2]In January 1994 the EPA proposed to use its discretionary authority to withhold federal highway funds within a period of a few months if the state did not adopt an approvable I/M program. According to the EPA, it postponed imposing such sanctions due to the earthquake that hit Southern California later in January.

Exhibit 8

Key Features of California's Hybrid Test-and-Repair I/M Program*

Centralized Test-Only Vehicles	Vehicles 6 years old and older (back to 1966 - est. 60% of fleet), 14,000 lbs. GVWR and under; program tests 1966+ vehicles.[a]
Test-and-Repair Vehicles	Vehicles under 6 years old.[a]
Number of I/M Test-and-Repair Stations	Not estimated.
Cost to Test/Repair Stations for Equipment, etc.	$30,000-$40,000 for RG240 or 4-mode ASM test.[b]
Number of Test-Only Stations	Not estimated.
Number of Vehicles Tested	9 million.
Number of State Personnel in I/M Program	559
Number of Covert Audits by State Personnel	At least one per year, per inspector per station. Additionally, for test-and-repair stations, one covert vehicle visit per station, per year, including purchase of repairs.[c]
Covert Audit Failure Rate	Not estimated.
Cost of Covert Audit Program	$8 million (est.).
Number of Referee Stations[d]	49
Personnel in Contractor's Referee Stations	120
Cost of Referee Contract	$9 million
Personnel Contracted to Perform Overt Audits	42

Exhibit 8 (Continued)

Number of Overt Audits	At least 2 per year per test lane or bay.[c]
Cost of Overt Audit Program	$3.6 million.
Total State Operating Expense for I/M Program (Including Referee and Quality Assurance Services)	$57.5 million + $12.7 million from Legislature.
Test Fee for Motorist	$30–$40 test-only (est.); $50 or more test/repair (est.)[e]
Test Standards	Estimated to fail 40% of vehicles (EPA estimate).
Waivers[f]	None for "gross polluters" or initial out-of-state registrations. Limits on waivers for vehicles which previously received a waiver.
Program Oversight Cost	$7/vehicle or $31.5 million annually (est.).[g]

*These are the features of California's "default" program. Depending on the results of California's demonstration studies (see page 42), certain features of the default program may change.

[a]Note also that all vehicles, at change of ownership, regardless of vehicle age, must be tested and "gross polluters," tampered vehicles, and those eligible for a waiver (as identified by remote sensing or a test-and-repair facility) regardless of age are required to be tested at a test-only facility.

[b]Estimated to be $20,000 in additional costs beyond existing basic I/M testing equipment.

[c]Required by federal regulations for all states.

[d]A referee station arbitrates disputes between drivers and testing center operators.

[e]Actual fees not yet determined. California officials believe the test-only fee is likely to be in the $20-$25 range and the test-and-repair fees will be near the test-only fee due to market considerations.

[f]Test-and-repair stations may not issue waivers.

[g]The EPA has stated that the current cost of oversight ($7 per vehicle) in California's basic I/M program will substantially increase in the enhanced program.

Source: Developed by LB&FC staff from information obtained from EPA documents, California law, the California/U.S. EPA Memorandum of Agreement, and correspondence with California officials.

- To quantify the emission reductions achievable from a remote sensing-based program that identifies gross emitting vehicles.

- To determine if high emitting vehicles can be identified using criteria other than, or in addition to, the age of the vehicle.

The EPA has agreed to use the study in deciding whether fewer or more vehicles will need to be directed to test-only stations. California has committed to completing this study by December 31, 1994.

The success of the California approach will depend heavily on the outcome of the demonstration study, particularly the effectiveness of alternative, less expensive test equipment and the pilot remote-sensing program in Sacramento County. An acceptable alternative test to the IM240 is important because the purchase of an IM240--costing at least $100,000--is not economically feasible for many service station owners. The EPA has agreed to allow California to use such alternative tests and procedures if the results of the study show that the alternatives are at least equivalent to the EPA's tests and procedures.

The remote testing program is important in identifying gross emitting vehicles for "out-of-cycle" repairs. Remote testing involves a remote sensing device that shines an infrared beam across the road. The beam passes through a vehicle's exhaust plume and is altered by the gases. A detector on the other side of the road receives the altered beam and can infer the carbon monoxide and hydrocarbon content in the exhaust plume. (Efforts are underway to modify the device to detect nitrogen oxide emissions.) The remote sensing device can automatically match a car's emissions to its license plate, and gross polluters can be sent a fine or a citation to report for closer inspection. Advocates of remote testing believe it could eliminate, or at least reduce, the need for scheduled inspections.

The EPA has applied the "50 percent credit discount" (discussed in Section II-B) to the vehicles eligible to go to test-and-repair stations, estimated to be about 30 percent of the fleet. According to California officials, the net effect of their negotiated agreement with EPA will reduce this discount to 37 percent to reflect California's existing efforts in other areas. The EPA will consider further reducing the credit discount applied to test-and-repair programs to the extent that California can demonstrate that: (1) by using remote sensing devices it can identify vehicles needing repair that would not otherwise be identified and (2) enhanced enforcement, training, and other measures can be effective in remedying deficiencies identified in the program. California can use these credits to reduce the number of vehicles required to be inspected at test-only facilities.

SECTION IV-B

Three Other States–Georgia, New Jersey, and Virginia–Are Actively Considering Test-and-Repair Approaches in Their Enhanced I/M Programs

Summary: **Twenty-two states must implement enhanced I/M programs. Sixteen of these states, including Pennsylvania, plan to implement a centralized test-only program using IM240 test procedures. Nevada plans to implement a decentralized test-only program. Georgia, New Jersey, and Virginia, are actively considering test-and-repair approaches to their enhanced I/M programs. Louisiana has placed its centralized test-only program on hold, and the legislature has appealed to President Clinton for greater flexibility to fashion a "reasonable" vehicle emissions program. California, the only state to date that has obtained EPA approval for a hybrid program, is discussed in Section IV-A.**

Twenty-two states, including Pennsylvania, are required to begin implementing enhanced I/M programs in January 1995.[1] In each of these states, all affected vehicles must be subject to an enhanced I/M inspection beginning in January 1996. This section describes the status of enhanced I/M programs in other states, with particular attention to Louisiana, Georgia, New Jersey, and Virginia.

Status of Enhanced I/M Programs in Other States

Most states (16 out of 22 states) are planning to implement a centralized test-only enhanced I/M program using IM240 test procedures.[2] Ten of these sixteen states have submitted I/M SIPs in whole or in part. As of June 10, 1994, the EPA had not yet given final approval to any of the plans, but is under a court order to make proposed decisions by July 15, 1994, and final decisions by September 15, 1994.

As of early June 1994, for the 22 states required to implement an enhanced I/M program:

- Fifteen have submitted complete or partial I/M SIPs.

[1]Six additional states, Arizona, Kentucky, Michigan, Missouri, Ohio, and Utah, are also planning to implement an EPA approvable enhanced I/M program in the more urban areas of their states, primarily to earn pollution credits to be applied to stationary and area source air pollution reduction requirements.
[2]Appendix G in the preliminary report provides summary information on the enhanced I/M programs in each of the 22 states.

- Six (Colorado, Georgia, Maine, Pennsylvania, Texas, and Wisconsin) have had their I/M SIPs deemed complete. Georgia, however, is attempting to amend its SIP to provide for a test-and-repair component.

- Seven have selected contractors for part or all of their centralized test-only enhanced I/M program. Envirotest is the contractor in three states (Colorado, Connecticut, and Pennsylvania) and New York City.

- Test fees vary from "free" in Delaware, Illinois, and Indiana, where costs are to be covered through other funds, to a maximum of $23 in Texas and an estimated $30 in Vermont. California's test fees have not yet been determined but were estimated to be from $30 to in excess of $50.

- Weight classes to be included in the program vary from 8,500 lbs. and under to 26,000 lbs. in Maryland and Virginia. New Jersey plans to test all affected vehicles regardless of weight.

- The number of vehicles subject to enhanced I/M inspection ranges from about 9 million in California and New York to 90,000 in Vermont. Pennsylvania ranks fourth among the 22 states with approximately 5.9 million vehicles subject to the enhanced I/M program.

Of the six states that are not actively pursuing a centralized test-only enhanced I/M program, only one, California, has a signed agreement with the EPA to develop a test-and-repair component to their program (see Section IV-A). A second state, Nevada, plans to implement a decentralized test-only network. Louisiana submitted a centralized test-only I/M SIP but, as of early June, had placed a hold on its process to select a contractor. The three remaining states--Georgia, New Jersey, and Virginia--were, as of late June, planning decentralized test-and-repair approaches in their programs. Additional information on these states is presented below.

Louisiana

Louisiana has submitted an I/M SIP for Baton Rouge, the only area in Louisiana required to implement an enhanced I/M program. The SIP proposes a centralized test-only program. However, earlier this year, Louisiana enacted legislation preventing general fund monies from being used to implement any form of an enhanced I/M program.

On May 25, 1994, the leadership of the Louisiana General Assembly sent a letter to President Clinton urging him to require the EPA to revise its rules to permit states flexibility to fashion "reasonable" vehicle emissions programs. The letter notes that "questions have arisen which should be addressed before any state is forced to commit to a costly, experimental program which may be unnecessary or

which could be dealt with by more cost efficient and more convenient methods." The letter also states that "Louisiana's air quality has improved so much since enactment of the CAA [Clean Air Act], such that, if our classification were set today we would not be required by the CAA to implement this costly program."

New Jersey

The New Jersey Division of Motor Vehicles operates 38 centralized test-only sites under its current emissions testing program, which uses BAR84 analysis standards with an idle test. In addition, about 4,000 privately-owned stations are licensed to provide test-and-repair services. The state-operated facilities do not charge a test fee and perform about 80 percent of all emissions tests.

New Jersey plans to implement a statewide enhanced testing program for all gas-operated vehicles and all model years. State officials have developed a proposal which they believe can meet the U.S. EPA performance standards while still retaining aspects of the state's current hybrid program. Exhibit 9 outlines the general characteristics of New Jersey's proposed system.

Exhibit 9

New Jersey's Enhanced I/M Proposal to the EPA

1. Biennial inspections for vehicles tested with the IM240, annual inspections if the vehicle is tested with an ASM test (biennial if vehicle less than 5 years old).
2. Vehicles 4 years old and newer can be tested at test-and-repair stations.
3. Vehicles older than 4 years must receive initial inspection at test-only stations. At option of motorist, retest can be performed by test-and-repair station.[a]
4. Fast Pass/Fast Fail IM240 test at test-only stations if rate of 15 inspections per hour can be achieved. Otherwise, ASM5015 at test-only stations.
5. Repair grade (RG) 240 or ASM5015 at test-and-repair stations

[a]A New Jersey official reports that the EPA will not consider allowing New Jersey vehicles older than four years to go to test-and-repair sites for retests.

Source: New Jersey Department of Law and Public Safety, Division of Motor Vehicles.

New Jersey officials have several concerns about the IM240 system. Even with biennial testing, the state's capital costs for a centralized IM240 test-only system would reportedly be about $222 million. Because the state owns and operates the test-only facilities, this equipment will have to be paid for by the state. New Jersey officials are concerned that the IM240 system will not be cost effective if it can inspect an average of only 8.5 vehicles per hour, as their tests indicate.

New Jersey officials also have concerns about possible delays for motorists due to the IM240. New Jersey operated an IM240 test lane for 120 days at one of its facilities and found equipment problems on 60 percent of those days. The lane was completely down for 53 of the 120 days. New Jersey is therefore concerned about possible long lines due to equipment failure.

To address these problems, the EPA has proposed a Fast Pass/Fast Fail IM240 test, which EPA initially projected would allow 20 inspections per hour. The test, which EPA has approved for all states, would be shorter than the standard IM240 because interim emission readings would identify vehicles that would be very likely to either pass or fail and therefore would not need to receive the full test. New Jersey officials still had concerns about the Fast Pass/Fast Fail IM240 test, and the EPA subsequently considered allowing New Jersey to use a four-mode ASM test until January 1997 if Fast Pass/Fast Fail IM240 could not be proven to achieve a rate of 15 inspections per hour. However, New Jersey would not commit itself to a date to revert back to the Fast Pass/Fast Fail IM240 because its tests indicated a maximum rate of no more than 12 inspections per hour using Fast Pass/Fast Fail.

New Jersey officials point out that, even with the EPA's approval for a substitute to the standard IM240 test procedures, there is no realistic way to overcome the 50 percent credit reduction penalty imposed by the EPA for retesting older vehicles at test-and-repair facilities. As of late May, New Jersey was involved in discussions with the EPA and was meeting with its Congressional delegation to assist in negotiating a preliminary agreement on a hybrid system for the state, including a reduction of the 50 percent credit reduction penalty. U. S. Senators Bradley and Lautenberg and Congresspersons Hughes and Roukema wrote the U.S. EPA Administrator, Carol Browner, on May 27, 1994, expressing serious concern about the EPA's implementation of the 1990 Clean Air Act Amendments, especially "over the EPA's refusal to allow any substitute for its preferred IM 240 tests and its rejection of the benefits of test-and-repair facilities for the majority of motorists." The Congressional letter urges the EPA to allow states "the flexibility which Congress intended in its adoption of CAAA." As of June 21, 1994, EPA Administrator Browner had not responded to this letter, although discussion of these issues was occurring between the EPA and New Jersey officials.

As of late June, New Jersey officials reported that they had resumed negotiations with the EPA and that they had reached "conceptual" agreement on one of the two major issues on which their proposal had stalled previously. New Jersey is still proposing to use the ASM5015 testing equipment but has committed itself to using the IM240 test by January 1997 whether or not it achieves a 15-per-hour throughput using the Fast Pass/Fast Fail algorithm. In the meantime, however, if New Jersey has other operational or technical problems with its IM240 lane, the reversion date would not apply and the EPA would negotiate with New Jersey to determine a suitable alternative procedure. The retest issue remains unresolved between New Jersey and the EPA. Although New Jersey wants to allow vehicles

older than four years to be retested at test-and-repair stations, EPA will not agree to permit New Jersey to do so.

Virginia

Virginia currently has a test-and-repair basic I/M program in three northern counties and five cities. These areas and three additional counties must implement an enhanced I/M program. The test-and-repair program has about 400 stations, of which about half are service stations and half are dealerships and fleet operators.

In 1993 the Virginia General Assembly required a test-only program for the enhanced I/M program. In 1994 the General Assembly reversed itself and mandated the Virginia Department of Transportation develop a test-and-repair approach. The legislation also gave the Governor the discretion to change to a test-only program if it is determined that federal laws and regulations do not permit a different approach. Virginia's legislation does not authorize a hybrid program.

Based on this charge, Virginia has been working to develop a decentralized test-and-repair program for vehicles up to 26,000 pounds GVWR.[3] The enhanced program will use the IM240 test for vehicles up to 8,500 pounds GVWR unless the U.S. EPA approves alternative procedures such as Repair Grade 240.[4] The program plans to use an idle test for heavy-duty vehicles.

The Virginia Department of Environmental Quality is developing several possible approaches for continuing its decentralized test-and-repair program. The approaches being evaluated include testing vehicles annually, tightening "cutoff" points, using a higher compliance rate than the 96 percent required by the EPA, and attempting to demonstrate that the current test-and-repair program is effective and therefore should not be subject to the full 50 percent credit reduction imposed on test-and-repair networks.

On June 2, 1994, the EPA informed the Governor of Virginia that because the Virginia Legislature had legislation mandating a test-and-repair I/M program, the EPA was revoking the "protective finding" for Virginia's 15 Percent Rate of Reduction plan for the Virginia portion of the Washington, D.C., ozone nonattainment area. The EPA noted that the 15 Percent plan was found conditionally complete (a protective finding) based in part on Virginia's commitment to implement a centralized test-only enhanced I/M program. Because Virginia was not proceeding with this commitment, the EPA revoked the protective finding.

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[3]In September 1993, Virginia issued a request for proposal to operate a centralized test-only program and has opened the proposals and bids that it received. However, Virginia has not awarded a contract because of the change enacted by the General Assembly in 1994.

[4]The U.S. EPA is developing the RG240 as a less expensive, dynamometer-based test that repair shops can use to determine whether they have corrected the problems on vehicles that fail IM240 tests. The repair shops could use the RG240 to measure emissions before and after repairing failed vehicles.

In its letter the EPA said that, as a result of revoking the protective finding, no new transportation plans or TIPs would be found to conform as of 30 days from June 2. Without such conformity, new federally funded transportation projects would be severely curtailed.[5] The EPA said it will consider reinstating the protective finding if Virginia submits new evidence that it is firmly committed to implementing an enhanced I/M program "which will provide the emission reduction assumed in the 15% SIP." According to the EPA letter, "such a commitment would be best proven by proceeding with the previously planned [test-only] program."

Virginia subsequently submitted a proposal for a completely decentralized test-and-repair program to the EPA on June 14, 1994. The proposal also requests that EPA place a hold on implementing sanctions related to its northern Virginia conformity SIP (June 2 letter). The Virginia proposal calls for a biennial test using IM240 equipment or its equivalent if the EPA approves an alternative test procedure for full credit. The EPA has informed Virginia that it will review and comment on Virginia's test-and-repair proposal by mid-July. Virginia has scheduled a public meeting for July 20, after which it will submit its formal state implementation plan to the EPA.

Georgia

Georgia has submitted an I/M SIP for a centralized test-only enhanced I/M network that was deemed complete by the EPA. However, the Georgia Legislature adopted a resolution in early February 1994 calling for implementation of the program to be delayed. As of early June, Georgia had not yet awarded a contract to carry out its program.

To explore alternatives to the centralized test-only approach, the Georgia Department of Natural Resources' Environmental Protection Division (EPD) formed an ad hoc committee composed of representatives of business, automobile dealers, service stations, Georgia air quality officials, Georgia Institute of Technology, Georgia DOT, and the regional EPA office. The committee has developed a set of alternatives to a centralized test-only program and has been meeting to discuss these options.

In early June, a Georgia EPD official told us that, in addition to the original centralized test-only approach, four other options were being considered. All of these options, which meet EPA's performance standards as indicated through the Mobile 5a model, include a test-and-repair component as part of a hybrid network.[6] Depending on the option, the four or six newest model years would be covered under the test-and-repair component. The various options rely on Repair Grade 240 test

[5]Transportation conformity requirements are discussed in greater detail in Section II-C.
[6]The 50 percent credit reduction for tailpipe emissions is being applied to vehicles tested at test-and-repair facilities.

procedures, which have not yet received EPA approval, being used at the test-and-repair centers. Georgia officials reported that the four options (presented in Exhibit 10) would meet EPA's performance standards even if, as the EPA believes, RG240 test procedures are only about 70 percent as effective as the IM240.

On June 17, 1994, the Georgia EDP attempted to submit a revised I/M SIP to the EPA for a hybrid enhanced I/M program. The EPA, however, would not accept the SIP, in part because it lacked enforceable state regulations. Georgia subsequently withdrew its test-only SIP and was preparing a complete I/M SIP in accordance with its new plans, expected to be submitted to the EPA by September. On June 20, 1994, the EPA gave Georgia's Governor a letter notifying him that, as a result of withdrawing the I/M SIP, the EPA was making a "finding of Failure" in that Georgia had failed to submit plans for a required program. The EPA made this finding effective as of December 30, 1993, the date the EPA issued a completeness determination regarding the state's centralized test-only I/M SIP submittal. The letter also acknowledges Georgia's efforts to develop an alternative enhanced I/M program and states that the EPA looks forward to assisting Georgia officials in developing and adopting an enhanced I/M program.

Georgia's proposed hybrid plan would require annual testing for all vehicles. The newest six model years would be tested at a decentralized network of locations using RG240 technology. Vehicles seven years and older would be required to be tested in a centralized network using I/M240 technology. See also Appendix F for additional information on Georgia's planned I/M program.

Exhibit 10

Hybrid I/M Program Options Georgia Has Considered*

	Option 1	Option 2	Option 3	Option 4
Network Type	Test-and-repair - 6 newest model years Test-only - all others	Test-and-repair - 6 newest model years Test-only - all others	Test-and-repair - 6 newest model years Test-only - all others	Test-and-repair - 4 newest model years Test-only - all others
Inspections	RG240 - 6 newest model years IM240 - all others Purge - all models Pressure - all models 3 point ATP[a] - all models	RG240 - 6 newest model years IM240 - all others Purge - all models Pressure - all models 3 point ATP - all models	RG240 - 6 newest model years IM240 - all others Purge - all models Pressure - all models 3 point ATP - all models	RG240 - 4 newest model years IM240 - all others Purge - all models Pressure - all models 3 point ATP - all models
Frequency	Biennial - 6 newest Annual - all others	Biennial - 1981+ Annual - 1975–1980	Biennial - 1989+ Annual 1975–1988	Biennial - 1981+ Annual - 1975–1980
Model Years	1975+	1975+	1975+	1975+
Vehicle Types	LDGV[b], LDGT[c]	LDGV, LDGT, HDGV[d]	LDGV, LDGT, HDGV	LDGV, LDGT
Failure Rates	RG240 - EPA spec.[e] IM240: - 25% failure 1981+[f] - 20% failure pre-1981	RG240 - EPA spec.[e] IM240: - 25% failure 1981+[f] - 40% failure pre-1981	RG240 - EPA spec.[e] IM240: - 25% failure 1981+[f] - 40% failure pre-1981	RG240 - EPA spec.[e] IM240: - 25% failure 1981+[f] - 20% failure pre-1981

*Georgia reports that all of these options meet the EPA's I/M performance standard for emission reductions. The option Georgia proposed to the EPA on June 17, 1994, is different from the four options shown in this exhibit and is shown in Appendix F.

[a]Anti-tampering program.

[b]Light-duty gasoline-powered vehicle.

[c]Light-duty gasoline-powered truck.

[d]Heavy-duty gasoline-powered vehicle.

[e]EPA specifications not yet established, so failure rates cannot be estimated.

[f]Estimated and based on outputs of .8 grams per mile (GPM) of HC, 20 gpm of CO, 2.0 gpm of NOx.

Source: Developed by LB&FC staff from information provided by Georgia Department of Natural Resources' Environmental Protection Division.

