The State of New Jersey
Department of Environmental Protection

Revisions to the Enhanced Inspection and Maintenance (I/M) Program for the State of New Jersey

Elimination of Tailpipe Testing and Other I/M Program Changes

I/M Program Modeling and USEPA Performance Standard Modeling

SIP Revision

May, 2016

Preface

This document is a revision to the State of New Jersey's Inspection and Maintenance (I/M) program State Implementation Plan (SIP). Specifically, this document provides the United States Environmental Protection Agency (USEPA) with documentation on the emission impacts that will result from proposed changes to New Jersey's enhanced I/M program. The proposed changes to New Jersey's I/M program are primarily the discontinuation of tailpipe and gas cap leak testing.

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Acronyms and Abbreviations

ASM	Acceleration Simulation Mode
CAA	Clean Air Act
CIF	Centralized Inspection Facility
CO	Carbon Monoxide
EGR	Exhaust Gas Recirculation
Fed. Reg.	Federal Register
gpm	Grams Per Mile
HC	Hydrocarbons
HDGV	Heavy Duty Gasoline Vehicle
I/M	Inspection and Maintenance
LDGT	Light Duty Gasoline Truck
LDGV	Light Duty Gasoline Vehicle
LEV	Low Emission Vehicle
MY	Model Year
NAAQS	National Ambient Air Quality Standards
NHSDA	National Highway System Designation Act
NJDEP	New Jersey Department of Environmental Protection
NJLEV	New Jersey Low Emission Vehicle Program
NJMVC	New Jersey Motor Vehicle Commission
NJDOT	New Jersey Department of Transportation
NO_x	Nitrogen Oxides
OBD	On-Board Diagnostics
OTR	Ozone Transport Region
PCV	Positive Crankcase Ventilation
PIF	Private Inspection Facility
ppm	Parts Per Million
psi	Pounds Per Square Inch
ROP	Rate of Progress
RPM	Revolutions Per Minute
RVP	Reid Vapor Pressure
SIP	State Implementation Plan
TSI	Two-Speed Idle
USEPA	United States Environmental Protection Agency
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds
ZEV	Zero Emission Vehicle

Executive Summary

This document is a revision to the State of New Jersey's Inspection and Maintenance (I/M) program State Implementation Plan (SIP) reflecting proposed rule changes to the program. The changes are the discontinuation of: two-speed idle tests on model year 1981-1995 light duty gasoline vehicles, idle tests on pre-1981 model year light duty gasoline vehicles, idle tests on heavy duty gasoline vehicles, and gas cap leak testing. To replace the emission benefit losses from these I/M program changes, New Jersey allocates a portion of the emission benefits from the New Jersey Low Emission Vehicle Program (NJLEV)[1].

In order to make changes to it's I/M program New Jersey must make the following two demonstrations:

- First, the USEPA I/M Performance Standard test must be passed. The USEPA Performance Standard test requires the calculation of the following three MOVES2014 inventories or cases: no I/M program, proposed I/M program, and performance standard I/M program. The USEPA Performance Standard test is passed if the emissions of the proposed I/M program case are less than the emissions of the performance standard I/M program case.

- Second, it must be demonstrated that the changes to the I/M program will not interfere with the State's ability to attain or maintain any National Ambient Air Quality Standards (NAAQSs). This will be demonstrated by quantifying the difference in emission reductions between the original I/M program and the proposed I/M program and offsetting any shortfall through new, previously unclaimed and contemporaneous emission reductions. The shortfall is calculated by running the MOVES2014 model for both the original and proposed I/M programs for the evaluation year. The differences in emissions between these two cases are the emissions shortfall. The emission benefits in the evaluation year are estimated by running the MOVES2014 model with and without the model inputs that represent the NJLEV program. The differences in emissions between these cases represent the emission benefits of the NJLEV program. These emission benefits must be equal to or larger than the emission benefit losses from the I/M program changes.

The I/M Performance Standard demonstration shows that the State's proposed I/M program continues to meet the USEPA I/M Performance Standard. In addition, the proposed changes to the I/M program do not compromise the State's efforts to meet and/or maintain NAAQSs for ozone or carbon monoxide.

[1] P.L 2003, c.266 (c.26:2C-8.15 et al.) The New Jersey Low Emission Vehicle (NJLEV) Program, which consists of the adoption of the California Low Emission Vehicle Program including the Zero Emission Vehicle Mandate.

I. Introduction

A. Background

In accordance with the requirements of the Clean Air Act (CAA), the State of New Jersey implemented an enhanced Inspection and Maintenance (I/M) program on December 13, 1999. The implementation of this program continues to be an integral part of New Jersey's plan to attain and maintain compliance with the health-based National Ambient Air Quality Standards (NAAQSs) for ozone and for carbon monoxide. Reducing the emissions of carbon monoxide, as well as emissions of volatile organic compounds (VOCs) and nitrogen oxides (NO_x) (precursors to ozone formation), will help the State in its efforts to improve its air quality and protect the health and welfare of its citizens.

New Jersey's enhanced I/M program design is a hybrid network system that consists of both centralized (test-only) and decentralized (test-and-repair) facilities. A private contractor to the State operates the centralized portion of the inspection network which consists of a network of Centralized Inspection Facilities (CIFs). The decentralized network is comprised of over 1,000 Private Inspection Facilities (PIFs) that are privately owned and operated, and licensed by the New Jersey Motor Vehicle Commission (NJMVC) to perform vehicle inspections on behalf of the State. This hybrid network design gives motorists a choice as to where to have their vehicles inspected.

B. Purpose

This document revises the State of New Jersey's enhanced Inspection and Maintenance (I/M) State Implementation Plan (SIP) to reflect proposed rule changes to the program. The changes include the discontinuation of: two-speed idle tests on model year 1981-1995 light duty gasoline vehicles, idle tests on pre-1981 model year light duty gasoline vehicles, idle tests on heavy duty gasoline vehicles, and gas cap leak testing. Heavy duty gasoline vehicles equipped with OBD will be subject to OBD testing. In addition, the changes include a requirement that inspections of commercial vehicles, as well as, re-inspections of all vehicles must be performed at New Jersey's decentralized I/M facilities. This SIP revision includes emission modeling that quantifies the impacts of the program changes including a comparison to the USEPA performance standard. The goal of this SIP revision is to demonstrate that New Jersey's enhanced I/M program continues to meet the USEPA I/M performance standard after the changes to the I/M program are implemented. It will also demonstrate that the I/M program changes do not compromise the State's efforts to meet and/or maintain National Ambient Air Quality Standards (NAAQSs) for ozone or carbon monoxide. A complete history of New Jersey's I/M SIP is provided in Appendix I.

II. USEPA I/M Performance Standard Modeling and I/M Program Benefits Modeling

A. Background

As part of its final rule for Inspection and Maintenance (I/M) requirements, the USEPA established "model" programs for areas that were required to implement I/M programs. The model programs are termed by the USEPA as the "I/M performance standards" and are defined by a specific set of program elements.[2] The purpose of the performance standard is to provide a gauge by which the USEPA can evaluate the adequacy and effectiveness of each state's I/M program. As such, states are required to demonstrate that their I/M programs achieve applicable area-wide emission levels for the pollutants of interest that are equal to, or lower than, those which would be realized by the implementation of the model program. The USEPA also allows for a margin of error in determining compliance with the performance standard.[3]

Originally, the USEPA only designed one enhanced I/M performance standard, as specified at 40 C.F.R. §51.351, and required all enhanced I/M program areas to meet or exceed that standard. However, on September 18, 1995, the USEPA promulgated the alternate low enhanced performance standard.[4, 5] The alternate low enhanced performance standard is a less stringent enhanced I/M performance standard established for those areas that have an approved SIP for Rate of Progress (ROP) for 1996, and do not have a disapproved plan for ROP for the period after 1996 or a disapproved plan for attainment of the air quality standards for ozone or carbon monoxide.[6]

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[2] 40 C.F.R. §51.351.

[3] 40 C.F.R. §51.351(g)(13).

[4] 60 Fed. Reg. 48029 (September 18, 1995).

[5] On July 19, 1996, the USEPA established an additional enhanced I/M performance standard for qualified areas in the Northeast Ozone Transport Region (OTR), often referred to as the OTR low enhanced performance standard. The emission reduction targets for the OTR low enhanced performance standard are less than both the low enhanced performance standard and the basic performance standard. The USEPA established two criteria that areas have to meet in order to be eligible for the OTR low enhanced performance standard: 1) the standard applies only in attainment areas, marginal ozone non-attainment areas and certain moderate ozone non-attainment areas with populations under 200,000 in an OTR; and, 2) the standard program must be supplemented by other measures in order to achieve emission reductions equal to or greater than that which would have occurred had a regular low enhanced I/M program been implemented. Although New Jersey is currently required to meet the low enhanced performance standard, New Jersey did not meet the criteria to qualify for use of the OTR low enhanced performance standard.