V. Discussion of the Potential Cost, Convenience, and Other Impacts of Alternative I/M Approaches

SECTION V-A

State Administrative and Oversight Costs

Summary: **Federal regulations require that PennDOT carry out various data collection, quality assurance, and enforcement activities to ensure that its enhanced I/M program operates effectively. The costs associated with these administrative and oversight functions are paid from the state's Motor License Fund. While the amount of funding required will vary depending upon the network type that is implemented, it seems clear that the costs involved in administering a contractor-operated centralized program would be far less than a hybrid or a completely decentralized test-and-repair network. PennDOT estimates the Commonwealth's first-year costs for a centralized test-only network at $1.9 million, an increase of about $300,000 over the cost of the basic I/M program. We estimate that the state's annual administrative and oversight costs for a hybrid network would be about $7.4 million. Most of this cost differential results from the fact that inspections in a hybrid network would be performed by many business entities rather than one, with more inspection sites creating the need for more intensive and costly state oversight and program evaluation and audit activities.**

Federal regulations require that states implementing an enhanced I/M program must take steps to ensure the program operates effectively. These administrative and oversight efforts must be taken no matter what enhanced I/M network type is used (i.e., test-only, test-and-repair, or some combination thereof). The required activities include:

- *Data Collection and Analysis.* Various reports are required and test data must link specific test results to specific vehicles.

- *Quality Assurance Audits.* Regular overt and covert audits are to be conducted.

- *Equipment Quality Control.* A system for ensuring that test equipment is calibrated and maintained properly must be provided.

- *Enforcing Motorist Compliance.* Compliance must be ensured through the denial of motor vehicle registration. Also, systems must be developed to ensure proper vehicle identification, scheduled testing, program enforcement, and effectiveness monitoring.

- *Inspector and Station Enforcement.* Inspectors must be trained and certified and penalties for violation of program requirements must be applied fairly and systematically. A penalty schedule is required.

- *Program Effectiveness Evaluations.* A continuous state-run effectiveness evaluation system must be developed which includes special testing of a representative sample of the subject vehicle population and a program to determine the amount of emission reductions the state can credit toward the further progress requirements.

These activities result in administrative, oversight, and enforcement costs for the state I/M agency.

PennDOT's Vehicle Control Division within the Bureau of Motor Vehicles administers Pennsylvania's current basic I/M program in 11 counties. As of June 1994, 32 staff, including 14 quality assurance officers and 3 supervisors were involved in administering the basic I/M program. Administrative and oversight costs to the Motor License Fund for the basic I/M program were projected at about $1.5 million in FY 1993-94.

The contractor-run centralized system which PennDOT is in the process of implementing would involve an increase in the Commonwealth's I/M program costs. Table 1 provides a breakdown of estimated additional costs for the first year start-up phase as currently proposed. Due to additional staff and equipment needs, PennDOT projects an increase in the state's administrative costs of about $300,000 in the start-up year and about $200,000 in subsequent years. These amounts are over and above the $1.5 million currently being spent for the basic I/M program.

The first year start-up requirements for PennDOT include initial capital outlays for computers, systems development, and two vehicles. After the first year, annual operating expenses drop to an estimated $1.7 million because initial EDP development costs and vehicle purchase costs do not recur in the second year.

We believe, however, that PennDOT's estimate of additional costs may understate the costs of conducting EPA-required program audits. Additional costs ranging from $1 million to $2.5 million could be necessary depending upon the EPA's interpretation of its "one covert audit per year per inspector" regulation and the nature and extent of audit activities undertaken by PennDOT.

Envirotest pays for some of the administrative and oversight costs of the program. In addition to assuming the Department's EDP costs, Envirotest will also be providing data transmission and conducting roadside testing (these costs are part of the inspection fee). Also, Envirotest will reimburse the Commonwealth for the $17 test fee when a covert audit vehicle is inspected. At least some of these costs might have to be assumed by the Commonwealth under other network types.

Table 1

Estimated Costs to the Commonwealth for Oversight and Enforcement of a Centralized (Contractor-Operated) Test-Only Network

Current Basic I/M Program Cost		$1,550,000
Additional Costs for Enhanced Program:		
Additional Staff[a]	$50,000	
Additional Vehicles[b]	20,000	
EDP Costs	[c]	
Systems Development	185,000	
Travel	50,000	
Total Additional Costs	$305,000[e]	
Total I/M Costs to the Commonwealth		$1,855,000[d,e]

[a]Estimated cost for two additional staff at $25,000 per employee including benefits.
[b]Cost for two vehicles for field investigators.
[c]An estimated $358,000 would be required in order to furnish PennDOT with seven personal computers, 19 laptop computers, and a mini-computer with enhanced memory capability. However, the PennDOT contractor, Envirotest, has agreed to provide this capability as part of the agreement.
[d]This figure drops to $1.7 million in subsequent years because the expenditure for additional vehicles and systems development are nonrecurring costs.
[e]The costs to conduct EPA-required audits of the state I/M program may be understated in this estimate. Additional costs ranging from $1 million to $2.5 million could be necessary depending upon the EPA's interpretation of its "one covert audit per year per inspector" regulation and the nature and extent of audit activities undertaken by PennDOT.

Source: PA Department of Transportation.

In Pennsylvania's Enhanced I/M Program State Implementation Plan (November 1993), PennDOT included an estimate of the Commonwealth's costs to administer a completely decentralized test-and-repair program. PennDOT estimated that in a totally decentralized test-and-repair program about 5,000 stations would be required for enhanced I/M testing. With such a system, the Commonwealth would incur additional costs because of the expanded administrative, oversight, and quality control activities that would be required.

Based on estimated costs for additional auditors and inspectors, computer equipment, vehicles, and travel costs, PennDOT projected costs at $4.8 million the first year and $3.6 million thereafter. PennDOT reports, however, that it has reconsidered this original estimate and now believes that $3.6 - $4.8 million to administer a completely decentralized test-and-repair system is substantially understated.

Subsequent cost estimates developed by the Department have focused more on the potential cost to the state of administering a "hybrid" program similar to the California program. Using a proration of California's current and projected program expenses and the number of vehicles to be tested, PennDOT's staff concluded that annual costs in the $14-$17 million range would be required to implement this type of program in Pennsylvania. The Department's estimate is based on the assumption that Pennsylvania's enhanced I/M hybrid program costs would be 20 to 25 percent of California's program costs.[1]

Based on information obtained from PennDOT and the California Bureau of Automotive Repair, we also estimated the potential costs associated with adopting a California-type hybrid program in Pennsylvania. As shown on Table 2, we estimate the first-year costs of such a program at $7.4 million, an increase of about $5.8 million over and above the costs of the current basic I/M program. This cost could, however, be as high as about $13 million depending upon the number of covert audits that PennDOT would ultimately be required to conduct and the nature and cost of these audits.

Much of the cost increase over the basic program and the test-only network is due to the significantly expanded oversight responsibilities that PennDOT would have in dealing with approximately 2,300 test-and-repair stations in a hypothetical hybrid program. (See Table 2.) This would create substantial additional personnel, travel, equipment, and other operating costs.

As shown on Table 2, we estimate that the staff size of PennDOT's Vehicle Control Division would at least double from 32 in the basic program to 66 in the hypothetical hybrid. Additional staff costs for the hybrid program are more than $900,000 higher than the test-only estimates, primarily because of the need to hire additional motor vehicle program investigators, referee station attendants, and other personnel.

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[1]California's program costs are approximately $69.6 million. PennDOT officials stated that they recognize that a number of the activities that are a part of the California program would probably not be included in Pennsylvania's program. Also, Pennsylvania will be testing approximately 2.9 million vehicles biennially as compared with 6.5 million biennially in California. Considering that the scope of Pennsylvania's program is approximately 45 percent of California's effort, PennDOT officials regard 20 to 25 percent of California's costs as a conservative estimate of how much it might cost to oversee a hybrid network in Pennsylvania.

Table 2

Estimated Costs to the Commonwealth for Oversight and Enforcement of a Hybrid Emission (I/M) Program*

Current Basic I/M Program Cost		$1,550,000
Additional Costs for Enhanced Program:		
Additional Staff[a]	$ 964,000	
Travel[b]	100,000	
Professional Svcs/Utilities/Rent[c]	330,000	
Test Equipment for Referee Stations[d]	$600,000	
Systems Development[e]	185,000	
EDP and Field Staff Equipment[f]	400,000	
Additional Vehicles[g]	300,000	
Audit Expenses (Overt and Covert)[h]	3,000,000	
Total Additional Costs	$5,879,000	
Total I/M Costs to the Commonwealth		$7,429,000[h]

*Assumes a hypothetical hybrid (based on the California program) in which 2.5 million 1989 and newer vehicles would be eligible to go to a test-and-repair facility. The hybrid network would include approximately 2,300 test-and-repair stations and 55 test-only stations in the 25 affected PA counties.

[a]Estimated salary and benefit costs for 34 additional staff: 11 motor vehicle program investigators, 4 field supervisors, 15 referee station attendants, and four central office staff.

[b]Primarily travel costs for motor vehicle program investigators.

[c]An estimate of additional operating costs associated with expanded facilities, especially an increase in the number of referee stations from 4 to 15.

[d]The equipment used by the referee stations would need to be capable of validating test results obtained at a regular I/M inspection facility. Assuming that something less expensive than the IM240 would be acceptable for this purpose, one option, the BAR120 Hybrid developed in California, was developed to approximate the results achieved with the IM240 transient test. The cost of the necessary equipment is estimated at $40,000 and would be installed at each of the 15 referee facilities.

[e]This is the same amount reported for system development in the centralized contractor-operated system. Considering that many more stations would need to be linked to a centralized location for data collection and analysis, this cost may be higher.

[f]Under the planned centralized test-only system, Envirotest, has agreed to provide this capability (estimated at $360,000) as part of their agreement with PennDOT. This cost, or at least a portion of it, might have to be assumed by PennDOT under a hybrid system. Also, this figure has been increased to $400,000 to account for the probable need to purchase additional laptop computers for field staff.

[g]Estimated cost for 30 additional vehicles for field staff.

[h]This may be a conservative estimate. Covert audit costs are assumed at $1,000 per audit and overt audits at $89 per audit (based on a November 1992 EPA report). Also, covert audit expenses are estimated on the basis of one per lane rather than one per inspector. If the EPA regulation is interpreted as requiring one audit per inspector, the audit cost estimate would increase to $8.5 million and the total to $12.9 million.

Source: Developed by LB&FC staff with information obtained from the PA Department of Transportation, I/M program literature, and contacts with staff of the California Bureau of Automotive Repair.

To cover the 2,300 test-and-repair facilities, these additional staff would need additional vehicles and would generate additional travel costs. Additionally, computer equipment and equipment for an expanded number of referee stations would be required.

The most significant additional cost in a test-and-repair program, however, would be state expenditures to conduct the quality assurance program required by federal regulations. These regulations require both overt and covert audits of both the test-only and test-and-repair stations.

EPA regulations require overt audits of all test lanes or bays at least twice per year. A 1992 EPA study estimated the per audit costs for overt audits at $89. In Pennsylvania's planned test-only program, 574 overt audits would be required annually (287 lanes x 2 audits per lane). In a hypothetical hybrid network, 4,930 overt audits would be needed (2,465 lanes x 2 audits per lane).[2]

EPA regulations also require at least one covert audit per year per inspector. Covert audits are to use vehicles set to fail the inspection. This requirement establishes a minimum level of activity, although it does not necessarily require that each inspector be covertly audited. Additionally, in test-and-repair programs, each station must receive one covert audit annually that includes the purchase of repairs. Follow-up audits are to be performed at stations where problems are discovered.

As described by the EPA, a number of different types of costs are incurred in performing covert audits. The vehicle has to be modified to fail the inspection and the modification must be documented so that the improper testing can be proven in court if necessary. The staff time and travel costs to perform and document the audit also contribute to the overall cost. In addition, vehicles have to be acquired and should either be replaced or have their appearance altered through repainting in order to avoid recognition. The costs of pursuing a case through the administrative/legal system in those instances where improper testing is discovered must also be considered. In a November 1992 report, the EPA estimated the annual covert audit cost per station (estimated at 3 covert audits with repairs purchased in one) at $3,250.

EPA reviews of Pennsylvania's basic I/M program have documented that Pennsylvania's covert audit program has not been conducted with the level of sophistication required by the 1990 CAAA and subsequent EPA regulations. In contrast, California's covert audit program reportedly includes many of the EPA-endorsed procedures. For example, in some audits, covert vehicles are prepared at

[2]For estimating purposes, we developed a hypothetical hybrid network consisting of about 2,300 (one lane) test-and-repair stations and 55 (three lane) test-only stations. In such a network, there would be 2,300 lanes in the test-and-repair component and 165 test-only lanes, a total of 2,465 lanes. See page 40 for further discussion of the hypothetical hybrid network.

a remote location, trucked nearby to an inspection site being audited and then trucked back to the preparation site for verification of test results. PennDOT's I/M program staff further described aspects of California's covert audit testing program that might need to be included in PA audits:

- A covert test vehicle must be modified to fail the inspection. For some model year vehicles, removal of the catalytic converter will achieve this.[3] For newer vehicles, inducing a fault or failure in the computerized vehicle engine operating controls will be required. To accomplish this, either existing PennDOT mechanics would have to be used, taking them away from normal duties, or additional mechanics would have to be hired or contracted.

- Covert preparation facilities must be convenient to test sites to ensure replicability of audit results. Additional facilities may need to be leased or purchased if existing PennDOT facilities do not meet this criterion.

- Remote observation equipment (e.g., video cameras, binoculars, etc.) must be used in observation of inspector performance.

- Documentation of audit results must be sufficient to ensure proper legal action against an inspector or station if applicable. EPA requires that a record of all audits and legal actions, if necessary, be maintained by the state. In addition, EPA requires severe penalties, including monetary fines, against inspectors and stations committing major test violations.

California program personnel reported that their existing covert audit program has cost between $8 million and $11 million in recent years to perform 2,000 or fewer covert audits a year. Based on California's costs and PennDOT's understanding of EPA covert audit requirements, PennDOT officials suggested an estimate of $3 to $5 million as an annual state cost for covert audits in a hybrid program, with the qualification that PennDOT may not have to fully duplicate California's covert efforts to comply with EPA requirements.

[3]EPA permission is required to remove the catalytic converter, but it must be replaced prior to resale. If the catalytic converter is not replaced, the vehicle cannot be sold and must be scrapped.

SECTION V-B

Motorist Convenience

Summary: **Motorist convenience in an emissions inspection program depends on many factors, including test frequency, driving distance, certainty of service, hours of operation, waiting times, and the number of trips required to repair and pass the vehicle. A key convenience advantage of Pennsylvania's proposed centralized test-only program is that vehicles would have to be tested, and the fee paid, only once every two years. A hybrid or completely decentralized test-and-repair program could require annual testing. A key advantage of a test-and-repair approach is alleviating the "ping-pong" effect of a test-only program.**

While valid arguments can be made on both sides, the approach most convenient to motorists may depend largely upon individual circumstances and preference. Some motorists, particularly if they live near a test-only station, avoid peak days, and own a car that is likely to pass, may prefer the convenience aspects and greater objectivity of the test-only approach. Others, particularly if they have a repair facility they trust or anticipate a bad experience with the "ping-pong" effect, may prefer the test-and-repair approach.

Motorist convenience depends on many factors. These include test frequency, cost, driving distance, certainty of service, hours of operation, waiting times, and the necessity for multiple trips. These factors are affected, to varying degrees, by the type of emissions inspection program. Proponents of a centralized test-only program argue that this type of program is more convenient to motorists, and proponents of a decentralized test-and-repair program argue with equal confidence that the test-and-repair approach better serves motorists.

Biennial Versus Annual Inspections

The EPA believes test frequency is the single most significant factor in motorist convenience. EPA contends that if motorists are only required to have their vehicles tested every other year in a centralized test-only program, instead of annually in a test-and-repair program, inconvenience is cut in half. For example, Pennsylvania's current test-only plan is a biennial program (vehicles are tested every two years) whereas the Georgia hybrid plan requires annual testing of all

vehicles. EPA also notes that annual programs require that test fees be paid every year.[1]

Waiting Times

Proponents of centralized test-only networks note that motorists do not need to make an appointment and waiting and testing times are often shorter because they are enforced by contractual penalties. Pennsylvania's contract with Envirotest requires the contractor to build test sites within certain distances from population centers and imposes fines if specified waiting times are exceeded (see Section III-A).

PennDOT estimates that the test phase of the IM240 procedure takes about 14 minutes. A lane has three positions: position 1, where the fee is collected and the vehicle prepared for testing; position 2, where the IM240 tailpipe and purge test is done; and position 3, where the pressure test is done and test results are presented to the vehicle owner. Envirotest reports that vehicles will spend about 250 seconds (4.2 minutes) in position 1, 300 seconds (5 minutes) in position 2, and 250 seconds in position 3. Since one car can be at each of these three positions, a lane can be testing three vehicles at the same time. The EPA predicted a maximum throughput of 12 vehicles per hour using the standard IM240 or 15 per hour using a Fast Pass/ Fast Fail algorithm, which reduces test time by one to two minutes.[2] Based on experience with its high-throughput IM240 lane in Wisconsin, Envirotest believes that the lanes it constructs in Pennsylvania will handle more than 13 vehicles per hour.

The test time does not include potential waiting time while in queue for the test. Envirotest is required under its contract to photograph the license plate of vehicles as they enter their property and note the time of arrival. Envirotest must also photograph the license plate and note the time the vehicle enters position 1 of the test.[3] This will allow PennDOT to monitor wait times. Envirotest reports its waiting times in its Minnesota, Wisconsin, and Ohio programs are less than 15 minutes for 95 percent of motorists. Envirotest reports that nationally the average waiting time for all its programs is six minutes.

If waiting times should become excessive, Envirotest reports that each station has the capability to add at least one more lane. Depending on how long it would take to obtain the necessary building approvals from local officials (estimated to be 30 to 90 days), Envirotest believes it could add expansion lanes in about 45 to 60 days after beginning construction. Envirotest sees adding lanes as a last resort,

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[1]Also, in a biennial program a waiver is good for two years; in an annual program a waiver would be good for only one year, potentially increasing a motorist's costs by $450 per year.

[2]PennDOT officials informed us that they expect Envirotest to implement the Fast Pass/Fast Fail IM240 algorithm that has been approved by EPA.

[3]The license plate is also photographed and time noted when the vehicle exists the last position.

and would most likely first consider options such as increasing operating hours,[4] increasing employees, and advertising to encourage motorists to bring their vehicles in at off-peak times.

We reviewed the contract between PennDOT and Envirotest to determine Envirotest's contractual obligations if long waiting lines develop at the centralized test-only facilities. The contract requires Envirotest to have the capability to add sufficient additional lanes to accommodate a 2.5 percent increase in the number of vehicles tested. Envirotest reported that it has designed the initial facilities to meet such growth because it is less expensive to build ample lanes initially than to add them later. Although Envirotest is not otherwise contractually obligated to build additional lanes or stations if unanticipated waiting lines occur, PennDOT can fine Envirotest up to $600 per lane per day if waiting times are excessive (see page 31). Envirotest may, therefore, have an economic incentive to build additional lanes and stations regardless of any contractual obligation.

The Ping-Pong Effect

The biggest potential inconvenience of a centralized test-only program is for motorists whose vehicles fail the inspection. The EPA estimates that, in a mature program with effective repairs, about 10 percent of the vehicles will fail the initial test. Failure rates may be higher during the initial years of the program. If a vehicle fails the initial test, a total of a least three trips will be required. First, a motorist will have to drive to the test station for the initial test. Upon failing the initial test, the motorist will have to make a trip to take the vehicle to the repair facility, and then a trip back to a testing site for a retest. If the vehicle fails the second test, the motorist will have to make two more trips--one to the repair facility and a second back to a testing site--for a total of five trips. This is referred to as the "ping-pong effect." The extent to which "ping-ponging" occurs could significantly affect the public's acceptance of the enhanced I/M program.

A 1992 study by the U.S. General Accounting Office concluded that there are several problems that could complicate the repair of vehicles that fail the IM240 test and thereby contribute to "ping-ponging." These include (1) difficulty in diagnosing problems and repairing vehicles that only marginally exceed the emission standards or that fail only under certain driving cycles; (2) lack of mechanics adequately trained in emission system diagnostics for new, higher-technology vehicles; and (3) inability of repair shops to afford the equipment to confirm that their repairs are effective.

Proponents of test-and-repair facilities argue that such programs are more convenient because there are many more inspection locations and that waiting lines will be non-existent. The lower inspection volume also reduces the economies of

[4]Under the current plan, test-only stations would be open 60 hours a week, Monday through Saturday.

scale, however, and may result in higher test fees. Also, anecdotal evidence suggests that motorists that fail at a test-and-repair station may need to leave the car at the facility overnight or make an appointment at a later time for repair work, which would negate some of the convenience of a test-and-repair facility.

The EPA believes that centralized test-only facilities are, at the least, no less convenient than decentralized test-and-repair facilities, and are probably more convenient for most motorists. The EPA also cites a 1993 study by the California I/M Review Committee that looked at the entire time cycle, including driving to the station, getting a test, and the complete repair and retest process. The Committee estimated that the average total time for the entire process was 76 minutes in a centralized test-only program and 83.25 minutes in a decentralized test-and-repair program. The EPA also notes that test fees are generally lower in test-only programs and that these programs avoid the conflicts of interest associated with test-and-repair programs.

The EPA believes the foremost strategy for addressing the ping-pong effect is improving the capability of the repair industry, and notes that its regulations include a wide range of requirements and recommendations related to improving repair effectiveness. Additionally, some repair facilities may offer to take the vehicle to a test facility as part of an expanded service, such as in conjunction with the annual safety inspection. The vehicle owner could take his or her car to the repair facility and request that the repair facility take the car in for the emissions test and, if necessary, a retest after the repair are completed. The Envirotest contract requires expedited procedures to help minimize the wait times for repair facilities that want to offer such a service.

SECTION V-C

Consumer Fraud

Summary: **Test-and-repair inspection programs have inherent conflicts of interest. In particular, test-and-repair facilities may pass vehicles that should fail the emissions test to please valued customers or because they cannot repair the vehicle. Two opinion polls taken in 1991 and 1993 also reflect the public concern that test-and-repair facilities may not always operate in the consumer's best interest.**

To some extent, the extensive computerization required under the enhanced I/M program can alleviate, but not necessarily eliminate, some of the opportunities for such fraud. Additionally, EPA regulations require states to conduct extensive overt and covert audits and to impose strict penalties on emissions inspectors found improperly passing a vehicle on any of the required tests.

Emissions inspection programs that use test-and-repair networks have been criticized by many for the inherent conflict of interest that exists when tests and repairs are conducted at the same facility. Studies have generally shown that this is one reason why even well-enforced test-and-repair programs fall far short of achieving their potential effectiveness.

Conflicts of interest at test-and-repair facilities can occur on two levels: (1) purposely failing vehicles to generate repair business and (2) passing vehicles that should fail the emissions test. Because vehicles can appear to run smoothly despite emissions problems, owners cannot easily tell whether their vehicles' emissions systems are operating properly. As a result, it may be difficult for a vehicle owner to challenge a mechanic who fails the vehicle. Unscrupulous test-and-repair facilities could use this to their advantage by intentionally failing vehicles to generate repair business. Although this has not been a problem in the basic I/M program, which has a $50 minimum on repair costs to obtain a waiver, EPA believes it could be a problem in the enhanced program, which requires a minimum expenditure of $450 to qualify for a waiver.

Two opinion polls demonstrate the public's concern over such conflicts of interest. A 1991 poll done by Ritter Research for The Coalition for Safer, Cleaner Vehicles found that the majority of the public, whether from states with centralized or decentralized programs, favor the separation of required testing and repair (71

percent).[1] They also believe that their interests are best protected by the separation of testing and repairs (77 percent).[2] A 1993 Gallup survey done for The American Lung Association found similar results. Eight in ten (79 percent) vehicle owners believed the separation of emissions testing and repairs is a good idea.[3] Seven in ten (72 percent) felt separation of testing centers from repair facilities insures that the repairs that are made are necessary and done correctly.[4]

Test-and-repair facilities may also pass vehicles that should fail the test to please a valued customer, in exchange for monetary consideration, or because the mechanic does not know how to fix the problem. Covert audits done in Pennsylvania by both the Department of Transportation and EPA have frequently found instances where emissions inspectors have passed vehicles that were set to fail. These audits have found that major infractions of inspection regulations are quite common, and include offering to sell inspection stickers without actually inspecting the vehicles. The fourth report to the Legislature by the California I/M Review Committee found that improper Smog Checks may occur more frequently under circumstances where the vehicle owner has had a previous business relationship with the Smog Check station. The EPA believes that many emission inspectors pass vehicles that should fail because they are unable to repair the vehicles and are afraid to lose customers if they acknowledge their shortcomings.

The enhanced I/M program requires computerized and automated equipment that should reduce the opportunity for fraud and unintentional errors. This is true whether the program is centralized test-only or decentralized test-and-repair. The IM240, ASM, and RG240 tests all use computerized equipment in which the inspection standards are stored in the computer and are automatically selected based on vehicle model year and make. This reduces the amount of data entry and the possibility of intentional or unintentional errors. Pass/fail decisions are made by the computer based on these standards and measured emissions readings. Additionally, the problem of selling inspection stickers without ever conducting the test is largely eliminated because under the enhanced I/M program vehicles cannot be registered unless they pass the emissions test. This means a test must be done and the results sent to PennDOT to register the vehicle.

Although consumer fraud and improper testing is most often associated with test-and-repair programs, it can also occur in centralized test-only programs. According to the U.S. General Accounting Office, centralized test-only programs in

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[1]Question: Do you favor or oppose the separation of testing and repairs?
[2]Question: Do you feel your interests are best protected by the separation of the emissions testing from any repairs that might be necessary?
[3]Question: In some states, specialized testing centers are established to provide the emission inspection service. These facilities are prohibited by law from performing repairs. If your car fails, repairs are performed by the mechanic of your choice and not the inspection facility. Is the separation of emissions testing and repairs a good idea or a bad idea?
[4]Question: Do you think that for cars who fail an emissions test this separation of emissions testing from repairs helps insure that any car repairs made are necessary and done correctly or not?

Maryland, Arizona, and New Jersey also fail to identify noncomplying vehicles. However, management control over inspectors would be better in a centralized test-only environment, and other incentives that can lead to fraud, such as generating additional business or pleasing valued customers, are not present. Centralized test-only programs also reduce the potential for vehicle owners to "shop around" for an inspection station that is willing to provide a false passing result.

Efforts to Prevent Consumer Fraud

EPA regulations require states to undertake several efforts to prevent consumer fraud. First, states must implement a quality assurance program that includes both overt and covert audits. EPA regulations state that overt audits must be performed at least twice a year for each lane or test bay. These audits are to include equipment audits, checks of document security, record keeping, licensing and display information, and evaluation of the inspector's ability to properly perform an inspection. Screening or review of inspector and station records is required at least monthly.

The regulations also require that several types of covert audits be conducted regularly to ensure inspections are being done properly. Covert audits of inspector performance are to occur at least once per year per inspector in high volume stations. Covert audits involving site visits with vehicles set to fail are to occur at least once per year per the number of inspectors. In test-and-repair networks, at least one covert audit is to be done each year at each test-and-repair facility. These audits are to include the purchase of repairs and retesting the vehicle. EPA regulations require that the covert audit program use a sufficient number of covert vehicles and auditors to avoid detection and cover the range of vehicle technology groups (e.g., carbureted and fuel-injected). The quality assurance program must also include at least one audit each year of the auditors.

EPA also believes that I/M programs often have inadequate fines and penalties to discourage fraudulent behavior. Under the enhanced program, fines and penalties are quite strict. For example, in a test-and-repair network the inspector and the inspection station license must be suspended for a minimum of six months whenever a vehicle is intentionally improperly passed for any required portion of the test. In test-only programs, the inspector must be removed from inspector duty for at least six months (or the state must impose a penalty equivalent to the inspector's salary for that period).

EPA regulations require that motorists that fail the test be provided with information on the results of repairs performed by repair facilities in the area. The intent of this regulation is to assist motorists in finding a qualified repair technician. The information provided to the motorist is to include statistics on the percentage passing the first retest, the percentage requiring more than one repair/retest trip before passing, and the percentage receiving a waiver. Some repair

facilities note that these reports can place them in a no-win situation: either they undertake more extensive repairs than may be necessary to ensure the customer passes the retest and the repair facility does well on the public reports or they do only the minimum repairs that appear necessary and risk the customer failing the retest and appearing to be incompetent on the public reports. Either way, the repair facility risks alienating the customer.

States must also institute mechanisms to protect the public from fraud by inspectors, mechanics, and others involved in the program. This is to include a challenge mechanism (e.g., through referee stations) by which a vehicle owner can contest the results of an inspection. Under Pennsylvania's centralized test-only program, 14 PennDOT quality assurance officers and 3 supervisors will be located at inspection facilities throughout the state to resolve motorist concerns. Under a California-type hybrid program, PennDOT estimates that it would need 16-20 referee stations in addition to the quality assurance officers at the test-only facilities.[5]

[5]There are currently four referee stations serving the 11 counties in the basic I/M program.

SECTION V-D

Test Fees

Summary: **If economies of scale were the only consideration, test fees in a high-volume test-only program would be substantially lower than fees in a lower-volume test-and-repair environment. However, test fees may be capped in legislation, such as in Georgia and Virginia, or test-and-repair facilities may be forced by marketplace competition to keep test fees low. It is difficult, therefore, to predict with any degree of certainty how test fees would vary under alternative enhanced I/M program approaches.**

Inspection fees are set either by contract, by legislation or regulation, or by market forces. Test fees in basic I/M testing programs are generally lower in high volume (centralized) test-only inspection networks compared to those in lower-volume decentralized (test-and-repair) programs. EPA has found that such decentralized programs using computerized analyzers had the highest costs, averaging about $17.70 per vehicle; centralized contractor-run programs averaged $8.42 per vehicle.

Proponents of test-only I/M approaches contend that several factors enable centralized contractors to charge a lower test fee. These include economies of scale, with higher inspection volumes allowing amortization of costs over a much larger number of vehicles. Also, highly automated procedures and computerized equipment can minimize test time and labor costs.

Under Pennsylvania's current enhanced I/M plan, which involves biennial testing, test fees are contractually set at $17 for the first 21 days of the month and $22 for remaining days.[1] As shown on Exhibit 11, this fee is generally in line with other states that had finalized their fees as of June 1994. When annualized, it is also only slightly higher than the $8 annual fee charged in the Commonwealth's basic I/M program.

Although economies of scale would suggest that fees in a centralized test-only program should be significantly lower than fees in a test-and-repair environment, this may not necessarily be the case. Test fees in two states that recently announced they plan test-and-repair facilities in their enhanced I/M programs, Georgia and Virginia, are capped in law at $25 in Georgia and at $20 in Virginia.

[1]The contract provides for Envirotest to request a fee increase due to increased vehicle volume but does not require the Commonwealth to increase the fee.

Planned Enhanced I/M Network Types and Test Fees, by State

State	Network Type	Test Fee
California	Hybrid	$30 - $40 Test-Only $50 or More Test & Repair[1]
Colorado	Centralized Test-Only (1982 & newer) Decentralized Test-Only (1981 & older)	1982+ - Up to $24 1981 & Older - Up to $15
Connecticut	Centralized Test-Only	$20
Delaware	Centralized Test-Only	None[2]
Georgia	Proposed Hybrid[3]	Capped at $25
Illinois	Centralized Test-Only	None[4]
Indiana	Centralized Test-Only	None[5]
Louisiana	Centralized Test-Only	$10
Maine	Centralized Test-Only	$24
Maryland	Centralized Test-Only	$15-$17
Massachusetts	Centralized Test-Only	Unknown
New Hampshire	Centralized Test-Only	Unknown
Nevada	Decentralized Test-Only	$16 (est.)
New Jersey	Possible Hybrid	Not Available
New York	Centralized Test-Only	$21 (NYC) + $4 Adm.
Pennsylvania	**Centralized Test-Only**	**$17-$22**
Rhode Island	Centralized Test-Only	$20-$22 (est.) (capped at $25 by law)
Texas	Centralized Test-Only	$15-$23
Vermont	Centralized Test-Only	$20-$30 (est.)
Virginia	Decentralized Test-and-Repair[6]	Capped at $20
Washington	Centralized Test-Only	Capped at $18
Wisconsin	Centralized Test-Only	$15-$20 (est.)

[1]EPA estimates--actual fees not yet determined. California officials believe the test-only fee is likely to be in the $20-$25 range and the test and repair fees will be near to the test-only fee due to market considerations.
[2]Test costs are to be covered by a special fund consisting of court fees from traffic violations.
[3]On June 17, 1994, Georgia announced it opted for a hybrid enhanced I/M program and will revise its centralized test-only I/M SIP accordingly.
[4]Test costs are to be funded, at least initially, by the state's Motor Vehicle Fuel Fund and federal Congestion Mitigation and Air Quality (CMAQ) funds.
[5]Test costs are to be covered by monies from the state's General Fund and some CMAQ funds.
[6]Proposed to EPA; I/M SIP not yet submitted.

Source: Developed by LB&FC staff from information obtained from the EPA, the Northeast Ozone Transport Commission, and a May 1994 telephone survey of air quality and I/M program officials in these states.

Virginia's planned program calls for biennial testing. However, in Georgia's hybrid proposal, motorists will be tested annually and therefore required to pay the fee annually. All states with centralized test-only programs have a biennial program, so the fee is paid only once every two years.

The EPA believes test fees in the California hybrid program will be in the $30-$40 range in the test-only component of the program and $50 or more in the test-and-repair program. The California EPA disagrees with the U.S. EPA's estimates, and in early June reported that California's centralized test-only fees will likely be in the $20-$25 range. California believes that test-and-repair facility fees will be near its test-only fees due to market competition between test-only and test-and-repair facilities.

If a hybrid enhanced I/M program were to be implemented in Pennsylvania, it is possible that test fees would be capped by legislation[2] or that market factors would keep fees close to the $20-$25 range being projected in California. However, fees in this range would not cover the actual costs that local garages and dealerships would incur in acquiring and maintaining the equipment required for enhanced testing.

Currently, Pennsylvania stations do not have the equipment in place to begin testing vehicles in an enhanced I/M program. Proposals by both Georgia and Virginia for a test-and-repair component to their enhanced I/M program are based on an assumption that alternative test equipment to the IM240, either an Accelerated Simulation Mode (ASM)[3] or Repair Grade 240[4] will be approved by the EPA.

If Pennsylvania were to operate a test-and-repair component in its enhanced I/M program, participating stations would need to obtain this equipment, which costs in the range of $30,000 to $35,000 (for the RG240) or $41,000 (for the ASM). This does not include installation costs. Stations would also need to purchase software and a modem to transmit test results and other data related to vehicle registrations to PennDOT. Service contracts to maintain the equipment (about $200 a month) and annual software updates (estimated to cost $1,500) would also be required.

The president of the Pennsylvania Council of Automotive Associations told us that a survey he conducted shows that the association's members believe repair grade analyzers costing about $30,000 would be within the financial range of most

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[2]The basic I/M test fee is capped in legisation at $8.

[3]ASM: This steady-state test uses less expensive equipment to measure concentrations of pollutants from which the volume must be estimated. A multi-mode ASM measures emissions at idle and various speeds but does not simulate the periods of acceleration and deceleration that occur when a car is being driven.

[4]The RG240 provides an approximation of the IM240 mass emissions measurements. The procedure requires an electronically enhanced dynamometer with inertia weights, an exhaust dilution system, a BAR90 analyzer, and appropriate computer hardware and software.

repair facilities and that there would be a widespread willingness to participate in such a program. (We also received letters from service station owners who preferred a centralized test-only program.)

We estimated that to recoup these equipment and related costs, station owners would need to charge test fees generally in the range of $30 to $45.[5] As discussed earlier, however, fees may be capped or competition and market forces could result in test fees being below actual cost.

[5]Assumes all newer vehicles (model year 1989 through 1993) would go to a test-and-repair facility, an 8.875 percent amortization rate, that equipment would be amortized over a period of between 5 and 10 years, and that 2,300 test-and-repair facilities would participate in the enhanced program. If more vehicles participated, costs would go down; if more facilities participated, costs would go up.

SECTION V-E

New Economic Development

Summary: **No matter what enhanced I/M program design the Commonwealth adopts–centralized test-only, a hybrid, or a completely decentralized test-and-repair network–it must meet or exceed EPA performance standards. Additionally, Pennsylvania law requires that the enhanced I/M program not exceed EPA's minimum standards, so any approach the Commonwealth would take (including a hybrid program) would also achieve no more or no less than EPA's minimum emission reductions.**

Because of these requirements, other sources of pollution–stationary, area, and other mobile sources–would not be affected by the type of enhanced I/M program implemented. New economic development should, therefore, not be significantly affected by the type of program implemented, assuming the Commonwealth could avoid sanctions if it should change course.

The Clean Air Act requires that enhanced I/M programs must meet or exceed EPA performance standards. These performance standards are intended to achieve approximately a 28 percent reduction in VOCs, a 31 percent reduction in carbon monoxide emissions, and a 9 percent reduction in nitrogen oxide emissions from motor vehicles by the year 2000, when compared to what the area would have experienced without an I/M program. No matter what program design the Commonwealth would adopt--centralized test-only, a hybrid, or a completely decentralized test-and-repair network--it would need to meet or exceed these performance standards before it could be approved by the EPA.

Pennsylvania's I/M SIP as submitted to the EPA exceeds the EPA performance standards in some respects. However, PennDOT plans to promulgate regulations to make the emissions standards less stringent, which will bring the Commonwealth's program close to the minimum EPA requirements.[1] Any other program the EPA would find approvable would therefore have to achieve comparable performance results. As a consequence, there would appear to be no significant difference between a test-only, hybrid, or test-and-repair system on the amount of emission reductions achieved.

[1]Act 1992-166 requires that Pennsylvania's enhanced I/M program cannot be more stringent than required by the Clean Air Act.

The impact on other sources of air pollution--including stationary, area, and other mobile sources--would therefore be largely unaffected by the type of enhanced I/M program implemented; any approvable enhanced I/M program would achieve about the same amount of pollution reduction.

New economic development would, of course, be affected if the Commonwealth were to incur sanctions for not complying with the Clean Air Act requirements. The first sanction provided for in the Clean Air Act is the two-for-one credit offset for new sources of pollution. Under this sanction, which is described further in Section II-C, any business seeking to install new capacity or add capacity that generates extra emissions in nonattainment areas must arrange an emission reduction of at least twice that amount elsewhere in the locale.

The second sanction in the Clean Air Act, also described in Section II-C, is the withholding of certain federal highway funds. This sanction could impact on economic development in two ways: (1) highway projects important to the state's infrastructure might be delayed or canceled and (2) the jobs and positive economic "ripple effects" from large construction projects might be lost. Similar impacts would occur if the EPA revoked the protective finding over the Philadelphia area's 15 Percent SIP.

The Clean Air Act requires that the nation' most severely polluted areas, including the five-county Philadelphia area, achieve at least a 15 percent reduction in volatile organic compounds by the year 1996 and a 24 percent reduction by the year 2000. As the first step in achieving this goal, the Commonwealth has developed the 15 Percent SIP described in Section II A. This plan relies on emissions reductions from many sources, including both large and small commercial and industrial operations, the enhanced I/M program, and other mobile sources (e.g., reformulated fuels, employer trip reduction programs, and Stage II refueling control).

If the 15 Percent plan does not achieve the required emission reductions, other steps will have to be taken to ensure the goals are met. This means stricter controls and programs would be required for stationary, area, and/or mobile sources. A centralized test-only enhanced I/M program might be better able to achieve additional reductions--for example through annual testing, tighter cutpoints, or testing heavier vehicles--than a hybrid or test-and-repair program. This is because for a hybrid or test-and-repair program to be approved by EPA, many if not all of these steps will have to be taken at the outset of the program.[2] If additional emissions reductions were needed and could not be obtained from the enhanced I/M program, as might especially be the case in a hybrid or test-and-repair program, these new reductions would need to come almost exclusively from stationary, area, or other mobile sources. The cost of additional emissions reductions from

[2]For example, Georgia's hybrid plan calls for annual testing.

these sources could be quite high (see Table 3) and could potentially jeopardize new economic development.

Costs Per Ton

The EPA has stated that "not only is high-tech I/M [the enhanced I/M program] one of the most effective air pollution programs we know of, it's also the most cost effective." EPA estimates the cost of pollution reduction from a centralized test-only enhanced I/M program to be $500 per ton for a biennial program.[3] This figure is based on EPA's estimate of inspection and repair costs, less fuel economy benefits, of $5.4 million per year per million vehicles in a biennial program. The EPA estimates do not include motorist convenience costs. If the enhanced testing was done annually, rather than biennially, the cost effectiveness would be $1,300 per ton. EPA estimates that the cost to remove a ton of emissions is $10,000-$15,000 for a decentralized test-and-repair program.

The EPA reports a biennial enhanced I/M program to be seven times more cost effective than more stringent new car tailpipe standards and at least ten times more cost effective than additional controls beyond reasonably available control technology (RACT) on small and large industrial sources.

In reviewing EPA's data, Resources for the Future, a Washington, D.C.-based policy research organization, found that the purge and pressure tests, which are separate from the IM240 tailpipe test, are very cost effective for identifying hydrocarbon (VOC) emissions. The emission reduction benefit of adding the IM240 tailpipe test, however, yielded only marginal emission reductions over a two-speed idle procedure, but at a much higher cost. Resources for the Future, as quoted in a 1992 GAO report, found that the IM240 test-only reduced an additional .4 tons of hydrocarbon emissions at a cost of $12,000 per ton. This figure is considerably higher than EPA's estimate of $880 per ton of hydrocarbon emissions reduced. EPA's cost figure is much lower because it represents an average figure that includes both the purge and pressure tests along with the tailpipe test.

In testimony before the Pennsylvania Senate Transportation Committee in 1992, the Motor Vehicle Manufacturers Association of the United States, Inc., provided the information shown in Table 3 on the cost of various clean air strategies:

[3]Based on reductions of VOC, CO, and NOx. Some studies allocate costs based on only one type of pollution (e.g., VOC only). Cost per ton figures will be higher in these studies because costs are spread out over fewer tons of emissions. For example, EPA estimates that if all program costs were allocated to VOC (hydrocarbon) reductions, the biennial program has a cost effectiveness of $880 per ton of VOC reductions.

Table 3

Strategy	Cost ($/Ton of Emissions Reduced)
Enhanced I/M	$500 - $1,300
Stage II Refueling Control	$2,050
Federal Reid Vapor Pressure Controls	$2,300
California Reformulated Gasoline (Phase I)	$4,000
Federal Reformulated Gasoline (1995)	$5,300
Federal Reformulated Gasoline (2000)	$18,000
California Reformulated Gasoline (Phase II)	$2,000 - $18,000
Stationary Source Controls	$5,000 - $40,000
Severely Reformulated Gasoline	$174,000
LEV Program Vehicles	$274,000

Source: Motor Vehicle Manufacturers Association of the United States, Inc.

Appendix J contains additional information on the relative cost effectiveness of various transportation control management strategies.

Jobs Generated by the Enhanced I/M Program

The EPA has estimated that, nationwide, a centralized test-only enhanced I/M program will result in a net increase of 3,800 to 11,600 jobs. This increase is based on the need for additional inspectors and repair techniques, as well as new jobs in parts manufacturing, construction, and small business services. Studies done for the Coalition for Safer Cleaner Vehicles and the American Lung Association have projected smaller net increases in jobs from centralized test-only enhanced I/M programs.

Between 1995 and 2001 Envirotest Systems Corp., PennDOT's contractor for implementing the Commonwealth's enhanced I/M program, expects to employ in Pennsylvania 360 full-time and 2,100 part time workers each year with annual salaries and wages of $22 million and benefits of $5 million. Envirotest also notes that it will invest about $160 million in land, equipment, and construction and facilities improvements (using Pennsylvania firms) to develop Pennsylvania's test facilities. Envirotest expects to spend locally an additional $15 million annually for operating expenses such as printing, landscaping, office supplies, utilities, vehicles, maintenance, telephone, forms, freight and armored car, and other products and services. Envirotest estimates the project will generate about $4 million in annual property tax payments.