[6] 40 C.F.R. §51.351(g).

New Jersey is currently demonstrating compliance with the Clean Air Act requirements for ROP and does not have a disapproved attainment plan and therefore is only required to meet the alternate low enhanced performance standard. The USEPA I/M performance standard modeling included as part of this submittal is intended to show attainment of the alternate low enhanced performance standard.

New Jersey was required to implement its enhanced I/M program because of its non-attainment status for two criteria air pollutants; ozone (of which volatile organic compounds (VOCs) and nitrogen oxides (NO_x) are precursors) and carbon monoxide. The USEPA's final rule on I/M requirements also requires that the equivalency of the emission levels achieved by the State's enhanced I/M program design compared to those of the performance standard must be demonstrated using the most current version of USEPA's mobile source emission model.[7] The latest USEPA mobile source emission model is MOVES2014, which was used for this analysis.

In January, 2014 the USEPA issued the following guidance document: "Performance Standard Modeling for New and Existing Vehicle Inspection and Maintenance (I/M) Programs Using the MOVES Mobile Source Emissions Model", EPA-420-B-14-006. This guidance includes information on how to use the USEPA MOVES model to satisfy the USEPA Performance Standard requirements. For example, it explains that the MOVES model is run to calculate emissions inventories instead of the previous methodology of running the MOBILE model to calculate emission factors to conduct performance standard and other demonstrations. It also contains the following information concerning the additional demonstration that must be performed by New Jersey in order to change I/M programs:

> "…One means of making this demonstration is by quantifying the difference in emission reductions between the original program and the proposed program and offsetting any shortfall through new, previously unclaimed and contemporaneous emission reductions. The shortfall can be quantified in much the same way that the program demonstrates that it meets the performance standard: by modeling the original and proposed programs using the most recently approved mobile source emission factor model, which is currently the MOVES model.
>
> It should be noted that areas seeking to drop tailpipe testing in favor of OBD-only testing without strengthening the program in some other way (for example, by changing the test frequency from biennial to annual, or covering more of the newer model years) will necessarily create a shortfall that will either have to be filled with reductions from non-I/M control measures for the SIP to remain

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[7] 40 C.F.R. §51.351(d).

> whole, or the program will need to make a demonstration (for example, by using photochemical grid modeling) showing that the shortfall does not prevent the area from maintaining the NAAQS for which the program was required. The program will also need to demonstrate that the shortfall will not interfere with the area's ability to meet any other relevant NAAQS."[8]

New Jersey proposes to fill the emissions benefit shortfall created by dropping tailpipe testing by using a portion of the emission benefits from the New Jersey Low Emission Vehicle Program (NJLEV). Details regarding NJLEV are provided in Table 1 and Figure 1 below. The NJLEV program was implemented beginning with the 2009 model year. The 2018 emission benefits from NJLEV meet all of the criteria delineated by the USEPA; i.e., the emission benefits are new, previously unclaimed (except for the benefits from the 2009 model year vehicles) and contemporaneous. The emissions shortfall is calculated by running the MOVES2014 model for both the original and proposed I/M programs for the evaluation year. The differences in emissions between these two cases are the emissions shortfall. The emission benefits from the NJLEV program are quantified by additional MOVES2014 2018 runs that include cases with and without the NJLEV inputs. The difference in emissions between these MOVES2014 cases represents the estimates of the NJLEV emission benefits. These new emission benefits must be equal to or larger than the emission benefit losses from the I/M program changes.