Pennsylvania State University researchers, using an economic model developed by Regional Economic Models, Inc., estimate that, overall, employment will increase as a result of a centralized test-only enhanced I/M program by 2,944 jobs during 1995. The model shows that the net gain in jobs persists (though it declines) throughout the operation of the program. These gains are concentrated primarily in auto repair and service industries. One estimate states that Pennsylvania emission repair work will increase from $18 million under the current system to $98 million under an enhanced test-only system.

Of course many of these economic impacts, particularly those related to auto repairs, will occur regardless of whether the Commonwealth adopts a test-only, hybrid, or complete test-and-repair program. For example, if a hybrid approach were taken, dynamometers, which are large, in-ground pieces of equipment, would need to be installed at repair facilities. Installing this equipment would certainly generate additional construction work.

SECTION V-F

Clean Air and Health Effects

Summary: **Ozone can cause throat irritation, congestion, chest pain, nausea, labored breathing, and respiratory problems and is particularly harmful to older people and those with chronic heart and lung conditions. Automobiles are a major source of air pollutants, and DER anticipates the enhanced I/M program will achieve emissions reductions of 131 tons per summer day by 1996. However, similar reductions would have to be achieved under any type of EPA-approvable enhanced I/M program.**

Ozone levels in Pennsylvania have improved significantly in recent years. According to EPA's most recent data, the Philadelphia area is the only area in the state that has not yet attained national ozone standards. The Philadelphia area, at 0.13 ppm, is close to achieving the national ozone standard of 0.12 ppm.

Cleaning up the nation's air is a major environmental challenge. Each year millions of Americans face adverse health risks as a result of exposure to air-borne pollutants. Automobiles are an important source of these pollutants, especially ground level ozone. Ground-level ozone is a pollutant that is formed from emissions of volatile organic compounds (VOC), nitrogen oxide (NOx), and to a lesser degree, carbon monoxide (CO). Motor vehicles do not emit ozone, but they emit VOC and NOx which are precursors of ozone. These ozone precursors undergo chemical reactions in the atmosphere which then produces ground-level ozone.

Ozone is primarily a summertime problem. Under summer weather conditions, when temperatures are high and wind conditions are stagnate, hazardous levels of ozone can build up quickly and remain in place for several days. The most severe pollution is found in areas with little wind, much sunlight, and many motor vehicles. For purposes of complying with CAAA requirements, 45 of Pennsylvania's 67 counties have been classified by EPA as ozone nonattainment areas for ozone (see page 5 for a map showing the classifications of these counties).

According to the Pennsylvania Department of Environmental Resources (DER), 2,207 tons per day of VOCs were emitted in Pennsylvania from all sources[1] in 1990, along with 3,230 tons per day of NOx and 12,137 tons per day of CO. Highway sources (including automobiles and trucks) accounted for one-third of

[1]These include highway, off-road (e.g., railroad locomotives, lawn mowers, vessels, etc.), point (dry cleaners, gasoline service stations, etc.) and stationary sources (refineries, power stations, etc.).

Pennsylvania's VOC emissions, 23 percent of NOx emissions, and 61 percent of CO emissions.

Even without the enhanced I/M program or other new control strategies to reduce ozone emissions, DER expects that in 1996, highway sources will generate less VOC, NOx, and CO emissions than in 1990. This reduction will occur because newer cars that have improved emission systems and burn cleaner fuel will replace older models. With an enhanced I/M program and other control strategies, such as Tier I controls and reformulated fuels, DER anticipates a sizable reduction in highway source pollutants by 1996 (see Table 4).

Table 4

Proposed Highway Emissions Reductions for 1996
(In Tons Per Day)

	1990	1990 Baseline Adjusted	1996 Baseline	**1996 (Proposed)**
VOC	721	567	632.95	**423.43**
NOx	735	647	708.81	**618.20**
CO	7,435	4,891	5,403.05	**3,454.17**

Source: PA Department of Environmental Resources based on EPA models to estimate highway emission reductions.

In order to achieve a 15 percent reduction in highway VOC emissions by 1996 taking into account growth in vehicle miles traveled, highway source VOC emissions must be reduced by 95 tons per summer day in 1996. Current state plans call for a 210 tons per day reduction from highway sources, of which 131 tons or 62 percent are due to the enhanced IM program. The remainder are due to reformulated fuel and Tier I pollution controls on new automobiles.

Because any approvable enhanced I/M program must meet specific EPA performance standards, projected emissions reductions would be similar regardless of the type of enhanced I/M program the state would implement (e.g., centralized test-only or a hybrid program). This reasoning is explained in more detail in Section V-E.

Pennsylvania's Air Quality Has Improved Over the Last Several Years

Pennsylvania's air quality has improved markedly since 1988, one of the three years used by EPA when designating ozone nonattainment areas for the CAAA. According to EPA's most recent published data, all but one Pennsylvania

Metropolitan Statistical Area (MSA) had ground level ozone concentrations below the National Ambient Air Quality Standard of 0.12 ppm in 1992. Table 5 shows the peak statistic for ground level ozone for 1992 for Pennsylvania MSAs.

Table 5

1992 Peak Statistic for Ozone for PA MSAs

(in PPMs)*

MSA	
Allentown-Bethlehem, PA-NJ	0.1
Altoona	0.1
Beaver County	0.11
Erie	0.1
Harrisburg-Lebanon-Carlisle	0.1
Johnstown	0.09
Lancaster	0.11
Philadelphia, PA-NJ	0.13
Pittsburgh	0.1
Reading	0.1
Scranton-Wilkes-Barre	0.1
Sharon	0.1
State College	No data
Williamsport	0.09
York	0.1

*Applicable NAAQS is 0.12 ppm. This table presents the second maximum peak value measured at air quality sites in 1992. The primary years used by EPA for purposes of establishing ozone designations and classifications were 1987 to 1989. In calculating an area's design value for ozone, EPA uses the fourth highest valid daily value measured at air quality sites.

Source: EPA, Air Quality Status of MSAs, 1992.

As Table 5 shows, the Philadelphia MSA is the only area in Pennsylvania to exceed the NAAQS for ozone in 1992. If EPA were to classify ozone nonattainment areas using its 1992 air quality data, the Philadelphia area, with its value of 0.13 ppm, would be in marginal or moderate nonattainment.[2] The remainder of the state would be in attainment of the NAAQS for ozone.

According to EPA's *National Air Quality and Emissions Trends Report, 1992,* 1992 ozone concentration levels were the lowest since 1983. The report notes that the relatively high ozone level of 1988, one of the three years used by EPA to

[2]"Severe" ozone nonattainment levels are between 0.18 and 0.28 ppm.

designate and classify nonattainment areas, are likely attributable in part to unusually hot, dry, stagnant conditions in some areas of the country. The EPA attributes much of the improvement in ozone levels to recent measures such as Reid Vapor Pressure controls for gasoline that lowers fuel volatility and NOx and VOC tailpipe emissions.

EPA has also developed the PSI index to categorize air quality. A reading of 101 and above is considered unhealthy. Table 6 shows the number of days the major metropolitan areas of Pittsburgh and Philadelphia have had PSI days greater than 100 for each year since 1983.

Table 6

Ozone Only - Number of PSI Days Greater Than 100 at Trend Sites

City	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Philadelphia ...	54	29	29	22	33	43	20	17	32	8
Pittsburgh	9	0	2	1	5	14	2	0	1	0

Source: EPA, Selected Metropolitan Area Trends.

Clean Air Is Important to Our Health

Ground-level ozone can cause throat irritation, congestion, chest pain, nausea, labored breathing, and respiratory problems. It is particularly harmful to older people and those with chronic heart and lung conditions. The U.S. Congress Office of Technology Assessment estimates that nationwide the reduction of ozone to meet the established National Ambient Air Quality Standards will result in the elimination of many millions of incidents of respiratory symptoms annually.

According to the American Lung Association when healthy volunteers are exposed to ground-level ozone in clinical studies, they experienced coughing, a pain or itching sensation in the center of the chest, rapid and shallow breathing, and other signs of decreased lung functioning. The degree of unfavorable response in volunteers depends on the ozone concentration, the length of time they were exposed, and their level of exercise during exposure.

Some individuals are also more sensitive to the effects of ozone exposure. Some asthmatics, for example, when exposed to ozone appear to be more sensitive to its effects than healthy people. A large scale epidemiologic study in the Los

Angeles area and a study in the Houston area found that increasing levels of ozone are associated with the likelihood of asthma attacks.

The American Lung Association Chapter of Delaware and Chester Counties has stressed the importance of automobile inspection and maintenance programs as a way to reduce harmful, air-borne pollutants and improve the respiratory health of all Pennsylvanians. According to this chapter of the American Lung Association:

> We need the strongest I/M program possible to protect our lungs. Asthma is on the increase, affecting 9.9 million Americans. Several studies have correlated increased asthma attacks with increased ozone levels.
>
> George D. Thurston, assistant professor of environmental medicine at New York University, found that asthma admissions to 87 hospitals in New York City and 35 hospitals in Buffalo increased by 25 % to 30 % on the days when ozone levels were highest in the summer of 1988. He also reports that on days when ozone was above 0.12 parts per million (the current Federal standard) asthma attacks among children attending a summer camp increased by 30 %. Additional studies in Atlanta and north-central New Jersey reported similar findings.

Motor vehicles also emit nitrogen dioxide, especially in metropolitan areas with heavy traffic. The effects of this pollutant resemble the effects described for ozone.

Carbon monoxide is also emitted by motor vehicles. Carbon monoxide can interfere with the ability of the blood to carry oxygen to body tissues. The heart and brain are especially vulnerable to such oxygen shortages. People with coronary artery disease may be especially sensitive to carbon monoxide because when exercising their heart muscle may not have a sufficient supply of oxygenated blood.

VI. Options Available to the General Assembly

Summary: **The General Assembly has at least three options with regard to implementing the enhanced I/M program: (1) proceed with the current plan to implement a centralized test-only network, (2) pass legislation that would void the I/M SIP currently pending before the EPA, and (3) pass legislation requiring PennDOT to develop an I/M SIP revision that could eventually be incorporated into the Commonwealth's I/M plan.**

The first option–proceeding with the current I/M plan–would involve the least risk and expense to the Commonwealth. The second option–passing legislation that would void the state's current I/M SIP–involves substantial risks of EPA sanctions, court suits, and liabilities for Envirotest contract termination costs. The third option–passing legislation requiring PennDOT to develop an I/M SIP revision–would not invoke EPA sanctions or citizen court suits but would involve Envirotest's consent to amending its contract with PennDOT and could require an entire new RFP process due to actions by the unsuccessful vendors.

The Pennsylvania General Assembly has at least three options for how to proceed in implementing an enhanced I/M program.[1] These options are: (1) proceed with the current plan to implement a centralized test-only network, (2) pass legislation that would void the I/M SIP currently pending before the EPA, or (3) pass legislation requiring PennDOT to develop an I/M State Implementation Plan revision that could eventually be incorporated into the Commonwealth's I/M SIP.

Option 1: Proceed With the Current Plan

Barring any major new developments at the state level, Pennsylvania's current I/M SIP will probably be approved by the EPA. If the General Assembly chose not to intervene prior to final EPA approval, which must occur by September 15, 1994, the I/M SIP would become federally enforceable.

This option would involve the least risk to the Commonwealth in that the EPA could not impose sanctions and citizen groups would not have grounds to sue the Commonwealth for noncompliance with the Clean Air Act. Additionally, the other two options discussed could result in the Commonwealth breaking its contract with Envirotest, PennDOT's contractor for implementing the enhanced I/M program. As

[1]We did not consider "political" options, such as trying to appeal to the EPA or the President for deadline extensions or special consideration.

discussed below, if this contract were broken Envirotest believes it would be entitled to damages and other costs totaling about $355 million.

Another major advantage to this option is cost savings to the Commonwealth. As discussed in Section V, under the current enhanced I/M plan, PennDOT estimates monitoring and enforcement expenditures of about $1.9 million during the first year of implementation and about $1.7 million thereafter. A hybrid approach would involve annual monitoring and enforcement costs to the Commonwealth of from $7.4 million (our lower range estimate) to $17 million (PennDOT's upper range estimate). The Commonwealth might also incur added expense to test and certify additional emissions inspectors under a hybrid or decentralized test-and-repair approach.

Option 2: Pass Legislation That Would Void the Commonwealth's I/M SIP

The General Assembly could pass legislation requiring that Pennsylvania implement a hybrid or decentralized test-and-repair program, thereby making it impossible to implement the centralized test-only program as submitted to the EPA. If such legislation were enacted, the EPA has said it would treat the Commonwealth's I/M plan as rescinded, and would restart the mandatory sanctions clock that was stopped in December 1993 with seven months remaining. Citizens' groups might also file suit arguing that EPA must impose mandatory sanctions beginning in July 1994.

The EPA could also propose discretionary sanctions that could take effect much sooner, and it could revoke the protective finding over the Philadelphia area 15 Percent SIP. This would curtail the use of federal funds for many highway projects in the Philadelphia area, possibly in as soon as 30 days. These sanctions and possible court actions are described further in Section II-C of the report.

Potential Commonwealth Liability if the Envirotest Contract Is Terminated

If the current enhanced I/M program were abandoned, the Commonwealth would also need to settle with Envirotest, PennDOT's contractor implementing the program. As discussed in Section III-B of the report, Envirotest estimates it has incurred expenditures of $28.2 million as of June 30, 1994, with an additional $105.1 million in commitments as of May 31, 1994. Envirotest also believes that if the contract was terminated it would be owed an additional $221.4 million in termination costs and damages. Termination costs and damages are demobilization costs (including severance claims and settlement of subcontractor, supplier, and employee claims), lease termination expenditures, lost profits, and loss of business

value. All totaled, Envirotest estimates it would be owed about $355 million if the contract was terminated on June 30.

How much of this $355 million the Commonwealth might be liable for is unclear, in part because the termination clause of the Envirotest contract is unclear. The termination clause states that in the event the Commonwealth terminates the contract as a result of a change in law or regulation, the Commonwealth will request the State Legislature to appropriate to the contractor equitable compensation for capital costs and other appropriate expenditures incurred by the contractor prior to termination of the contract. The termination clause also states that the contractor:

> . . . understands and agrees that the Commonwealth will not request the legislature to appropriate funds for lost revenue from anticipated future vehicle inspection fees. . . . [The] Contractor also understands and agrees that any compensation for capital costs and other appropriate expenditures will require an appropriation by the legislature for this purpose, and that [the] Contractor's compensation will be limited to the amount appropriated by the legislature for this purpose.

This provision would appear to limit the Commonwealth's liability to whatever amount the Legislature appropriated for capital costs and other "appropriate" expenditures, excluding lost profits.

However, the last sentence of the termination clause reads:

> The foregoing is in addition to, and the Contractor reserves all rights and remedies under the Contract and otherwise available to it in law or equity in the event of termination.[2]

This provision would appear to allow the contractor to pursue remedies for other costs and damages, such as lost profits, through the Board of Claims[3] and the courts. Capital costs and other appropriate expenditures, however, would appear to be limited to the amount appropriated by the Legislature. (This is our interpretation, but others might interpret this clause differently.)

The Board of Claims has awarded lost profits to contractors in past cases, although in a 1992 case involving PennDOT the Board required the party seeking damages to choose between lost profits and reimbursement for expenses incurred.[4] Pennsylvania courts have also awarded lost profits if they can be established with reasonable certainty.

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[2]The full text of the termination clause is shown in Appendix K.
[3]The Board of Claims has initial jurisdiction over Commonwealth contract cases.
[4]This case was later reversed on other grounds by Commonwealth Court.

Envirotest believes the contract is clear in giving it the ability to seek all remedies available in law. Envirotest believes that, as a matter of law, in the event of wrongful termination of the contract by the Commonwealth, it would be entitled to be placed in the same position it would have been in if the contract had not been so terminated. Accordingly, Envirotest's position is that it would be entitled to recover all of its direct, consequential, secondary and incidental losses and damages resulting from the termination. As noted above, Envirotest estimates this amount to be about $355 million as of June 30, 1994. Envirotest also notes that, under Pennsylvania law, changes to the Clean Air Act, EPA's regulations, or Pennsylvania's I/M SIP cannot affect any pending or existing contracts or programs (see page 24).

PennDOT generally does not comment on potential litigation until an alleged cause of action has occurred and a claim has been made. PennDOT's Chief Counsel told us that if the Envirotest contract was terminated the department would raise all defenses available under the contract, at law and at equity.

Because Envirotest's commitments are for goods and services not yet received, it would presumably have some leverage with which to negotiate with its vendors if it sought to terminate its contractual obligations.[5] For example, Envirotest has a major contract commitment for dynamometers, but this equipment has not been delivered to the construction sites and, as of June 15, 1994, was still at the manufacturer's warehouse. If the manufacturer could sell these dynamometers to another company or if Envirotest could use these dynamometers for a contract in another state, an agreement might be reached between Envirotest and the manufacturer that would result in a much reduced commitment for its Pennsylvania contract.

Envirotest might have less leverage to recoup its $71.7 million in contractual commitments for construction and site improvements. These commitments, which involve two contracts, are primarily for the manufacture and construction of the 86 test facilities. Unlike dynamometers, the steel-framed test facility buildings are of different sizes, ranging from two to seven lanes, and therefore would probably be less easily adaptable to another state's needs.

If Envirotest was not willing or able to negotiate with its vendors to reduce its commitments and the Commonwealth reimbursed Envirotest for the cost of land, equipment, and other tangible assets, the Commonwealth would own those assets. The assets could then be sold, or used in further negotiations with Envirotest, to recoup at least some of the contract termination costs.

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[5]It is a general principle of law that the injured party make a reasonable attempt to mitigate his damages; e.g., in the case of a seller of goods, by finding another purchaser for his goods. We did not, however, attempt to assess the interchangeability of dynamometers or other test equipment to other programs in other states.

If the Envirotest contract were terminated, the funds needed to reimburse Envirotest could come from the General Fund or, arguably, the Motor License Fund. The Pennsylvania Constitution limits the use of monies from the Motor License Fund primarily to construction, maintenance, repair, and safety on public highways and bridges. PennDOT interprets this provision to include both the basic and enhanced emission inspection programs.

Option 3: Revise the I/M SIP and Amend the Envirotest Contract

As a third option, the General Assembly could pass legislation amending Act 1992-166 to require PennDOT, perhaps in conjunction with an advisory committee comprised of other interested parties, to develop a revision to the I/M SIP that has been submitted to the EPA. This is allowed under the Clean Air Act. A key advantage of this option is that it would not invoke EPA sanctions or subject the Commonwealth to lawsuits for not complying with the Clean Air Act requirements because the Commonwealth would continue to implement the current plan while the I/M SIP revision is being developed.

In developing such an I/M SIP revision, consideration should be given to the feasibility of using the California hybrid as well as approaches being developed in other states, particularly Georgia. (Based on an analysis done by EPA using data on Chester County, Pennsylvania could meet at least most EPA performance standards under the California hybrid program.) Developing an I/M SIP revision would allow the Commonwealth time to consider the results of the California demonstration study, as well as the efforts underway in New Jersey and Georgia, to assess the feasibility of alternatives to the IM240 test procedures. Other issues, such as how rigid EPA will be on its 50 percent credit reduction regulation for test-and-repair networks,[6] may also become clearer by the end of 1994.

Amending the Commonwealth's I/M SIP would, however, create possible problems with the Envirotest contract. This contract was awarded, and the Request for Proposal was issued, based on a centralized test-only program. If an I/M SIP revision was developed that contained a substantial change to this approach, the contract, unless amended, would be breached. The Envirotest contract specifically provides, however, that it can be amended through the Commonwealth's normal procedures.

If Pennsylvania decided to adopt a hybrid approach (i.e., an approach that used both test-only and test-and-repair components), it would still need a certain number of centralized test-only stations. If Envirotest was willing to operate the program under these conditions, the contract could conceivably be amended to allow

[6]The 50 percent credit reduction is a major issue in all the states pursuing alternatives to a test-only program (see Section II-B).

Envirotest to build and operate these test-only facilities. (Envirotest told us they would view any such change as a breach of the contract entitling it to its full measure of damages, including lost profits.) Some might contend, however, that such a change is so fundamental that the contract could not simply be amended, but rather a new Request for Proposal would need to be issued and the contract award process redone. New regulations would also have to be developed.

The Envirotest contract also provides that it can be terminated for "convenience of the Commonwealth."[7] In this event, if the contract work is performed by a subsequent contractor, Envirotest must transfer all the land, facilities, and components used to carryout the enhanced I/M program to the subsequent contractor at fair market value. Fair market value is to be initially determined by PennDOT. Thus if PennDOT could not reach an agreement with Envirotest for amending the contract, it could conceivably find another contractor willing to operate the test-only facilities under the modified conditions. PennDOT could then terminate the contract under the "convenience of the Commonwealth" provision. Under this scenario, PennDOT would not be required to seek reimbursement from the Legislature for Envirotest's "capital costs and other appropriate expenditures." However, the Commonwealth might still be liable to Envirotest for other costs and damages, such as lost profits and loss of business value.

[7]Envirotest believes that under established law, a "termination for convenience" provision does not allow the Commonwealth to terminate because the contract is merely inconvenient or the Commonwealth can negotiate a different deal.

APPENDIX A

PRIOR PRINTER'S NO. 2093 PRINTER'S NO. 2113

THE GENERAL ASSEMBLY OF PENNSYLVANIA

SENATE RESOLUTION

No. 116 Session of 1994

INTRODUCED BY LAVALLE, CORMAN, MUSTO, SHAFFER, BODACK, AFFLERBACH AND BAKER, APRIL 20, 1994

SENATOR LOEPER, RULES AND EXECUTIVE NOMINATIONS, AS AMENDED, APRIL 25, 1994

A RESOLUTION

Directing the Legislative Budget and Finance Committee to conduct a study on emissions testing.

WHEREAS, The Commonwealth of Pennsylvania is required to implement an enhanced vehicle emissions inspection program mandated by the Federal Clean Air Act and through regulations promulgated by the United States Environmental Protection Agency; and

WHEREAS, The Pennsylvania Department of Transportation has adopted through regulation and submitted to the Environmental Protection Agency an enhanced vehicle emissions inspection program involving centralized testing modeled after the Environmental Protection Agency preferred testing program; and

WHEREAS, The United States Environmental Protection Agency has subsequently entered into negotiations with the State of California and approved a hybrid ENHANCED VEHICLE EMISSIONS <— INSPECTION program involving both centralized and decentralized

Appendix A (Continued)

testing; and

WHEREAS, In light of the negotiated settlement in California, a number of states have expressed an interest in pursuing alternatives to the Environmental Protection Agency preferred centralized ~~testing~~ INSPECTION program by entering into negotiations with the Environmental Protection Agency; and <—

WHEREAS, The Pennsylvania Department of Transportation has decided not to pursue alternatives and open negotiations with the Environmental Protection Agency regarding Pennsylvania's program; therefore be it

RESOLVED, That the Senate of Pennsylvania in the interest of affording ~~Pennsylvania motorists with~~ PENNSYLVANIANS WITH THE CLEANEST AIR POSSIBLE THROUGH A COMBINATION OF MOBILE AND STATIONARY SOURCE POLLUTION REDUCTION PROGRAMS DIRECT THE LEGISLATIVE BUDGET AND FINANCE COMMITTEE TO CONDUCT A STUDY ON the most cost-effective and convenient enhanced vehicle emissions ~~testing~~ INSPECTION program possible~~, direct the Legislative Budget and Finance Committee to conduct a study on emissions testing to~~ AND ITS IMPACT ON THE OVERALL POLLUTION REDUCTION STRATEGY FOR THE COMMONWEALTH AND THE STUDY SHALL include, but not be limited to, the following components: <— <—

(1) A review and analysis of Pennsylvania law pertaining to provisions which require a petition by the Department of Transportation to the Environmental Protection Agency seeking revisions to Pennsylvania's program based on changes in Federal law, RULES AND regulations~~, standards, etc~~. <—

(2) An examination and analysis of the current Commonwealth contract for enhanced VEHICLE emissions inspection services, including all options available to this Commonwealth and costs associated with same. The study shall <—

Appendix A (Continued)

include an itemized accounting of any and all reimbursable costs incurred by the contractor to date and the source and manner in which any costs are to be provided.

(3) A study of options available to states and particularly, Pennsylvania under the Federal Clean Air Act, including deadlines AND amended State Implementation Plans~~,~~ ~~etc~~. <—

(4) A review and analysis of enhanced ~~emission testing~~ VEHICLE EMISSIONS programs in all states affected by amendments to the Federal Clean Air Act. The study shall include a review of approved plans, submissions, approaches being taken by other states and pending negotiations. A review of the ~~posture~~ POSITION taken by the Environmental Protection Agency with regard to programming and requested negotiations in other states shall also be conducted. <— <—

(5) An examination of ~~problems and uncertainties~~ THE ADVANTAGES AND DISADVANTAGES associated with centralized AND DECENTRALIZED ENHANCED VEHICLE emissions ~~testing. The review shall encompass studies made~~ PROGRAMS. A COMPREHENSIVE STUDY OF THE LITERATURE COMPILED to date regarding the effectiveness of centralized ~~testing~~ AND DECENTRALIZED VEHICLE EMISSIONS PROGRAMS and new technologies CURRENTLY available ~~or forthcoming~~. <— <— <— <— <—

(6) An in-depth analysis of centralized, decentralized or hybrid ENHANCED VEHICLE emissions inspection programs for this Commonwealth and the impact of each plan on ~~the motoring public~~ PENNSYLVANIANS in terms of ~~cost and~~ CLEAN AIR, COSTS, INCLUDING PROGRAM ADMINISTRATION, OVERSIGHT, ENFORCEMENT, TEST FEES, convenience~~; and be it further~~, HEALTH EFFECTS, INDUSTRY, INCLUDING STATIONARY SOURCES, NEW ECONOMIC <— <— <— <— <—

Appendix A (Continued)

DEVELOPMENT, LOSS OF FEDERAL STATE IMPLEMENTATION PLAN CREDITS, OTHER MOBILE SOURCE CONTROL STRATEGIES, TEST STANDARDS AND VEHICLE FAILURE RATES, WAIVER RATES, CONSUMER FRAUD AND COSTS OF POLLUTION REDUCTION PER TON.

(7) AN IN-DEPTH ANALYSIS OF THE LICENSING AND CERTIFICATION OF EMPLOYEES OF CENTRALIZED AND DECENTRALIZED ENHANCED VEHICLE EMISSIONS INSPECTION PROGRAMS AND OTHER AUTOMOTIVE RELATED SERVICES THAT MAY BE PROVIDED TO THE MOTORING PUBLIC;

AND BE IT FURTHER

RESOLVED, That the Legislative Budget and Finance Committee shall present its findings to the President pro tempore of the ~~Senate on or before June 1, 1994.~~ SENATE IN A PRELIMINARY REPORT <— ON OR BEFORE JUNE 15, 1994, WITH A FINAL REPORT TO BE SUBMITTED ON OR BEFORE JUNE 30, 1994.

APPENDIX B

Glossary of Selected Terms Pertaining to Motor Vehicle Emissions Testing

Acceleration Simulation Mode Test (ASM) - This steady-state dynamometer test uses less expensive equipment than the IM240 test to measure concentrations of pollutants from which the volume must be estimated. A multi-mode ASM measures emissions at idle and various speeds, but not the periods of acceleration and deceleration that occur when a car is being driven.

Air Pollution Credits - Credits states receive toward the Clean Air Act's requirement that the most seriously polluted cities achieve a 24 percent overall emissions reduction by the year 2000. Credits are achieved, in part, by implementing an effective emissions testing program.

Alternative Control Techniques (ACTs) - Guidance to be developed by EPA for the control of Volatile Organic Chemicals (VOC) and Nitrous Oxide (NO_x) sources under requirements of the 1990 Clean Air Act Amendments.

Automobile Emissions - Gases and particles that are given off from a car's carburetor, fuel tank, crankcase, and exhaust. Those which cause harmful air pollution are hydrocarbons, carbon monoxide, and nitrogen oxides.

Approved Exhaust Emission Analyzer - An instrument, developed for measuring the hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen emissions from the exhaust system of a vehicle, which meets required emission analyzer specifications and program requirements and has been approved by PennDOT.

BAR 90 - The acronym used for the California Bureau of Automotive Repair's "Exhaust Gas Analyzer Specifications" provided in 1990 for the testing and documentation of technical specifications required for the approval of analyzer use in California for the measurement of hydrocarbon and carbon monoxide emissions. These specifications, including performance criteria, design characteristics, instrument evaluation procedures and documentation, warranty requirements, and logistics must be met or surpassed for an exhaust gas analyzer to be considered equivalent to the BAR 90 exhaust gas analyzer.

Best Available Control Technology (BACT) - Technology required on new major sources and major modifications which reflects the best controls in use, taking into account costs and other non-air quality factors.

Appendix B (Continued)

CAAA - The 1990 amendments to the US Clean Air Act.

CO-Carbon Monoxide - A colorless, odorless gas formed by incomplete combustion of carbon, including gasoline. It is considered a mobile source pollutant.

CO_2-Carbon Dioxide - A colorless, odorless incombustible gas formed during respiration and combustion.

Centralized Test-Only Emission Inspection Network - A system for vehicle emission inspection utilizing consolidated facilities owned and operated by a state or by contractors to a state that provide for vehicle emission testing only.

Certificate of Emission Inspection - A serially numbered sticker that, when affixed to the windshield of a vehicle, indicates that the vehicle has passed an emission inspection.

Certificate of Waiver - An official state document indicating that the requirement of passing emission reinspection has been waived for a vehicle.

Certified Emission Inspector - A person who holds a valid certification card designated for emissions, issued by a state agency certifying that the person is qualified and has passed the requirements to perform emission inspections on subject vehicles in an appointed emission inspection station.

Decentralized Test-Only Network - A program design in which multiple participants are contracted to perform I/M testing (as opposed to a single contractor). To establish equivalency with traditional centralized programs and to avoid the decentralized discount incorporated in EPA's MOBILE model, participants must operate test-only facilities and are barred from making repairs, selling replacement parts, making referrals, or otherwise engaging in activities that would violate the intention of the test-only requirement (i.e., the avoidance of conflict-of-interest).

Dynamometer - (Also known as a "chassis dynamometer.") A device which applies a simulated road load to a vehicle's drive wheels while operating in a stationary, secure position. May be enhanced to simulate actual driving conditions, including various, transient vehicle speeds and acceleration/deceleration conditions.

Emission Inspection - The testing of the exhaust emissions of a subject vehicle, while it is running, for CO, hydrocarbons (HC) and oxides of nitrogen (NO_x).

Emissions Repair Technician - Any person engaged in diagnosing or repairing a motor vehicle(s) that has failed an emissions inspection and who is recognized by the state to perform such function.

Appendix B (Continued)

Enhanced Emission Inspection Program - A vehicle emission inspection program as defined by the EPA which includes computerized emission analyzers, on-road testing and inspection of vehicle emission control devices through a centralized or decentralized inspection program.

Environmental Protection Agency (EPA) - Federal agency having responsibility for administering federal laws relating to the protection of the environment.

Federal Standard - A minimum standard of vehicle or vehicle equipment performance issued under the National Traffic and Motor Vehicle Safety Act (15 U.S.C.A. §§ 1381 note, 1391-1409 and 1421-1425), the Motor Vehicle Information and Cost Savings Act (15 U.S.C.A. §§ 1901-2013) or section 101 the Clean Air Act (42 U.S.C.A. § 7401).

Federal Test Procedure (FTP) - A mass emissions test created to determine whether prototype vehicles comply with EPA standards, thus allowing production vehicles to be certified for sale in the United States. The FTP is too costly to use for I/M because vehicles must be maintained in a closely controlled environment for over 13 hours. The FTP is based on a 20 minute trip, driven once when the engine is cold, and again when it is hot.

Flue Gas Recirculation (FGR) - The technique of recirculating a fraction of the flue gas to the burners to reduce peak flame temperature and oxygen availability with vitiated (flue gas-diluted) air for NO_x reduction. FGR can also be used for steam temperature control when introduced through a furnace hopper.

GVWR - Gross vehicle weight rating - The value specified by the manufacturer on the federal weight certification label as the loaded weight of a single vehicle.

High-Tech Vehicles - Vehicles with computerized control of the engine and emission control system, especially 1983 or newer vehicles employing fuel injection (either port fuel injection (PFI) or throttle-body injection (TBI) as opposed to carburetion as a fuel metering methodology).

Hybrid Vehicle Emissions Testing Network - Emission inspection networks established by states that incorporate features different from a traditional centralized or decentralized program. For example, medium-to-high volume, test-only stations in decentralized, multi-participant systems, and multiple contractor system with defined territories are two possible hybrid systems which states have considered.

Hydrocarbons - Any compound composed of carbon and hydrogen, such as petroleum products. Excessive amounts in the atmosphere are considered undesirable contaminants and a major contributor to air pollution.

Appendix B (Continued)

Idle Test - A concentration-type emission test to measure the percentage of CO and parts per million of hydrocarbons (HC) in the exhaust stream of a gasoline-powered vehicle operating at idle. The nondispersive infrared detector (NDIR) equipment normally used gives a less accurate measure of HC than does the flame ionization detector (FID) equipment used in the FTP and IM240 tests.

I/M - Inspection/Maintenance - Program required in most ozone and some carbon monoxide nonattainment areas to reduce emissions through repairs of vehicles that are inspected and identified as being high emitters.

IM240 Emissions Test - A mass emissions (as opposed to concentration), transient short test run on an inertial and power-absorbing dynamometer using a 240 second driving cycle. The IM240 test is conducted in a test lane consisting of three inspection stations: (1) a visual inspection and fuel inlet check, (2) the dynamometer test and purge test (to measure vapor loss), and (3) the pressure test to measure leaks in the fuel system.

Unlike the idle test which is conducted at a single speed and expresses emissions in terms of percentages and parts per million, the IM240 is conducted at a range of accelerations and decelerations and provides emissions measurements in terms of grams per mile (gpm). The IM240 has proved particularly effective in accurately identifying high emitting, newer technology vehicles.

Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) - A law which establishes federal policy in this area and which included significant reforms from prior legislation.

Low Emission Vehicle (LEV) Program - A set of tailpipe emission standards based on California's LEV program for controlling emissions of nonmethane organic gas (NMOG), CO, and NO_x. These standards incorporate four vehicle types: transitional low emission vehicles (TLEVs), low emission vehicles (LEVs), ultra-low emission vehicles (ULEVs), and zero emission vehicles (ZEVs).

Low Excess Air (LEA) - Operation of boiler with minimal excess combustion air to optimize thermal efficiency and reduce NO_x formation.

Low-NO_x Burner (LNB) - Burner and windbox assemblies designed to minimize the formation of NO_x by various techniques, such as separated fuel jets, flue gas recirculation, and controlled air mixing.

Mobile5a Model - EPA's computer model used to estimate emissions from vehicles. The model is based on emission results obtained by EPA from testing of vehicles in actual use, using the Federal Test Procedure (FTP). Emissions in grams per mile traveled are calculated considering factors such as: average vehicles speeds; ambi-

ent temperatures; volatility of fuel (which strongly affects evaporative emissions); the type of emission inspection program, and the vehicles that it covers; and vehicle age and mileage distribution (can use national or local figures).

Emissions are calculated for each model year and vehicle type, then a weighted average is calculated to give an overall average emission per vehicle per mile for volatile organic compounds (VOC), carbon monoxide (CO), and nitrogen oxides (NO_x) emissions.

National Ambient Air Quality Standards (NAAQSs) - Standards for air quality concentrations that EPA sets to protect public health with an adequate margin for safety (primary standards) and to protect the environment (secondary standards).

Nitrous Oxides (NOX) (NO_x) - A compound formed during the engine's combustion process when oxygen in the air combines with nitrogen in the air to form the nitrogen oxides which are agency in photochemical smog.

NMHC - ***Non Methane Hydrocarbons*** - A mobile source of exhaust pollutant for which the EPA has set allowable standards.

On-Road Testing (Remote Sensing) Device - An exhaust gas analyzer capable of measuring vehicle exhaust gas content outside of the garage environment, while the vehicle is in motion on the road or at roadside.

Ozone (O_3) - It is a pollutant, commonly referred to as smog, that is formed from emissions of volatile organic compounds (VOC), nitrogen oxides (NO_x), and, to a lesser degree, carbon monoxide (CO). Motor vehicles, for example, do not emit ozone. Rather they emit VOC and NO_x, which are precursors of ozone. When they are emitted from motor vehicles, they undergo chemical reactions in the atmosphere which, under certain conditions, then produce the ground level ozone pollutant.

Particulates - Very minute particles of solid matter emitted from a vehicle's exhaust system.

Ping Pong Effect - Motorists who fail a test at a test-only facility must take their vehicle to an independent station for repair and then return to the test-only facility for a re-test.

Preconditioning - Operation of a vehicle at a specific speed, load (including no load), and time to ensure that a vehicle is properly warmed up prior to testing. A period of operation prior to testing to avoid false failures as a result of evaporative system purging into the sample.

Pressure Test - A test whereby inert gas is injected into a vehicle's evaporative system to establish the system's integrity by indicating the presence of a leak or by confirming the system's ability to hold pressure.

Purge Test - A test to determine whether a vehicle's evaporative emissions system recycles the gasoline vapors absorbed on the charcoal in the evaporative canister (i.e., whether or not the canister purges vapors to the engine to be combusted). To provide representative operation and opportunity for the purge control system to demonstrate its proper working order, the purge test is conducted on a dynamometer using the same 240-second transient driving cycle as the IM240 exhaust gas test. The test is conducted simultaneously with the tailpipe emission test.

Reasonably Available Control Technology (RACT) - Technology required to be installed on existing major sources in nonattainment areas. The lowest emission limit that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility.

Referee - (Also "waiver officer") A person responsible for verifying the accuracy of emissions inspection and the validity of emissions-related repair work for the purpose of issuing emissions waivers, exemptions, or exceptions. No employee of the contractor shall serve as a referee.

Reformulated Gasoline - Fuel that meets the specifications of the CAAA which will produce lower emissions of VOC and other pollutants such as toxics. California has its own reformulated gasoline specifications.

Remote Sensing Device - See On-Road Testing Device.

Repair Grade 240 Emission Test (RG240) - The RG240 provides an approximation of the IM240 mass emissions measurements. The procedure requires an electronically enhanced dynamometer with inertia weights, an exhaust dilution system, a BAR90 analyzer, and appropriate computer and software.

Selective Catalytic Reduction (SCR) - The injection of chemical reagents in the flue gas for the selective reduction of NO_x to nitrogen and water.

State Implementation Plans (SIPs) - Plans that states must develop to provide for attainment and maintenance of NAAQSs. The plans must be submitted to the Federal EPA for approval.

Test-and-Repair Network - A "decentralized" program where inspection and retests are performed at privately owned, licensed facilities, such as gas stations and other shops which may also do repair work.

Appendix B (Continued)

Transient Test - A vehicle emission inspection test in which the vehicle is tested for exhaust emissions under conditions simulating actual on-road driving conditions. Testing equipment includes an inertial power absorbing dynamometer, to permit simulation of driving, and exhaust gas analyzer equipment that analyzes the exhaust gas emissions under various driving conditions.

Two-Speed Test - A vehicle emission inspection test in which the exhaust emissions are measured at two ranges of engine revolutions per minute (rpm) as prescribed in 40 CFR Part 51, Subpart S, Appendix B(II).

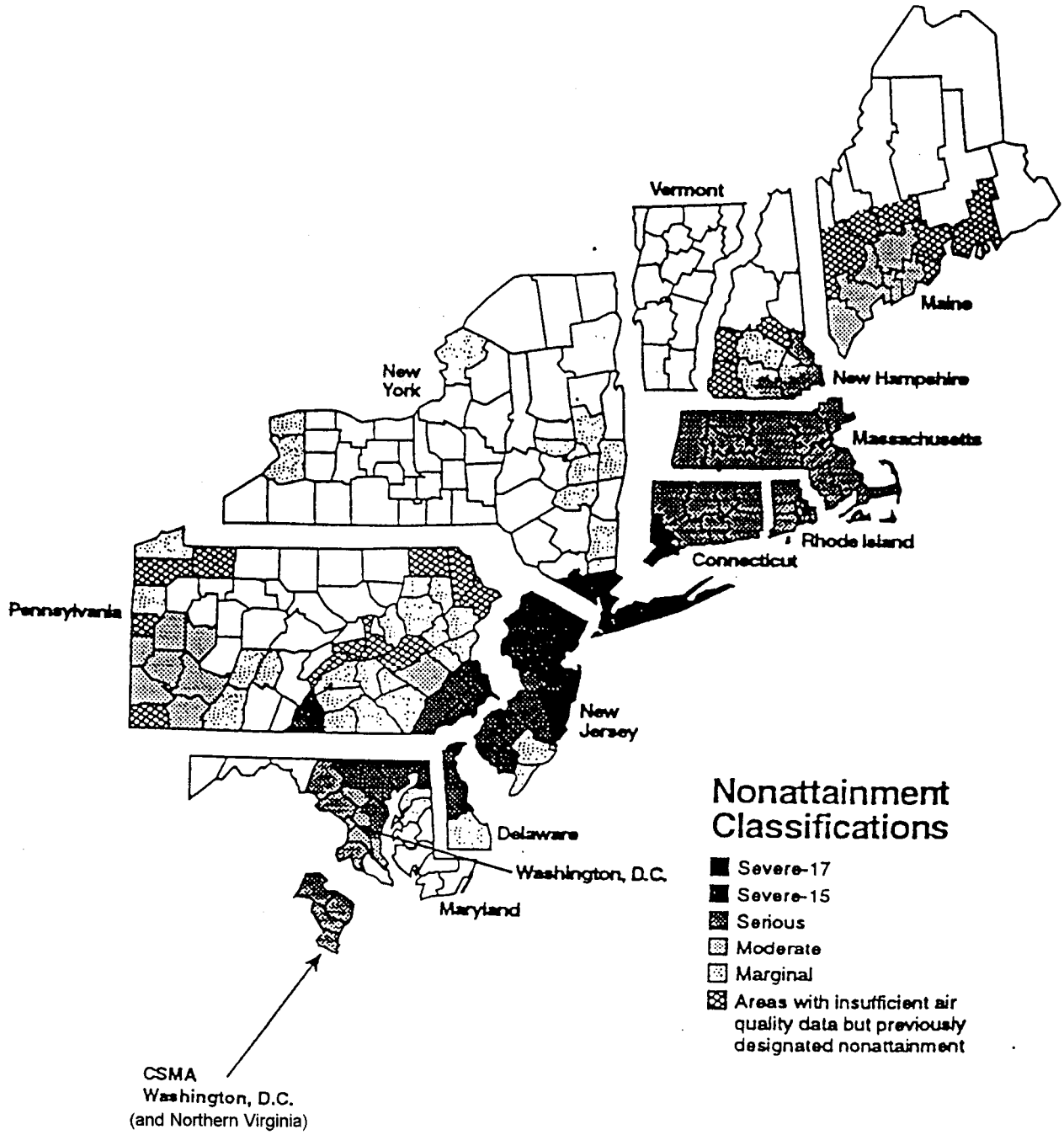
Volatile Organic Compounds (VOCs) - Hydrocarbon pollutants that react photochemically in sunlight with NO_x to produce ozone; controlling VOCs is the principal objective of the ozone nonattainment program.

2500 rpm/Idle Test - A two-speed, steady-state, concentration-type test in which emissions are sampled at both idle and 2500 rpm. To be considered a pass, a vehicle must pass at both speeds. The two-speed test has a better identification rate for high emitting vehicles than does the standard idle test.

APPENDIX C

Map of Northeast Ozone Transport Region

(Classified Ozone Nonattainment Areas)



Source: Pennsylvania Department of Transportation.

APPENDIX D

Projects Exempt From Transportation Conformity Sanctions

§ 51.460 Exempt projects.