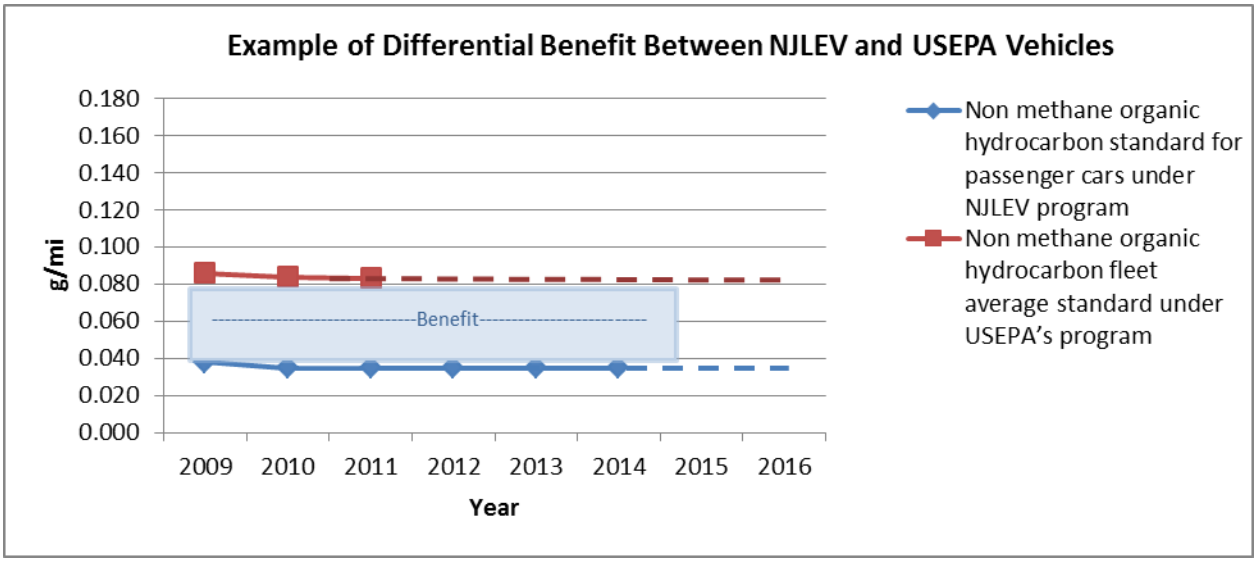
[8] http://www.epa.gov/OMS/epg/general/420b14006.pdf

Table 1: Summary of NJLEV Timeline and Emission Benefits

	2004	2006	2007 - 2008	2009	2015	2017+
MILESTONE	NJ law (N.J.S.A. P.L. 2003, c.266) passed requiring NJDEP to adopt Low Emission Vehicle (LEV) Program.	NJ LEV rules (N.J.A.C. 7:27-29) adopted establishing emission and evaporative standards more stringent than USEPA for new vehicles and instituting requirements for sale of zero emission vehicles or partial zero emission vehicles. Effective with 2009 model year.	USEPA approves SIP revision for NJLEV rules.	NJ LEV rules effective with 2009 model year.	NJ LEV rules incorporate more stringent evaporative and emission standards that are phased in beginning MY 2015.	USEPA Tier 3 standards become effective, which means NOx, VOC & formaldehyde standards are now equivalent to NJ LEV emission standards However, Federal requirements are not harmonized with the NJ ZEV program.
ENVIRONMENTAL BENEFITS AVAILABLE FOR MITIGATION	NA	NA	NA	2.3 tpd VOC+NOx from 2009 – 2018 model year vehicles meeting NJLEV rules including the ZEV requirements. These benefits continue to exist in 2017 and beyond.*		

*An additional 0.3 tpd VOC+NOx was achieved during this period but used in the Ozone Attainment Demonstration, dated October 29, 2007 and approved by USEPA in 2013, and thus not considered as mitigation in this SIP demonstration. There are also particulate matter and formaldehyde benefits occurring during this time period, but not incorporated into this SIP demonstration.

Figure 1



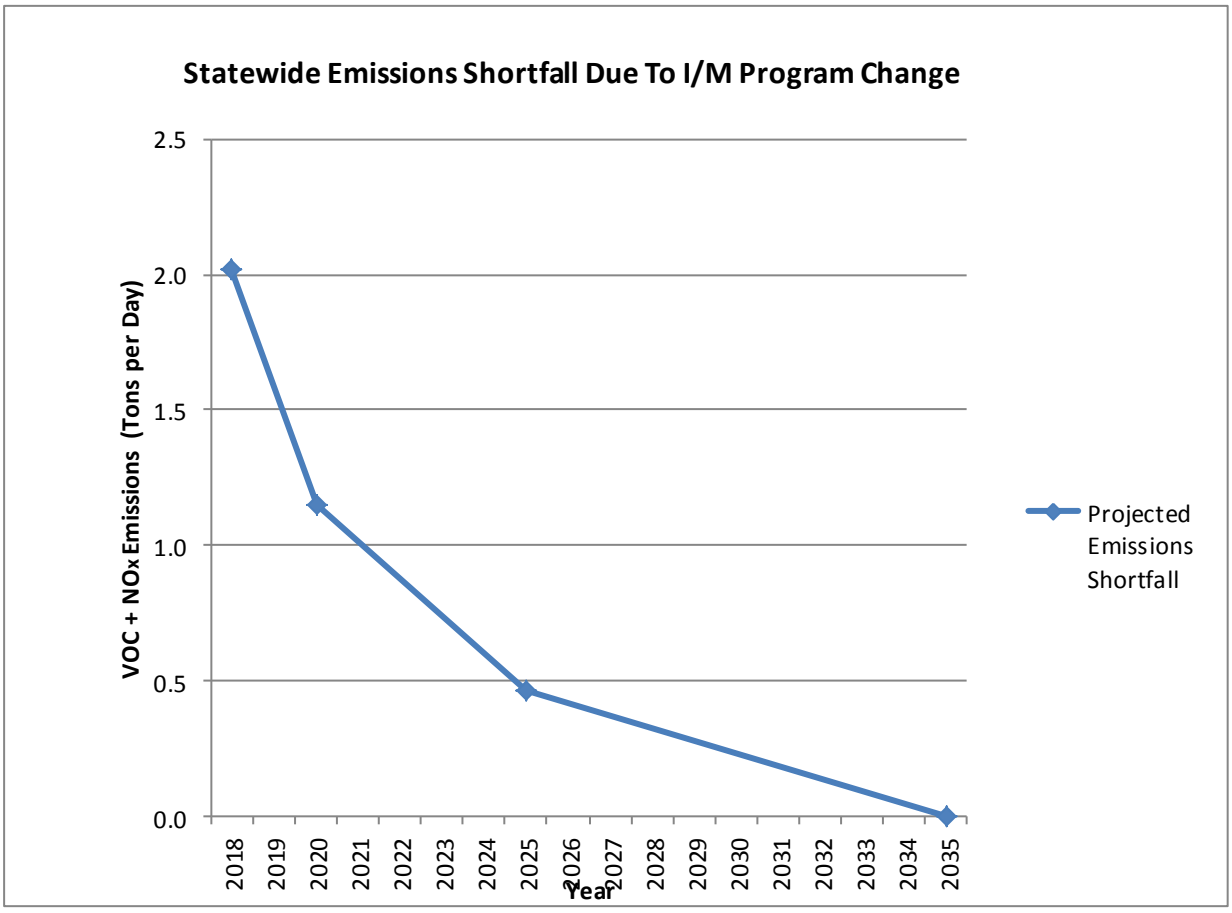
B. Additional Air Quality Improvement

New Jersey has several emission reduction strategies that will achieve emissions benefits for 2011 and future years. These strategies are not included in the SIP, but they will provide additional emission reductions by 2018, which will help ensure a greater amount of NO_x and VOC emissions reductions beyond the shortfall makeup in 2018 from the NJLEV program. The control measures and strategies that will further improve air quality are as follows:

Control of Petroleum Storage Tanks (N.J.A.C. 7:27-16.2)
Electric Generating Rule (N.J.A.C. 7:27-4.2, 10.2, 19.4)
Portable Fuel Containers (N.J.A.C. 7:27-24)
Voluntary Retrofits of Ferries (DERA/CMAQ Grants)
Phase 2 HEDD Rule for Electric Generating Units (N.J.A.C. 7:27-19.29)
Continuation of the I/M Program for Diesel Vehicles (N.J.A.C. 7:27-14)

An additional consideration is that the emission shortfall associated with the current I/M program changes peaks in 2018 and decreases in future years. This is because as the fleet ages there are fewer and fewer non-OBD equipped vehicles on the road and the dropping of tailpipe testing on these older vehicles has a decreasing impact on emissions. The following chart (Figure 2) shows a projection of the estimated shortfall:

Figure 2


Statewide Emissions Shortfall Due To I/M Program Change
VOC + NOx Emissions (Tons per Day)
2.5
2.0
1.5
1.0
0.5
0.0
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
Year
Projected Emissions Shortfall