Notwithstanding the other requirements of this subpart, highway and transit projects of the types listed in Table 2 are exempt from the requirement that a conformity determination be made. Such projects may proceed toward implementation even in the absence of a conforming transportation plan and TIP. A particular action of the type listed in Table 2 is not exempt if the MPO in consultation with other agencies (see § 51.402(c)(1)(iii)), the EPA, and the FHWA (in the case of a highway project) or the FTA (in the case of a transit project) concur that it has potentially adverse emissions impacts for any reason. States and MPOs must ensure that exempt projects do not interfere with TCM implementation.

TABLE 2.—EXEMPT PROJECTS

Safety
Railroad/highway crossing.
Hazard elimination program.
Safer non-Federal-aid system roads.
Shoulder improvements.
Increasing sight distance.
Safety improvement program.
Traffic control devices and operating assistance other than signalization projects.
Railroad/highway crossing warning devices.
Guardrails, median barriers, crash cushions.
Pavement resurfacing and/or rehabilitation.
Pavement marking demonstration.
Emergency relief (23 U.S.C. 125).
Fencing.
Skid treatments.
Safety roadside rest areas.
Adding medians.
Truck climbing lanes outside the urbanized area.
Lighting improvements.
Widening narrow pavements or reconstructing bridges (no additional travel lanes).
Emergency truck pullovers.
Mass Transit
Operating assistance to transit agencies.
Purchase of support vehicles.
Rehabilitation of transit vehicles.[1]
Purchase of office, shop, and operating equipment for existing facilities.
Purchase of operating equipment for vehicles (e.g., radios, fareboxes, lifts, etc.).
Construction or renovation of power, signal, and communications systems.
Construction of small passenger shelters and information kiosks.
Reconstruction or renovation of transit buildings and structures (e.g., rail or bus buildings, storage and maintenance facilities, stations, terminals, and ancillary structures).
Rehabilitation or reconstruction of track structures, track, and track bed in existing rights-of-way.
Purchase of new buses and rail cars to replace existing vehicles or for minor expansions of the fleet.[1]
Construction of new bus or rail storage/maintenance facilities categorically excluded in 23 CFR part 771.
Air Quality
Continuation of ride-sharing and van-pooling promotion activities at current levels.
Bicycle and pedestrian facilities.
Other
Specific activities which do not involve or lead directly to construction, such as:
Planning and technical studies.
Grants for training and research programs.
Planning activities conducted pursuant to titles 23 and 49 U.S.C.
Federal-aid systems revisions.
Engineering to assess social, economic, and environmental effects of the proposed action or alternatives to that action.
Noise attenuation.
Advance land acquisitions (23 CFR part 712 or 23 CFR part 771).
Acquisition of scenic easements.
Plantings, landscaping, etc.
Sign removal.
Directional and informational signs.
Transportation enhancement activities (except rehabilitation and operation of historic transportation buildings, structures, or facilities).
Repair of damage caused by natural disasters, civil unrest, or terrorist acts, except projects involving substantial functional, locational or capacity changes.

[1] PM_{10} nonattainment or maintenance areas, such projects are exempt only if they are in compliance with control measures in the applicable implementation plan.

Source: 40 C.F.R §51.460.

APPENDIX E

Number of Vehicles Subject to PA's Enhanced I/M Inspection Program, by County*

	Passenger Vehicles	Light Duty Trucks[a]	Light Duty Trucks[b]	Total
Allegheny	699,044	73,588	24,966	797,598
Beaver	96,554	16,652	4,757	117,963
Berks	202,290	35,252	9,148	246,690
Blair	71,805	14,555	3,606	89,966
Bucks	324,450	40,033	13,070	377,553
Cambria	86,140	16,001	4,143	106,284
Centre	55,296	13,177	2,941	71,414
Chester	214,662	28,979	8,788	252,429
Cumberland	134,997	22,072	5,904	162,973
Dauphin	153,848	22,062	10,549	186,459
Delaware	327,034	26,398	9,439	362,871
Erie	140,319	23,988	6,919	171,226
Lackawanna	114,346	15,132	3,276	132,754
Lancaster	235,923	42,746	11,157	289,826
Lebanon	65,960	13,404	3,148	82,512
Lehigh	160,538	19,385	5,905	185,828
Luzerne	194,615	28,989	6,750	230,354
Lycoming	63,485	14,943	4,460	82,888
Mercer	61,923	12,093	4,118	78,134
Montgomery	477,443	43,360	16,170	536,973
Northampton	163,881	23,398	6,149	193,428
Philadelphia	475,531	26,660	11,421	513,612
Washington	115,287	21,995	6,871	144,153
Westmoreland	200,978	35,951	10,536	247,465
York	207,967	41,604	9,269	258,840
Total	5,044,316	672,417	203,460	5,920,193

*Represents all 1968 and newer passenger vehicles and light-duty trucks in counties subject to the enhanced I/M Program.
[a]Light-duty trucks 6,000 lbs. GWVR or less.
[b]Light-duty trucks 6,001 to 9,000 lbs. GWVR.

Source: Summary of Registered Vehicles in Pennsylvania by County, PennDOT, May 12, 1994.

APPENDIX F

Georgia's Proposed Enhanced I/M Program

Program Description

- 13 counties covered.
- Covers all 1975 and later model, gasoline-powered, cars and light-duty trucks.
- Annual testing for all vehicles.
- Improved motorist convenience through a testing network of both centralized contractor-operated stations and independent decentralized stations.
  - Newest six model years will be tested at a decentralized network of locations (repair garages, service stations, dealerships, etc.) using a RG240 tailpipe test system--a simpler version of the IM240 system. Testing will begin May 1, 1995. Individual stations will be licensed as in the current program.
  - Vehicles seven model years and older will be required to be tested in a centralized network, using the IM240 tailpipe test. Testing for these vehicles is scheduled to begin on January 1, 1996. A single contractor will be hired to perform this testing.

Primary Changes From the Program Originally Planned by Georgia

- Provides for cleaner air.
- Hybrid network instead of only centralized, state contractor-operated.
- Annual testing instead of biennial.
- Less expensive equipment ($30,000 for RG240 vs. $125,000 for IM240) for testing newer vehicles.
- Two more model years covered (1975 and 1976).

Why These Changes Were Made to the Original EPD Program

- Georgia feels this program is significantly better in reducing air pollution emissions from vehicles. The Atlanta metro area reportedly will need all the reductions it can get if Georgia hopes to meet the federal and state ozone standards and protect the public's health.
- Georgia believes a hybrid network has several advantages:
  - Greatly increased number of inspection stations will improve convenience for many motorists. (A Georgia Tech survey indicates 200-300 stations may participate in the new program, in addition to the expected 25 multi-lane stations in the centralized portion of the program.) It will allow some motorists the option of having tests and repairs done at the same facility.
  - RG240 equipment in repair garages can also be used to aid in the repair of vehicles. This should improve the quality and reduce the cost of any required repairs.

Source: Georgia Department of Natural Resources.

APPENDIX G

Pennsylvania Automotive Technician Training Program
Fundamental Inspection Repair System Training (F.I.R.S.T.)

Program Description: The Fundamental Inspection Repair System (FIRST) Program is a hands-on, repair oriented, 60 hour (20 3-hour class modules) technician training course. FIRST is designed to help automotive repair professionals meet the challenge of diagnosing and repairing today's complex computer controlled vehicles.

Program Outline:

Module 1:	Overview of I/M240 Inspection/Repair Program
Module 2:	Fundamentals of Electricity/Electronics
Module 3:	Electrical Measurement Instruments and Batteries
Module 4:	Starting, Charging Systems and Wiring Schematics
Module 5:	Ignition System Operation
Module 6:	Ignition Systems Testing
Module 7:	Engine Mechanical
Module 8:	Air/Fuel Mix, Chemistry of Combustion and Principles of Carburetion
Module 9:	Principles of Fuel Injection
Module 10:	Emission Control Systems
Module 11:	Exhaust Analysis
Module 12:	Diagnosing Emission Problems
Module 13:	Fuel System Servicing
Module 14:	Computer Theory
Module 15:	Input Strategies, and Sensor Training
Module 16:	Output Devices and Component Testing
Module 17:	Computerized Fuel Management System Operation
Module 18:	Computerized Spark Management Systems
Module 19:	Driveability Diagnosis
Module 20:	Motor Vehicle Inspection Program Information

The classroom learning sessions have been enhanced with audio-visual aids (such as slides and videotapes), hands-on exercises, demonstrations and shop procedures. Each course includes a comprehensive student workbook, containing information sheets and procedures to help the students use these techniques and procedures in the repair facility on a daily basis.

Source: Developed from information received from ASPIRE, Inc.

APPENDIX H

Pennsylvania Automotive Technician Training Program Emission Diagnostic Graduate Education (E.D.G.E.)

- History of Emission Testing (Program Goals and Objectives)
- Dynamic (I/M240) vs. Static (Steady State/No Load) Testing
- Equipment used in I/M240 Inspection Process
- I/M240 Inspection Process
- Service Industry/Technician's Role in the I/M240 Repair Process
- Interpreting I/M240 Inspection Data (Trace Analysis)
- Equipment and Technologies Used in the I/M240 Repair Process
- Use of On-Board Diagnostics, OBD I and OBD II
- Use of Scan Tools, Interfaces, and Serial Data Recorders/Playback Systems (ALDL) Information
- Use of Lab Oscilloscopes - Analog, Digital, and Data Plotters (Waveform Analysis)
- Diagnosing and Repair of Emission System Failures - Both Transient and Evaporative Through the Application of Emission and Computer Control Theory and Diagnostic Data
- Development and Utilization of Technician Analytical Skills to:
  - Interpret I/M240 Data for Systemic Failures
  - Interpret I/M 240 Data for Signature (Pattern Match) Failures
- Use of I/M Hotlines in Repair of I/M240 Vehicles
- Use of PC Computers for Repair Information Retrieval and Data Acquisition
- Electronic Recalibration of On-Board Computers (EEPROM Technology)
- State Specific I/M240 Inspection Information
- Repair Verification

Source: Developed from information received from ASPIRE, Inc.

APPENDIX I

Vehicles in Pennsylvania Subject to Enhanced I/M Testing, by Model Year

Model Year	Number of Vehicles[a]	Percent of Total	Cumulative Percentage
1994	206,534	3.49%	3.49%
1993	443,774	7.50	10.98
1992	419,622	7.09	18.07
1991	436,720	7.38	25.45
1990	456,056	7.70	33.15
1989	502,047	8.48	41.63
1988-1968	3,455,440	58.37	100.00%
Total	5,920,193	100.00%[b]	

[a]Includes all 1968 and newer passenger vehicles and light-duty trucks in counties subject to the enhanced I/M Program.
[b]Does not add due to rounding.

Source: Developed by LB&FC staff from Summary of Registered Vehicles in Pennsylvania by County, PennDOT, May 12, 1994.

APPENDIX J

COST EFFECTIVENESS OF TCMs

HIGH (< $25,000/TON OF HC)	MODERATE ($25,000 - $100,000/TON OF HC)	LOW (>$100,000/TON OF HC)	UNKNOWN, BUT LIKELY HIGH
- Smog/VMT Tax - Buy-Backs of Older Cars - Area-wide Ridesharing - Signal Timing	- Parking Pricing - Congestion Pricing - Incident Management	- HOV Lanes - Park-and-Ride Lots - Transit Improvement - Employer Trip Reductions - Bike and Walk Facilities	- Compressed Work Week - Telecommuting - Land Use Planning

TCMS = Transportation Control Measures
HC = Hydrocarbon
HOV = High Occupancy Vehicle

Source: Pennsylvania Department of Transportation.

APPENDIX K

Termination Clause of Envirotest's Contract With PennDOT

15. Termination. In addition to any other rights of termination set forth in this Contract, the Commonwealth shall have the unilateral right to terminate this Contract either in whole or in part upon thirty (30) calendar days' written notice to the Contractor in accordance with the following:

a. Commonwealth abandonment or postponement of work set forth in the RFP;
b. Default (inadequate performance or non-performance by the Contractor as determined by the Commonwealth); or
c. For convenience of the Commonwealth.

These reasons shall not be deemed to limit the Commonwealth's right to terminate this Contract for any other reason as permitted under this clause, other

provisions of this Contract, or under applicable statutory law or regulations. Any such termination shall be effected by delivery to the Contractor of a written Notice of Termination specifying the extent to which performance of the work under the Contract is terminated either in whole or in part, and the date on which such termination becomes effective. The Contractor shall cease work as of the date set forth in the said Notice of Termination.

In the event of termination for Default the provisions of Paragraph 17 shall apply. In the event of termination for convenience of the Commonwealth, if the Contract work is performed by a subsequent contractor, the Contractor shall transfer title and assign leases and deliver to the subsequent contractor all land, facilities and components thereof installed, acquired and/or used by the Contractor to perform the work under this Contract and the subsequent contractor shall pay to the Contractor, prior to the transfer of title, fair market value for all such land, facilities and components as initially determined by the Commonwealth. In the event that the Commonwealth otherwise terminates this Contract, including as a result of a change in law or regulation, the Commonwealth agrees to request the State legislature to appropriate to the Contractor equitable compensation for capital costs and other appropriate expenditures incurred by the Contractor prior to termination

of the Contract. Contractor understands and agrees that the Commonwealth will not request the legislature to appropriate funds for lost revenue from anticipated future vehicle inspection fees. The Commonwealth agrees to meet with the Contractor to discuss the amount of compensation it will request from the legislature. Contractor also understands and agrees that any compensation for capital costs and other appropriate expenditures will require an appropriation by the legislature for this purpose, and that Contractor's compensation will be limited to the amount appropriated by the legislature for this purpose. Neither the Commonwealth request to the legislature nor the payment of compensation pursuant to such a request will be construed or deemed as an admission by the Commonwealth of liability to the Contractor. The foregoing is in addition to, and the Contractor reserves all rights and remedies under the Contract and otherwise available to it in law or equity in the event of termination.

16. Disputes.

In the event that any dispute arises between the parties under this Contract, the Secretary of Transportation or his designee shall make a determination in writing of his interpretation and shall send the same to the Contractor. The decision of the Secretary (or said designee) shall be

APPENDIX L

Results of Selected Research Studies Related to Enhanced Vehicle Emissions Testing Programs

Overview of the Literature

The Clean Air Act Amendments of 1990 cite I/M programs as an important strategy for helping attain national air quality standards by the year 2005. The EPA in its final rules for I/M programs noted that typical urban areas which implement its model program will experience a 28 percent reduction in emissions of VOC, a 31 percent reduction in CO emissions, and a 9 percent reduction in NOx emissions from highway mobile sources by 2000 when compared to what the area would experience without an I/M program.

Others, however, are unsure that reductions in emissions will result as forecasted. For example, Scherrer and Kittelson (1994) studied air quality at three sites in the Minneapolis-St. Paul area before and after the introduction of a centralized I/M program. They found that the I/M program accounted for only a 1.3 percent improvement in carbon monoxide levels based on actual air quality measurements and that newer cars with improved emission systems are accounting for greater improvements in air quality. Lawson (1993) and others (Irving Review Group, 1993) concluded that motorists are taking steps to pass the I/M test and to run their car clean for one day--the day of the emissions test. Because of these findings, researchers such as Lawson call for additional research on different possible program designs before investing considerable time and money for enhancements to the existing I/M programs.

Others question the effectiveness of I/M programs in testing certain model vehicles. Because of problems with the idle test in testing and repairing certain vehicles, Haskew et al (1987) believe that vehicle owners are being subject to inconvenience and needless expense for unnecessary repair. They believe that more effective auto emissions reductions will be achieved through on-board auto diagnostic systems, which are in newer model cars.

The GAO (1992) also reported problems with EPA's I/M 240 test procedure, noted that some vehicles may be more difficult to diagnose and repair, and noted that mechanics are not trained in emissions repair for high-technology vehicles. According to the GAO (1992) vehicles that only marginally exceed the emissions standards may be especially difficult to diagnose and repair. Owners of such vehicles may be sent back and forth between the test sites and repair shops, increasing their frustration and inconvenience. And, after repairs to these vehicles

are made, they may emit more emissions than before. As a result the anticipated emissions reductions from I/M programs may not be realized. The California I/M Review Committee (1993) similarly stressed the need for improving the training of mechanics and technicians to improve emissions testing and achieve targeted emissions reductions. Others (California Research Bureau, 1993; Irving Review Group, 1993 and Spencer, 1994) note that cleaner air can be achieved by targeting high emitting vehicles without the need to test all cars.

The GAO (1992) further questioned EPA's position about the cost effectiveness of the IM240 tailpipe test. The GAO noted one research organization found that it costs $12,000 per ton of hydrocarbon emissions reductions rather than $880 as implied by EPA.

I/M programs, however, have strong supporters. The American Lung Association (1993) points to improved health benefits which will result from cleaner air. Public opinion polls sponsored by I/M program advocates also show that the public favors reducing auto pollution and under certain conditions supports enhanced inspection and maintenance programs as a way to achieve cleaner air. (Ritter Research, 1991, and the Gallup Organization, 1993).

Debate Over the Effectiveness of Test-Only and Test-and-Repair I/M Programs

Much debate has also occurred over the relative effectiveness of test-only versus test-and-repair networks. EPA has concluded that greater benefits can be achieved at lower cost and with limited inconvenience to the motoring public through centralized programs (Tierney, 1991; EPA, 1992; and EPA, 1993). EPA also notes that a recent study in California (California I/M Review Committee, 1993) supports its position about the inherent conflict of interest problems encountered in test-and-repair programs. Others reviewing the California report, however, do not draw the same conclusion (Rand, 1993; Irving Review Group, 1993; and the California Research Bureau, 1993). The 1993 Rand report concluded that a well safeguarded test-and-repair system can be highly effective.

The data which EPA has used to base its decision that test-and-repair programs are assumed to be 50 percent less effective than test-only programs has also been questioned. For example, the General Accounting Office (1993) found that the data which EPA used to base its decision provided qualitative support for EPA's position that test-and-repair programs have in the past been less effective, but it did not provide quantitative support for a 50 percent emission credit reduction. According to the GAO, centralized programs such as those in Maryland, Arizona, and New Jersey also fail to identify noncomplying vehicles. In an EPA covert audit

in Maryland, the I/M program failed to identify noncomplying vehicles 40 percent of the time according to the GAO. The GAO also found problems with the methodologies used in the EPA studies.

Some examples of the problems in the EPA audits can be seen from the EPA covert audit of Pennsylvania's I/M program carried out in May 1989. According to the EPA's covert audit of Pennsylvania's basic I/M program, improper tests were performed in the program 79 percent of the time (EPA, 1993). However, only 14 out of Pennsylvania's 3,524 certified stations were selected for this covert audit. According to PennDOT staff who participated in the audit, these stations had to be within five or six miles of one of PennDOT's referee stations because the test vehicle used in the covert audit did not consistently "run dirty" once the catalytic converter was at full operating temperature. The stations which were audited, therefore, had to be near the referee stations to prevent the test car from "running clean."

Because of this problem with the test vehicle, four or five of the stations visited were not included in the final report data because the vehicle tested clean at the inspection station and subsequently at the PennDOT referee station. Also, the type of improper testing identified during Pennsylvania's covert audit ranged from a mechanic list not being posted in a public area, to no preconditioning being done, to an inspector pulling a vacuum line in order to pass the vehicle.

Descriptions and Primary Conclusions of Key Studies on Test-Only and Test-and-Repair I/M Programs

Enhanced Inspection and Maintenance Analysis *- American Lung Association, February 1993.*

Brief Description: This report provides estimates for Pennsylvania of the reduction in ozone season daily emissions that will be achieved as a result of the implementation of the Environmental Protection Agency's (EPA) model enhanced inspection and maintenance (I/M) program.

Primary Conclusions: The report concluded that in the typical ozone nonattainment area in Pennsylvania, adoption of a centralized test-only enhanced I/M program will result in greater VOC and NOx emission reductions than the current basic I/M program. VOC reductions from enhanced I/M are expected to be achieved at a cost of $500 per ton. Associated NOx emission reductions are expected at $1,850 per ton. Enhanced I/M also provides inexpensive CO emission reductions, which will help the state obtain and maintain air quality standards for that pollutant.

Evaluation of the California Smog Check Program and Recommendations for Program Improvements, Fourth Report to the Legislature - *California I/M Review Committee, February 16, 1993.*

Brief Description: The EPA considered the results of this evaluation when deciding that centralized test-only programs are more effective than decentralized test-and-repair ones. Parts of the report include a discussion of the advantages of a test-only I/M program and the benefits of an enhanced test-and-repair program. The report also discusses testing devices which are an alternative to the IM240 and remote sensing technologies.

Primary Conclusions: The report concluded that California's I/M program was not achieving its legislatively targeted emission reductions because existing test procedures are less effective in vehicles with computer-controlled engines. Also, under-hood visual and functional inspections which can identify defects missed by the tailpipe test are not being completed properly by mechanics. To correct this, mechanics need additional training. Another reason for the California I/M program not achieving targeted emission reductions is that many vehicles that fail the current tests are only partially repaired to pass the test or obtain a waiver. Excessive emissions, however, often remain with these vehicles.

The California I/M Review Committee recommended that California implement a hybrid I/M program. Such a program would use high volume test-only stations in areas requiring enhanced I/M and the basic California I/M program with enhancement in other areas. The Committee also proposed that the state license certain private repair stations to perform reinspections, provided these stations are able to perform loaded-mode testing and employ qualified mechanics.

Issue Summary, Motor Vehicle Inspection and Maintenance in California - *California Research Bureau, August 24, 1993.*

Brief Description: This report summarizes the issues central to the debate in California concerning enhanced motor vehicle I/M programs. It includes a discussion of issues raised concerning the California I/M Review Committee's evaluation of California's smog check program. The report includes a discussion of centralized test-only versus decentralized test-and-repair and hybrid testing programs.

Primary Conclusions: The report concludes that there are plausible arguments that a centralized test-only inspection system may be less effective in

cleaning the air than the U.S. Environmental Protection Agency contends. Remote sensing and programs to repair or remove high emitting vehicles from the road may be more effective than routine scheduled inspections.

Report of the Irvine Review Group - *Department of Economics, University of California, Irvine, August 9, 1993.*

Brief Description: This report includes a discussion of the California I/M Review Committee's evaluation of California's smog check program, the limitations of both centralized test-only and decentralized test-and-repair I/M programs in reducing auto emissions, remote sensing, and alternative I/M testing devices.