C. Modeling Parameters and Assumptions

Modeling parameters and assumptions used to calculate emissions that represent: a no-I/M program baseline run, New Jersey's proposed new I/M program, the USEPA alternate low enhanced I/M performance standard program, New Jersey's existing I/M program and New Jersey's proposed I/M program with and without NJLEV program inputs are provided in Appendix II. MOVES runs were conducted using inventory mode for two representative counties; Middlesex County representing the northern ozone nonattainment area and Mercer County representing the southern ozone nonattainment area. Typical summer work weekday emission results (in tons per day VOC, NO_x and carbon monoxide) for the representative counties were scaled up to statewide emission estimates based on 2018 vehicle miles travelled projections for the evaluation year. Middlesex and Mercer counties were selected as representative counties based on a number of factors. First, an evaluation of New Jersey's 2011 summer day SIP inventories indicated that the statewide VOC + NOx emissions based on MOVES runs for all 21 counties were 361 tpd while the statewide VOC + NOx emissions based on the average VMT-based scale-up of Mercer and Middlesex counties was 360 tpd. This demonstrates that scaling up the VOC + NOx emissions based on VMT for a combination of these two counties is very close to the statewide value obtained by running all 21 NJ counties. Second, these two counties contain a representative mix of the various roadway types that comprise the entire state. Therefore, a combination of Middlesex and Mercer counties closely represent the entire state when VMT is used to scale VOC + NOx emissions.

In order to confirm the accuracy of the conclusions reached in this I/M SIP by using these representative counties, SIP results were calculated for the following 3 cases: both counties scaled up to statewide using VMT (this is the case in this I/M SIP), Mercer county only scaled up to statewide using VMT, and Middlesex county only scaled up to statewide using VMT. The SIP conclusions were almost exactly the same regardless of whether a single county (irrespective of which one) or two counties are used as the basis for making statewide estimates.

The evaluation year for these I/M program changes is 2018. For evaluation purposes it has been assumed that the I/M program changes take place in 2016 and that in 2018 a complete I/M cycle has been completed (because New Jersey's program is biennial) so that the resulting emission changes are fully realized.

New Jersey's enhanced I/M program is comprised of a hybrid network of both centralized test-only facilities and decentralized test-and-repair facilities. Network type is no longer part of modeling an I/M program because the difference between centralized and decentralized programs has become insignificant.[9]

9 Ibid.

C. Modeling Results

The following tables show the emissions obtained for the USEPA performance standard modeling and I/M program benefits modeling. Modeling files including MOVES input files, MOVES run specifications, MOVES input databases, MOVES output databases, and emission results files/summaries are provided in Appendix III.

Table 2: Performance Standard Modeling Results – 2018 Statewide Onroad Emissions

Model Scenario	VOC + NOx (tons/day)	Carbon Monoxide (tons/day)
New Jersey No I/M Program	163.7	935.6
New Jersey Proposed I/M Program	153.4	829.1
USEPA Low Enhanced Performance Standard	160.3	853.1
% Reduction of NJ Proposed I/M Program Relative to No I/M Program	6.3%	11.4%
% Reduction of Performance Standard Relative to No I/M Program	2.0%	8.8%

Table 3: I/M Program Benefits Modeling Results – 2018 Statewide Onroad Emissions

Model Scenario	VOC + NO_x (tons/day)	Carbon Monoxide (tons/day)
A. New Jersey Existing I/M Program Without the NJLEV Program	154.0	867.2
B. New Jersey Proposed I/M Program Without the NJLEV Program	156.0	878.6
C. New Jersey Proposed I/M Program With the NJLEV Program	153.4	829.1
D. NJLEV Benefits for 2009 Model Year That Were Claimed in a Previous Ozone Attainment Demonstration SIP	0.3	5.1
E. SIP Emission Benefits Shortfall (From I/M Program Changes) (B-A)	2.0	11.4
F. NJLEV Benefits (B-C)	2.6	49.5
G. NJLEV Benefits Not Previously Claimed (F-D)	2.3	44.4

III. Conclusion

As shown in Table 2 for all pollutants, the percent reductions for the New Jersey proposed I/M program relative to no I/M program are greater than the corresponding percent reduction of performance standard relative to no I/M program. Therefore the proposed New Jersey passes the USEPA performance standard test.

Table 3 contains the results of the I/M program benefits modeling runs. The emissions benefits increase from the NJLEV program are equal to or greater than the emissions benefits decrease from the I/M program changes for all air pollutants. This demonstrates that the proposed changes to the enhanced I/M program do not

compromise the State's efforts to meet and/or maintain National Ambient Air Quality Standards (NAAQSs) for ozone or carbon monoxide.