Primary Conclusions: The report concluded that California's current inspection program is really only designed to ensure that cars are clean one day every two years--on the I/M inspection day. The key to an improved I/M program is better enforcement through random on-the-road inspections using remote sensing to detect tailpipe emissions and enforcement via better certification and monitoring of inspectors.

Car Owners' Attitudes Toward Emissions Testing and Other Proposed Measures to Reduce Air Pollution - *The Gallup Organization, Inc., Princeton, New Jersey, April 1993.*

Brief Description: This report, sponsored by the American Lung Association, includes results from a nationwide survey of 1,001 adults in March 1993 concerning their views on separating auto emissions testing centers from auto repair centers and other views on the amount of time which is reasonable for such testing.

Primary Conclusions: When asked, "In some states, specialized testing centers are established to provide the emission inspection service. These facilities are prohibited by law from performing repairs. If your car fails, repairs are performed by the mechanic of your choice and not the inspection facility. Is the separation of emissions testing and repairs a good idea or a bad idea?" eight in ten vehicle owners surveyed believed the separation of emissions testing and repair is a good idea. When asked, "Do you think that for cars who fail an emissions test this separation of emissions testing from repairs helps insure that any car repairs made are necessary and done correctly or not?" seven in ten vehicle owners felt separation of testing centers from repair facilities ensures that the repairs that are made are necessary and done correctly. Nine in ten vehicle owners believe that those who failed

emissions testing should be required to return for a free reinspection. Sixty-nine percent of those surveyed indicated that 45 minutes is a reasonable time for travel to the test site, testing, and travel home.

I/M Effectiveness With Today's Closed Loop Systems *- Haskew, Harold M., James J. Gumbleton, David P. Garrett, SAE Technical Paper 871103, Government/Industry Meeting and Exposition, Washington, D.C., May 18-21, 1987.*

Brief Description: The report analyzes the effectiveness of I/M tests (idle tests) on 1983-85 model year cars. It describes several problems with I/M testing and considers the cost effectiveness of I/M programs.

Primary Conclusions: The report concludes that for 1983-85 GM cars, the idle test is not an effective predictor of vehicles which fail the federal test procedure. Thirty to 70 percent of 1981-85 vehicles which are tested may be incorrectly identified as high-emitting vehicles because in many I/M programs vehicles are not properly preconditioned. As a result, vehicle owners are subject to inconvenience and needless expense for unnecessary repairs. The report offers recommendations for improved and more effective I/M programs through reliance on on-board auto diagnostic systems.

Passing the Test – Human Behavior and California's Smog Check Program, Air and Waste, Vol. 43 *- Lawson, Douglas R., December 1993.*

Brief Description: This report analyzes data from more than 11,000 vehicles inspected in California's random roadside surveys to assess the characteristics of vehicles that are high emitters of hydrocarbons and carbon monoxide. It also used roadside survey data to compare emission system tampering and emission system failures in areas with I/M programs against areas without such programs. The study found that tampering and overall failure rates were similar in the two areas.

Primary Conclusions: The study concluded that motorists are taking steps to pass the I/M test to run their car "clean for one day." Because the time and money proposed for future "enhancements" to I/M programs are so enormous and have not been shown to reduce emissions and to address the human behavior aspect of I/M, the report recommends that different possible I/M program designs be studied before preceding to implement a single type of enhanced I/M program.

Restructuring Smog Check *- Rand Corporation, August 23, 1993.*

Brief Description: This is a consulting report prepared by Rand staff for the California Senate Transportation Committee. The report discusses the evaluation data and research methods used in the California I/M Committee's evaluation of California's smog check program. The report also notes problems encountered in California when its I/M program operated as a test-only system. Comments are also offered on the EPA's computer-based mathematical model to estimate vehicle emissions reductions.

Primary Conclusions: In general, the report concluded that California's I/M program should be restructured, but there is no empirical evidence to require the separation of test-and-repair functions in I/M programs. A well safeguarded decentralized test-and-repair system, with rigorous state supervision, can be highly effective.

EPA Response: EPA developed a response to Rand's report. In general, EPA noted that remote sensing devices are not effective in identifying VOC and NOx emissions. Further, it notes that Rand had not demonstrated how and to what extent California's program would be improved through additional safeguards and that no combination of safeguards was likely to solve the fundamental conflict of interest inherent in test-and-repair programs.

Attitudes and Opinions Regarding Vehicle Emission Testing *- Ritter Research, September 1991.*

Brief Description: This report, sponsored by the Coalition for Safer Cleaner Vehicles, discusses the results of random telephone interviews with 1,008 adults to determine their experiences with vehicle emissions testing programs and their attitudes about centralized and decentralized testing programs. Among the items discussed in the report are consumer reaction to the separation of testing and repairs, testing fees, waiting time, and convenience. The study was carried out in five states--two with centralized I/M programs and three with decentralized programs.

Primary Conclusions: The study reported that the majority of adults surveyed who own a vehicle favor more effective vehicle testing for emissions. Seventy-four percent of those surveyed thought a $10 vehicle emission inspection fee was reasonable, but only 30 percent felt a $50 fee was reasonable. Motorists from decentralized testing programs are more apt to be inconvenienced than motorists from states with centralized programs. When asked the questions "Do you favor or oppose the separation of testing and

repairs?" and "Do you feel your interests are best protected by the separation of the emissions testing from any repairs that might be necessary?" the large majority of those surveyed, whether from states with centralized or decentralized programs, favor separation of testing and repair and believe their best interest is protected by such separation.

I/M Effectiveness as Directly Measured by Ambient CO Data *- Scherrer, Huel C. and David B. Kittelson, SAE Technical Paper Series 940302, reprinted from Global Emission Technology and Analysis (SP-1043), Detroit, Michigan, 1994.*

Brief Description: This study reports on research conducted by the University of Minnesota evaluating the effectiveness of a centralized I/M program. The study relies on direct measurements from air quality monitoring site data to consider the effectiveness of an I/M program.

Primary Conclusions: According to the research, the introduction of a centralized I/M program accounted for only 1.3 percent of the improvement in carbon monoxide (CO) levels at three area quality measurement locations in the Minneapolis-St. Paul area. A 25 to 30 percent reduction in CO levels had been expected to result from the program. Much of the improvement in air quality which occurred is attributed to new cars meeting improved emission standards.

EPA's Response: EPA responded critically to this report saying that the study is built on the false premise that without an I/M program CO emissions will eventually reduce to zero due to new car technology. According to EPA, the reduction in CO due to new car technology will level off. The EPA noted that the program which was studied is not an enhanced I/M program but a basic program. Further, EPA indicated that it has never predicted that its estimates of emission reduction would be able to be measured at individual air quality monitoring sites. EPA also reported that it and the Minnesota Pollution Control Agency (MPCA) never predicted that the I/M program would achieve a 25 to 30 percent reduction in overall CO inventory. EPA also noted the study is based on incomplete data because five air quality monitoring sites were not included.

Responding to EPA's comments, the study's authors noted that (1) claims of a 30 percent reduction were set forth in a fact sheet prepared by the MPCA for the Minnesota legislature when requesting I/M program authorization; (2) the study accurately described the I/M program and did not use the term "enhanced" program; (3) the statistical analysis used in the study does not assume that auto emissions will eventually be reduced to zero due to new car

technology and fleet turnover; and (4) the five air quality monitoring sites were not included because these sites could not provide data for both before-and-after the start of the I/M program. The researchers noted that their study is based on direct measurements of physical quantities, whereas computer models, such as EPA's computer models to estimate emissions reduction for I/M programs, are wholly dependent on formulas.

On-Road Hydrocarbon Remote Sensing in the Denver Area - *Donald H. Stedman, Yi Zhang, Gary A. Bishop, Paul L. Guenther, Stuart P. Beaton, and James E. Peterson, Environmental Science Technology, Vol. 27, No. 9, pp. 1885-1891, 1993.*

Brief Description: This study by staff from the University of Denver uses remote sensors to detect on-road motor vehicle carbon monoxide and hydrocarbon vehicle emissions in August and October 1991 at two different locations in the Denver area. The purpose of the study was to determine if there were significant differences between hydrocarbon emissions from vehicles from counties in Colorado with annual emissions testing programs and counties without such testing program. The authors did not find a significant difference between the on-road hydrocarbon emissions from vehicles participating in testing programs and vehicles not subject to such programs.

Primary Conclusions: The authors concluded that most of the vehicles had relatively low emission rates; a small percentage, regardless of their age, had extremely high rates; and the percentage increased with age because of poor maintenance and tampering.

I/M Network Type: Effects on Emission Reductions, Cost, and Convenience, Technical Information Document - *Tierney, Eugene J., EPA-AA-TSS-I/M-89-2, January 1991.*

Brief Description: This report discusses the relative effectiveness of centralized test-only and decentralized test-and-repair I/M programs. It focuses on three key issues: (1) emissions reduction effectiveness, (2) cost, and (3) convenience. The report is based on information from EPA testing programs, EPA and state audits of I/M programs, and analyses of I/M operating data.

Primary Conclusions: The overall conclusion of the report is that centralized test-only I/M programs will usually offer greater emission reduction benefits than decentralized test-and-repair I/M programs, unless the test-and-repair program makes special efforts that may border on the unreasonable. The report also concludes that greater benefit can be achieved at a lower cost and

with limited inconvenience to the motorist through centralized test-only programs. These advantages dovetail with trends in I/M technology, which all point in the direction of increased sophistication, leading to higher cost unless economies of scale can be achieved.

I/M Costs, Benefits, and Impacts - *United States Environmental Protection Agency, November 1992.*

Brief Description: This report provides the technical background information which EPA used to assess the cost and benefits of enhanced I/M programs compared to basic I/M programs. It includes information from recent research on test procedures and vehicle emissions, the basis for the EPA computer models used to establish emissions benefits and program cost effectiveness, information on the differences in cost effectiveness among programs based on differences in network and test type, projections for average per vehicle cost for inspection and repair, and the cost offset of the fuel economy benefit achieved by making such repairs.

Primary Conclusions: The EPA concluded that the IM240 test results showed good correlation with federal test procedures for prototype vehicles and that overall benefits such as improved fuel economy would more than offset the cost of additional repairs. However, the EPA did not rule out the possibility that alternative tests, particularly shorter transient tests, might prove equally effective.

Quantitative Assessments of Test-Only and Test-and-Repair I/M Programs - *United States Environmental Protection Agency, EPA-AA-EPSD-I/M-93-1, November 1993.*

Brief Description: This report discusses EPA data and other survey data which serve as the basis for EPA's conclusion that test-only I/M programs are 50 percent more effective than test-and-repair programs.

Primary Conclusions: The report concludes that EPA reached its decision concerning test-and-repair program effectiveness by using quantitative data from over 10,000 covert audits. Moreover, several recent studies carried out by states confirm its decision.

Air Pollution, Progress and Problems in Implementing Selected Aspects of the Clean Air Act Amendments of 1990 - *United States General Accounting Office Statement of J. Dexter Peach, Assistant Comptroller General, GAO/T-RCED-94-68, October 29, 1993.*

Brief Description: This report discusses several of the unresolved issues concerning EPA's I/M program requirements, including the issue of the relative effectiveness of test-only and test-and-repair I/M programs. The report notes that many states report adopting a test-only I/M program because of EPA's 50 percent reduction in emissions credits for test-and-repair programs.

Primary Conclusions: According to the GAO, the key issue concerning the high-tech test which EPA is requiring in enhanced I/M programs "is that EPA has not satisfactorily demonstrated its high-tech testing program in any real-world setting and that great uncertainty still surrounds the program's cost and effectiveness." GAO concluded that the available information provides qualitative support for EPA's position that test-and-repair programs have in the past been less effective, but it does not provide quantifiable support for a 50 percent reduction. According to the GAO, covert audits of centralized programs also show that they fail to identify noncomplying vehicles and there are many limitations in the methodologies used in the studies cited by EPA. The GAO based its conclusion on the following information:

Basis for EPA's Position: The EPA officials informed the GAO that there were two studies which first established that decentralized programs were less effective than centralized programs in identifying vehicles which had their emissions systems tampered with. They were:

- A 1982 EPA study of pollution control tampering in ten cities involving 2,885 vehicles which found the lowest rate of tampering occurred in the only city with both an anti-tampering and a centralized emissions testing I/M program (Portland, Oregon). All of the programs included in this study did not do tailpipe emissions testing.

- A 1985 California study of 595 vehicles with defective emission controls which found that many problems were missed at test-and-repair stations. For example, only 25 percent of the vehicles with tampered PCU valves were identified.

EPA believes that information from state audits of I/M emissions testing programs and results from three recent studies confirm its position. These recent studies include:

- A 1990 study by the New York Department of Motor Vehicles of New York's decentralized program

Appendix L (Continued)

- A 1993 audit of Missouri's decentralized program

- A 1993 study of California's decentralized program

EPA started covert audits of I/M programs in 1989. As of October 1993, EPA and states had conducted covert audits in 17 decentralized and 8 centralized programs.

Based on its review of the above studies, the GAO reported the following:

Few Vehicles Tested During Covert Audits: The GAO noted that few vehicles were tested during these audits. For example, only 1 vehicle was tested in 9 covert station audits in Arizona, 5 vehicles were tested in 5 covert station audits in Maryland, and an unknown number of vehicles were tested in 13 covert station audits in New Jersey.

Covert Audit Data Show Centralized Programs Do Not Always Properly Identify Noncomplying Vehicles: According to the GAO, the covert audits available to it from EPA indicate that both decentralized and centralized programs fail to identify noncomplying vehicles. For example, EPA and states have found improper visual testing (e.g., failure to check for a catalyst) and improper emissions testing (e.g., substituting data from a clean vehicle to pass another vehicle) in centralized programs. In Arizona, Maryland, and New Jersey, for example (where only a small number of tests were completed), inspectors at centralized program sites failed to identify noncomplying vehicles 11 percent, 40 percent, and 69 percent of the time, respectively.

Study Methods Are Problematic: GAO noted some of the following specific problems with the methodologies in the studies cited by EPA as a basis for its decision:

- The 1982 Anti-Tampering Study in Ten Cities: The study's selection approach was subject to bias. Vehicles were selected differently in each city, and there was a wide range of participation rates from one city to another. In some cases, participant motorists volunteered, others were selected at a state parking lot, while others were chosen at I/M testing facilities. The percent of participation varied from 1 percent to 44 percent at different locations. Because of this, EPA could not make unbiased estimates of the effectiveness rates of the I/M programs in these cities or project these results nationwide.

According to the GAO, EPA agreed that the 1982 tampering survey data may be biased because of, among other things, the sampling approach used.

- The 1990 New York Study: The sample consisted of only 13 vehicles. According to the GAO, assuming that this was a valid statistical sample, the expected effectiveness rate would have had a very high variability ranging from between 27 and 80 percent, at a 95 percent confidence level.

- The 1993 Missouri Audit: The sample consisted of only 38 vehicles. Again assuming this was a valid statistical sample, the expected effectiveness rate would have a very high variability, ranging between 51 and 79 percent calculated at a 95 percent confidence level.

- The 1993 California Study: This study reports on improper visual checks under the hood for anti-tampering checks. Under-the-hood anti-tampering checks are not currently required in EPA's enhanced I/M program regulations. They do not specifically report on problems in tailpipe emissions testing.

- Adjustments Made by EPA to Initial Improper Testing Rates: In reporting overall effectiveness rates to Congress based on state studies, EPA adjusted these rates downward to account for retesting. For example, in the case of Missouri, the state initially identified 66 percent of the noncomplying vehicles and failed to identify 34 percent. To account for retesting, EPA adjusted the 66 percent downward to arrive at an overall effectiveness rate of 44 percent for Missouri. EPA acknowledged to the GAO that it has no hard data to support its assumption that retest failure rates are comparable to initial failure rates. Moreover, in all cases, the states were not able to identify all of the noncomplying vehicles that EPA assumed would be identified under a centralized program. State officials in New York and California noted that cheating by inspectors occurs as a result of conflict of interest. However, their information did not quantify the extent of such cheating.

EPA Response: The EPA noted there is a body of quantitative data on the emission reduction effectiveness of test-only and test-and-repair programs. EPA also stated that it had used a few of the studies discussed by the GAO in different ways than the GAO reported. No comments were provided concerning the specific study limitations identified by GAO.

Appendix L (Continued)

Air Pollution, Unresolved Issues May Hamper Success of EPA's Proposed Emissions Program - *United States General Accounting Office, GAO-RCED-92-288, September 1992.*

Brief Description: This report includes GAO findings on the drawbacks to the IM240 test procedure and an independent assessment of certain data included in EPA's document entitled "I/M Costs, Benefits, and Impacts."

Primary Conclusions: The report concludes that there are certain drawbacks to the IM240 test procedure. Over 25 percent of the vehicles that EPA tested using the IM240 test failed an initial test, but passed a second test, even though no repairs were made to the vehicles. Vehicles that fail the IM240 test may be more difficult to repair because of trouble diagnosing the cause of emission problems for marginal failures and mechanics not trained in emission repairs for high-technology vehicles. The report also notes that the IM240 tailpipe test results in an additional reduction of 0.4 tons of hydrocarbon emissions at a cost of $12,000 per ton, not EPA's estimate of $880 per ton. EPA's cost figure is much lower because it represents an average figure that includes both the purge and pressure test along with the tailpipe test.

EPA Response: EPA claimed the GAO did not understand the nature of emissions testing and the advantages of the IM240 test. According to EPA, the GAO also failed to report information provided by EPA concerning how to reduce failures among marginal vehicles, and the GAO did not note that there were instrumentation problems during the testing of the vehicles included in the GAO study. The EPA also identified several activities which it has carried out to provide for better repair of vehicle emission systems, reduce marginal vehicle failures, and identify alternative test procedures.

Source: Developed by LB&FC staff.

APPENDIX M

New Emissions Testing Technologies and Results of Related Research Studies

Overview of New Emissions Test Technologies

IM240

Procedure: A transient, dynamometer-based test simulating a four-minute driving cycle.

Equipment: Inertial power-absorbing dynamometer, constant volume sampler, and computerized laboratory-grade analyzers for CO, HC, and NOx.

Estimated Cost: Approximately $105,000.

Special Features: The IM240 test simulates the Federal Test Procedure for prototype vehicles and measures mass emissions (grams per mile) instead of concentrations (parts per million).

Status: Approved by the U.S. EPA for enhanced I/M programs.

Fast-Pass/Fast-Fail

Procedure: An abbreviated IM240 test using cumulative emissions to determine whether vehicles can pass or fail the IM240 test without completing the four-minute cycle.

Equipment: See IM240 above.

Estimated Cost: See IM240 cost - not separate from IM240 acquisition costs.

Special Features: The fast-pass/fast-fail algorithm test enables inspectors using IM240 equipment to begin making pass-fail decisions after 30 seconds. The U.S. EPA has estimated that the average fast test takes about 115 seconds.

Status: Developed by the U.S. EPA for enhanced I/M tests with IM240 equipment.

Acceleration Simulation Mode

Procedure: A dynamometer-based test simulating one or more driving speeds.

Equipment: Steady-state dynamometer and BAR90 analyzer with NOx bench and anamometer.

Estimated Cost: Between $30,000 and $40,000, depending on dynamometer cost.

Special Features: The ASM test procedure involves one or more loaded modes to simulate the acceleration phase of the transient IM240 test and uses concentration measurements to estimate mass emissions.

Status: Proposed by California and New Jersey as an alternative I/M test.

Repair Grade 240

Procedure: A dynamometer-based test simulating the IM240 driving cycle.

Equipment: Steady-state dynamometer, BAR90 analyzer with NOx bench, and exhaust dilution system (constant volume or variable flow).

Estimated Cost: Between $30,000 and $33,500, depending on dilution system.

Special Features: The RG240 test would enable mechanics to estimate IM240 measurements before and after working on failed vehicles.

Status: Being developed for repair shops to use in checking their work.

BAR120

Procedure: A dynamometer-based test simulating a two-minute driving cycle with loaded modes.

Equipment: Steady-state dynamometer, BAR90 analyzer with NOx bench, and exhaust dilution system (constant volume or variable flow).

Estimated Cost: Between $30,000 and $40,000, depending on dilution system and dynamometer.

Special Features: The BAR120 test combines a simulated short transient test with one or more ASM modes.

Status: Being developed by the California Bureau of Automotive Repair as an alternative I/M test procedure or a repair shop test.

Remote Sensing

Procedure: A roadside device for monitoring emissions from passing vehicles.

Equipment: Infrared detector and source, video camera, modified police radar gun, personal computer with special software, calibrators, and gas bottles.

Estimated Cost: 50 cents per monitored vehicle when used routinely.

Special Features: Remote sensing devices can identify approximately half of the passing vehicles with excessive CO emissions but are less reliable for measuring HC emissions. NOx detection capabilities are being developed.

Status: Being developed to supplement I/M programs with emissions monitoring between tests.

On-Board Diagnostics

Procedure: Built-in diagnostic system for detecting vehicle equipment problems. All new cars must have on-board diagnostic systems by 1996. OBD systems will detect problems such as cylinder misfiring, catalyst malfunctions, leaks in the evaporative control system, and problems with the oxygen sensor.

Equipment: Built into vehicle.

Estimated Cost: Included in vehicle cost.

Special Features: On-board diagnostic systems alert drivers to vehicle equipment malfunctions that may need repairs, and OBDs can be inspected during I/M tests. (Eventually OBDs could even replace transient I/M procedures, because research has shown that OBD-equipped vehicles will account for more than 90 percent of emissions by 2010.)

Status: Required for all new cars by 1996.

Descriptions and Primary Conclusions of Key Studies on New Technologies

I/M Tests and Procedures

The Evaluation of Potential I/M Tests for an Enhanced Inspection and Maintenance Program *- Ragazzi, R. and K. Nelson, Colorado Department of Health, December 1992.*

Brief Description: The purpose of this study was to evaluate the effectiveness of various I/M tests for possible use in an enhanced I/M program. The tests evaluated were the IM240, ASM2545, ASM2525, ASM5015, Road Load 35, Road Load 50, and the no-load idle and 2500 rpm tests.

Primary Conclusions: The authors concluded that the IM240 tests, both the 95-second and four-minute versions, had fewer false failures and identified significantly more vehicles with excess emissions than any steady-state test. However, the authors found that all of the dynamometer-based tests were about equally efficient at measuring evaporative canister purge.

Analysis of I/M Test Alternatives *- Klausmeier, R., Radian Corporation, Austin, Texas, April 1994.*

Brief Description: This paper evaluates alternative exhaust and evaporative system tests that can be implemented in enhanced I/M programs. EPA's IM-240 exhaust emissions test is compared with the BAR120, ASM5015, and ASM2525 exhaust emissions tests. The helium test developed by Environmental Systems Products is compared with EPA's proposed purge and pressure evaporative system tests.

Primary Conclusions: The Radian Corporation concluded that BAR120 offered the most promise as an alternative to IM240 testing but that more comparative data would be needed. In addition, the ease of using helium as a trace gas made it seem more cost-effective than the purge-and-pressure method proposed by the EPA.

Evaluation of a Four-Mode Steady-State Test With Acceleration Simulation Modes as an Alternative Inspection and Maintenance Test for Enhanced I/M Programs *- United States Environmental Protection Agency, EPA-AA-AQAB-93-01, May 11, 1993.*

Brief Description: This report provides EPA's evaluation of the effectiveness of the four-mode, steady-state ASM test compared to the IM240 test. It also contains a description of the analysis techniques used by EPA and the data included in the evaluation.

Primary Conclusions: The EPA concluded that a four-mode ASM test would not identify as many high-emitting vehicles and would produce more false failures than an IM240 test. Repairs to ASM-failed vehicles would be less effective than the repairs needed to pass an IM240 test, but more stringent ASM pass-fail criteria would increase the failure and error rates to unacceptable levels. In addition, a four-mode ASM test would take as long as an IM240 test using a fast-pass, fast-fail algorithm. The EPA concluded that the lower cost of the ASM equipment would not offset the benefits of IM240 testing.

Assessment of Acceleration Simulation Mode (ASM) Testing as an Alternative to the IM240 Transient Dynamometer Test - *California Air Resources Board, Mobile Source Division, August 1993.*

Brief Description: The California Air Resources Board evaluated two ASM tests, a 50 percent load at 15 miles per hour (ASM5015) and a 25 percent load at 25 miles per hour (ASM2525), to determine whether they would be cost-effective alternatives to the IM240 test. In addition, the Board reviewed the U.S. EPA evaluation of a four-mode ASM test as compared to the IM240 test.

Primary Conclusions: The Board concluded that the IM240 appeared to be a superior test but that the ASM tests performed well enough to serve as cost-effective alternatives. Although the IM240 identified more substandard vehicles, the additional failures tended to be marginal emitters for which repairs would have less benefit. The Board criticized the U.S. EPA study on the grounds that sampling bias and questionable statistical methods had led to erroneous conclusions. A November 1993 EPA memorandum commented on the criticisms and found fault with the sampling methods and test procedures used in the Board study.

Vehicle Emissions Reductions and Costs, A Study of Alternatives for Enhanced Inspection and Maintenance (I/M) - *Radian Corporation, DCN 91-245-116-04, December 1991.*

Brief Description: This study evaluated alternative tests to determine if they could be equivalent to EPA's IM240 high option test. The alternative tests evaluated included (1) interrogation of the on-board diagnostic system in conjunction with the existing two-speed idle test and (2) loaded-mode tests that simulate highway driving and acceleration.

Primary Conclusions: The Radian Corporation concluded that technical problems might make the IM240 test difficult to use and that the evaporative systems on some vehicles might be difficult to test using the EPA-approved method. Radian suggested that questions about the cost and inconvenience of IM240 testing obligated the EPA to investigate the potential of loaded-mode tests and on-board diagnostic systems.

Development of Improved Loaded-Mode Test Procedures for Inspection and Maintenance Programs - *Austin, Thomas C., and Larry Sherwood, SAE Technical Paper Series, 891120, Government/Industry Meeting and Exposition, Washington, D.C., May 2-4, 1989.*

Brief Description: This report discusses the Acceleration Simulation Mode (ASM) test and its ability to accurately identify vehicles with emissions in excess of the established standards.

Primary Conclusions: The authors concluded that loaded-mode tests could provide a cost-effective alternative to transient tests and that no-load tests would require a new set of standards under the California Smog Check Program. The authors recommended developing new standards for estimating mass emissions regardless of the test.

Report on the EPA/Manufacturer Cooperative I/M Testing Program *- McCargar, James A., and Lisa Mouat Sapp, Technical Report EPA-AA-EPSD-I/M-92-01, September 1992.*

Brief Description: This report analyzes how incremental repairs affected privately-owned vehicles that had failed the Michigan Auto Exhaust Testing Program. The study focused on model years 1981 through 1986. Seven manufacturers performed a series of repairs and retests on vehicles they had produced, and the EPA repaired and retested vehicles from other manufacturers. High-emitting vehicles moved into marginal or passing categories after an average of 1.5 repair steps.

Primary Conclusions: The authors concluded that repairing the most likely problem first produced the most effective results and that repairing marginal vehicles produced negligible reductions in emissions. In addition, they concluded that second-chance I/M tests reduced the likelihood of unnecessary repairs to normal emitters without greatly increasing the likelihood that high emitters would pass.

Remote Sensing Devices

Remote Monitoring of High Tailpipe Emissions from On-Road Gasoline Vehicles with a Low Incidence of False Failures *- Smith, Dennis L., and Peter M. McClintock, SAE Technical Paper Series 922313, International Fuels and Lubricants Meeting and Exposition, San Francisco, California, October 19-22, 1992.*

Brief Description: This paper analyzes three studies of remote sensing devices to determine their usefulness in identifying gross-polluting vehicles.

Primary Conclusions: The authors concluded that remote devices could identify over 40 percent of the repairable carbon monoxide emissions. They also

could help identify polluting vehicles not detected by I/M programs without greatly increasing the false failure rates. The authors noted that the false failure rates calculated in previous studies had led to unnecessary concern about inconveniencing drivers.

Provo Pollution Prevention Program, A Pilot Study of the Cost Effectiveness of an On-Road Vehicle Emissions Reduction Program - *Stedman, Donald H., Gary A. Bishop, James E. Peterson, and Theresa Hosick, University of Denver, January 15, 1993.*

Brief Discussion: This report discusses a pilot program which used on-road remote sensing at two locations to identify gross polluting vehicles. Owners of gross polluting vehicles at one location were solicited for a free repair program. The gross polluting vehicles at the second location were used as a control group.

Primary Conclusions: The authors concluded that, by identifying 47 of the worst-polluting vehicles in a fleet of 7,160 and having them repaired, they had removed more pollutants from the air than the 2,500 best vehicles were emitting. They estimated the cost effectiveness of a large-scale program as $200 per ton of reduced emissions and concluded that the program would pay for itself through improved fuel economy. However, the authors noted that some of the 47 vehicles had excessive repairs done because mechanics diagnosed the problem incorrectly or used the wrong equipment to check their work.

Evaluation of a Remote Sensing Device at a Centralized I/M Lane - *Whitney, Kevin A., and Edward L. Glover, SAE Technical Paper Series 922315 (1992).*

Brief Description: This paper reports on the use of a remote sensing device to measure the emissions from vehicles entering and leaving an Arizona I/M center conducting a steady-state dynamometer test.

Primary Conclusions: The authors concluded that, although remote sensing could not identify enough polluting vehicles to replace periodic I/M testing, it could identify enough gross polluters to supplement an I/M program. The authors found that the remote technology was ineffective for emissions other than carbon monoxide.

Identifying Excess Emitters with a Remote Sensing Device: A Preliminary Analysis - *Glover, Edward L., and William B. Clemmens, SAE Technical Paper Series 911672 (1991).*

Brief Description: This paper reports on the use of a remote-sensing device to measure carbon monoxide and, in some cases, hydrocarbon emitted by vehicles leaving a centralized test-only site in Indiana. The study used IM240 results to compare emissions measured by the remote device and a standard, two-speed test.

Primary Conclusions: The authors concluded that, although the remote device identified only a small fraction of the vehicles emitting high amounts of carbon monoxide, it might have value for randomly checking vehicles between I/M tests. More stringent cutpoints gave results comparable to the two-speed test but produced more false failures.

Evaluation of the Stedman (FEAT) Vehicle Emissions Sensing System - *Elliott, D., C. Kaskavaltizis, T. Topaloglu, SAE Technical Paper Series 922314, International Fuels and Lubricants Meeting and Exposition, San Francisco, California, October 19-22, 1992.*

Brief Description: This study evaluated a remote sensing system to determine how well it could identify vehicles that would fail standard Canadian emissions tests.

Primary Conclusions: The authors concluded that remote sensing could identify pre-1988 vehicles with heavy carbon monoxide emissions and that such vehicles would account for 50 percent of all such emissions. However, the authors cautioned against using the system to identify newer vehicles and suggested that it might serve better to estimate overall fleet emissions than identify specific out-of-compliance vehicles on the basis of a single reading.

Source: Developed by LB&FC staff.

APPENDIX N

Agency Response to This Report

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
HARRISBURG, PENNSYLVANIA 17120

OFFICE OF
SECRETARY OF TRANSPORTATION

June 28, 1994

Phillip R. Durgin
Executive Director
Legislative Budget and Finance Committee
400 Finance Building
Harrisburg, PA 17105-8737

Dear Mr. Durgin: Phil

Thank you for the opportunity to review and comment on the draft final report regarding the Commonwealth's enhanced Emissions Inspection/Maintenance program. You and your staff have obviously put a great deal of time and effort into an analysis of a complicated subject which has a great impact on our ability to attain air quality standards.

I will be attending the public meeting on June 29, 1994 at 9:00 AM , Room E8B of the Capitol. With me will be John Heaton, Chief Counsel, Mario Pirritano, Deputy Secretary for Safety Administration, and David Ori, manager of the Vehicle Control Division.

Sincerely,

Howard

Howard Yerusalim, P.E.
Secretary of Transportation

cc: Parker Williams
Mario Pirritano
Larry King
John Heaton
Robert Mustin
James McCarron
Audrey Miner
David Ori
Martin Shortall

Legislative Budget and Finance Committee

Final Report on Pennsylvania's Enhanced Vehicle Emissions Inspection Program

Report Presentation by Bob Frymoyer at the June 29, 1994, Meeting

Good morning. We are here today to present our final report on Pennsylvania's enhanced vehicle emissions inspection program as called for by Senate Resolution 116. Two weeks ago we issued a preliminary report on this topic that addressed three of the study's seven objectives. Briefly, that report found that Pennsylvania is required under federal law to implement an enhanced emissions inspections and maintenance, or I/M, program in 25 counties and that EPA regulations and potential sanctions have made it difficult for states to implement a program other than the EPA's preferred centralized test-only program. The preliminary report also describes the California hybrid program, in which some cars can go to decentralized test-and-repair facilities, and the efforts underway in New Jersey, Georgia, and Virginia to develop other types of hybrid or test-and-repair programs.

Today's report addresses the remaining four study objectives: the advantages and disadvantages of test-only versus test-and-repair programs; the conclusions of recent studies on enhanced I/M programs and related new technologies; the costs incurred to date by Envirotest Systems, the contractor responsible for implementing Pennsylvania's I/M program; and, fourth, the options available to the General Assembly at this time.

Advantages and Disadvantages of Various Program Approaches

A major portion of the report addresses the advantages and disadvantages of test-only, hybrid, and test-and-repair approaches to an enhanced emissions inspection

program. We found one advantage of Pennsylvania's centralized test-only approach is the relatively low cost to the state for administration and oversight of the program. PennDOT believes it can administer the test-only program for about $1.9 million dollars annually. While we believe this estimate may be somewhat low, we agree that the cost to administer a hybrid program that includes test-and-repair stations would be much higher. We estimated that state costs to administer a hybrid program might range from $7.5 to $12 million annually. Much of this additional expense in a potential hybrid program would be due to the overt and covert audits required by EPA regulations. Under a hybrid program, there would be many more test facilities and inspectors, so audit costs would be higher.

Motorist convenience is a key concern of all parties. Convenience involves several factors, including test frequency, cost, driving and waiting times, and the number of trips between testing facilities and repair stations to pass the emissions test. Pennsylvania's planned program is a biennial program, meaning that vehicles are tested once every two years. If Pennsylvania were to change to a hybrid or test-and-repair program, at least some vehicles might need to be tested annually. While California's hybrid program requires only biennial testing, the hybrid program Georgia has proposed requires annual testing, involving additional costs and inconvenience to motorists.

Waiting time is another major factor affecting motorist convenience. The I/M240 emissions test can be done in about 13 to 14 minutes. This procedure involves cars moving through three positions, the longest of which takes about five minutes. Because a car can be at each of these three positions, three cars can be undergoing some phase of the test at the same time. The EPA believes I/M240 lanes can test up to 12 vehicles per hour, or 15 per hour using a Fast Pass/Fast Fail algorithm.

Envirotest believes its lanes can test 13 or more cars per hour, a figure it says it has verified at its high-throughput lane in Wisconsin. Envirotest reports that, nationally, the waiting time before beginning an I/M240 test averages 6 minutes and that in its Minnesota, Wisconsin, and Ohio programs, 95 percent of motorists wait less than 15 minutes to be tested.

We reviewed the Envirotest contract to determine its contractual obligations if waiting times should become excessive. The contract requires Envirotest to build its stations with the capability to expand to accommodate an annual vehicle growth of 2.5 percent. Envirotest reported that it is building its initial facilities with enough lanes to meet this growth requirement and that each station also has the capacity to add at least one more lane. In the report we note that, regardless of its contractual obligations, Envirotest may have an economic incentive to build additional lanes or stations if waiting times become excessive because Envirotest can be fined up to $600 per day for every lane that exceeds certain specified waiting times.

Test-and-repair proponents cite the "ping-pong" effect as a major shortcoming of test-only programs. Ping-ponging refers to the need for a vehicle to be tested at the test-only facility, driven to a repair garage if it fails the test, and then driven back to the test facility for a retest. If the vehicle fails the retest, this cycle has to be repeated. The EPA acknowledges this potential problem, but believes improved training of repair technicians will reduce some of the inconvenience because proper repairs will assure that fewer vehicles will fail the retest, and our report describes PennDOT's efforts to meet EPA mandates in this area. We also note that some repair facilities may offer to have someone from the garage take the car to the test facility so the vehicle owner would not have to make additional trips.

We concluded that the approach most convenient to motorists may, in the final analysis, depend largely on an individual's circumstances and preferences. A motorist who lives near a test facility, avoids peak time, and owns a car that is likely to pass the test may see test-only programs as more convenient and offering greater objectivity. Others, particularly if they have a repair garage they trust or anticipate a bad experience with the ping-pong effect, may prefer the test-and-repair approach.

Other factors, such as test fees and the program's impact on economic development, health, and clean air, may not vary much between a test-only, hybrid, or completely test-and-repair approach. For example, although economies of scale would suggest that test fees should be lower in a high volume test-only program, some states, such as Georgia ($25) and Virginia ($20), have statutorily capped the fees test-and-repair facilities can charge. Also, in a hybrid program market competition may force test-and-repair facilities to keep test fees below their actual costs.

Any enhanced I/M program that EPA would approve must meet certain minimum federal performance standards independent of any other air pollution reduction strategies. Importantly, however, Pennsylvania law requires that the I/M program cannot exceed minimum federal requirements. Therefore, the type of I/M program Pennsylvania undertakes would probably have little impact on industry or other economic development efforts. Similarly, the impact on citizen health or the quality of air in the Commonwealth would not vary significantly because all enhanced I/M approaches must meet these same standards.

Costs Incurred Under the Envirotest Contract

Section III of our report shows costs incurred to date through PennDOT's I/M contractor. In November 1993, the Pennsylvania Department of Transportation contracted with Envirotest Systems, a firm based in Tucson, Arizona, to implement the state's enhanced I/M program. The contract calls for Envirotest to build and operate 86 test-only stations throughout the 25 counties required to have an I/M program. As of the end of last week, Envirotest reported that it had purchased the land for 24 of these sites and 53 more were under purchase agreement. Envirotest also told us they have begun construction at 11 sites and anticipate the first station will be completed in mid-July. Just yesterday, Envirotest told us construction had begun at 20 sites. Envirotest is financing the cost of building these facilities, which it will eventually recoup through the test fee charged to motorists when they get their vehicles inspected.

As of May 31, 1994, Envirotest reported having incurred expenditures of $16.3 million, with an additional $105.1 million in commitments. This does not include anticipated expenditures of $11.9 million for June, which brings the total to $133.3 million in expenditures and commitments as of June 30. We reviewed these figures (through June 15) and believe them to be reasonably accurate. However, the $105 million in commitments is for goods and services under contractual obligation but not yet received. If the Envirotest contract were to be terminated, Envirotest and its vendors would need to make reasonable efforts to mitigate their damages for these expenditures and commitments.

Envirotest also believes that, if the contract were terminated, it would be owed an additional $221.4 million for demobilization costs, lost profits, and loss of business

value. All totaled, Envirotest believes it would be entitled to about $355 million in reimbursements: $133.4 million for expenditures and commitments, and $221.4 million in termination costs and damages. We reviewed the termination clause of the Envirotest contract to assess the Commonwealth's likely liability for these costs if the contract were terminated. The contract's termination clause is not clear, but provides that in the event the Commonwealth terminates the contract as a result of a change in law or regulation, the Commonwealth would request the Legislature to appropriate to Envirotest equitable compensation for "capital costs and other appropriate expenditures." However, Envirotest could pursue reimbursement for other costs and damages, such as lost profits, through the Board of Claims or in court. I should add that this is our reading of the contract, and other parties may have a different opinion.

Options Available to the General Assembly

The last section of the report addresses the options available to the General Assembly. The first option is to proceed with the planned centralized test-only program. This option involves the least administrative and oversight costs for the state and would avoid sanctions, citizen lawsuits, and Envirotest contract termination costs.

The second option is for the General Assembly to pass legislation that would void the I/M plan the state submitted to the EPA last November. This, however, would likely subject the Commonwealth to EPA sanctions, citizen lawsuits, and contract termination costs.

The third option is to pass legislation requiring the Department of Transportation to revise its I/M plan once it is approved by the EPA to allow at least some vehicles to

go to test-and-repair stations. Such revisions are permitted under federal law, so long as during this period Pennsylvania would be legitimately proceeding to implement the plan already approved by the EPA. This approach would allow Pennsylvania to take advantage of work being done in California, Georgia, and Virginia, without risking sanctions. However, unless Envirotest agreed to a contract amendment, which appears unlikely, the Commonwealth might be liable for contract termination costs. Even if Envirotest agreed to a contract amendment, the RFP process itself may need to be redone because the I/M program's characteristics might be considered to be significantly different than those originally bid.

We would again like to express our appreciation to the Department of Transportation, especially Secretary Yerusalim, the Department of Environmental Resources, the U.S. EPA, and the many other organizations and persons who have assisted us in this project. Thank you.

FACT SHEET

LB&FC Final Report

Pennsylvania's Enhanced Vehicle Emissions Inspection Program

The June 15 preliminary report addressed three of the seven objectives cited in SR 116: (1) the federal Clean Air Act requirements, (2) a discussion of PA's enhanced I/M program, and (3) approaches to enhanced I/M in other states. This final report includes information on these objectives and addresses the remaining four objectives: (4) costs incurred under the Envirotest contract, (5) advantages and disadvantages of test-only and test-and-repair programs, (6) recent studies of enhanced I/M programs and new technologies, and (7) options available to the General Assembly. This sheet addresses objectives 4 to 7.

Costs Incurred Under the Envirotest Contract (pp. 33-35 and pp. 84-87)**:** Envirotest Systems, PennDOT's contractor for the enhanced I/M program, reports expenditures of $16.3 million and commitments of $105.1 million as of 5/31/94. These costs, together with anticipated expenditures of $11.9 million in June, total $133.3 million. However, much of the $133.3 million is for goods and services not yet delivered and, if the contract were terminated, Envirotest and its vendors would need to make reasonable attempts to mitigate their damages. If the contract were terminated, Envirotest believes it would be owed an additional $221.4 million in termination costs and damages, for a total of $354.6 million. As of 6/24, Envirotest reported owning 24 sites with 53 more under purchase agreement and having begun construction at 11 sites.

Pros and Cons of Test-Only and Test-and-Repair Approaches (pp. 54-82)**:** Centralized test-only programs have relatively low state administrative and oversight costs. PennDOT estimates the test-only program will cost about $1.9 million to administer, $300,000 more than for the basic I/M program. PennDOT's estimates may be low, but we agree that state costs to administer a hybrid program would be higher than for a test-only program possibly about $7.5 million.

Motorist convenience is a major concern of all parties. Convenience involves several factors: test frequency, cost, driving distance, waiting time, and ping-ponging. Pennsylvania's test-only program is biennial: vehicles are tested once every two years. A hybrid program (e.g., Georgia) might involve annual testing potentially adding inconvenience and expense to motorists. Reducing the ping-pong effect--multiple trips between a test site and a repair facility--is an advantage of a test-and-repair approach, but test-and-repair programs have inherent conflicts of interest that can undermine the program's effectiveness. Waiting times might be less under a test-and-repair program, but we concluded that the approach most convenient to motorists will depend largely upon individual circumstances, such as the proximity of a test facility, the vehicle's condition, and the motorist's trust in his or her mechanic.

Although economies of scale can keep test fees low in a centralized test-only program, statutory caps and market competition can force test fees to be comparable in test-and-repair programs. The type of I/M program PA adopts, as long as sanctions are avoided, would have little effect on economic development, health, or air quality because they all must meet, and by PA law cannot exceed, EPA minimum standards.

Recent Studies: Appendix L (pp. 111-127) discusses research on enhanced testing programs and Appendix M (pp. 128-135) discusses research on test technologies. These studies were considered and are cited in various sections of the report.

Options Available to the General Assembly: (1) proceed with the centralized test-only program; (2) pass legislation to void the state's I/M plan, but this would risk sanctions, lawsuits, and contract termination costs; (3) pass legislation requiring PennDOT to revise the state I/M plan, but as provided for in federal law. Option 3 would avoid sanctions and citizen law suits, but would still risk contract termination costs and could require an entire new RFP process.