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2018 Annual Report

Massachusetts Vehicle Check Inspection and Maintenance Program

April 24, 2020

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- Attachment B: 2018 Detailed Emissions Test Data
- Attachment C: 2018 Test Data by Station

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2018 Annual Report Massachusetts Enhanced Inspection and Maintenance Program

1 EXECUTIVE SUMMARY

This Annual Report is required by the U.S. Environmental Protection Agency (EPA) under 40 CFR 51.366. This regulation requires that annual reports cover four categories of information:¹

- Station and inspector oversight,
- Quality control,
- Compliance and enforcement, and
- Emissions test data.

2018 was the ninth full year of operation of Massachusetts Vehicle Check, the Commonwealth's enhanced Inspection and Maintenance (I&M) Program.

The Massachusetts Department of Environmental Protection (MassDEP) and the Massachusetts Department of Transportation's Registry of Motor Vehicles Division (RMV) jointly administer the Massachusetts Vehicle Check Program. In November 2016, the Commonwealth contracted with Applus Technologies to manage and implement the program starting on October 1, 2017. This contract continues the same program design established October 1, 2008 and adds new features to assist with program oversight that are described in the 2016 – 2017 biennial report. The Massachusetts Vehicle Check is a comprehensive vehicle emissions and safety testing program including:

- Inspections provided by a decentralized network of inspection stations;
- Stations and inspectors licensed by the Commonwealth;
- Annual safety tests;

¹ See "Attachment A: Index of Report Pages Relevant to EPA Regulation Sections" for details about where specific required items appear in this report.

- Commercial vehicle safety inspections that meet U.S. Department of Transportation requirements, so these vehicles only need one comprehensive check;
- An annual On-Board Diagnostic (OBD) emissions test for vehicles that are equipped with OBD systems (vehicles 15 or more years old are exempt);
- An annual opacity test for emissions for diesel vehicles model year 1984 and newer greater than 10,000 lbs. gross vehicle weight rating (GVWR) that are not equipped with OBD;
- A safety test and any applicable emissions test upon transfer of ownership;
- A requirement that vehicles that fail their initial emissions test be repaired and pass a re-test within 60 days;
- Waiver eligibility, for a one-year waiver of the emissions standards, for certain vehicles that fail their emissions test after being repaired by a state-registered repairer;
- An “economic hardship” extension for vehicles that failed their emissions test and require replacement of a major (and expensive) component to pass, giving the vehicle owner one year to finance repairs or replace the vehicle;
- Ten Motorist Assistance Centers (MACs) located across the state to provide information to motorists, technical assistance to repair technicians, help with getting vehicles “ready” for testing after emissions repairs, vehicle evaluations for repair waivers and economic hardship extensions, and vehicle testing quality assurance;
- Market-based fees for commercial vehicle inspections; and
- An inspection fee of \$35 for non-commercial vehicles. The fee was increased from \$29 to \$35 on July 1, 2014, the first increase since 1999.

The Agencies amended the program’s implementing regulations (MassDEP at 310 CMR 60.02, and RMV at 540 CMR 4.00-4.09) to incorporate these changes in September 2008, and the enhanced program started operation on October 1, 2008. A revision to the Massachusetts State Implementation Plan (SIP), reflecting the changes to MassDEP and RMV regulations, was submitted to EPA in June 2009, with a minor revision in November, 2009. The regulatory changes received EPA approval effective March 26, 2013.

This report covers the period between January 1, 2018 and December 31, 2018.

1.1 Major Findings

Emissions Tests Conducted

In 2018, an annual emissions test was required for the majority of the fleet. The following non-diesel² vehicles required an OBD test:

- Vehicles in model years 2004-2007 weighing 8,500 lbs. GVWR or less,

² A diesel vehicle is defined as a vehicle powered by an engine using a compression ignition thermodynamic cycle. Non-diesel vehicles are typically fueled with gasoline, including hybrids, but may also be powered by alternative fuels such as natural gas.

- Model year 2008 and newer vehicles weighing 14,000 lbs. GVWR or less.

The following diesel vehicles required an OBD test:

- Vehicles in model years 2004-2006 weighing 8,500 lbs. GVWR or less,
- Model year 2007 and newer vehicles weighing 14,000 lbs. GVWR or less.

Heavy duty diesel vehicles (weighing over 10,000 lbs. GVWR) with model year 1984 or newer that were not subject to the OBD test required an opacity test.

An emissions test was also required when a vehicle meeting any of the above requirements changed ownership or had its registration transferred to Massachusetts from another state.

In 2018, there were approximately 5.08 million vehicles registered in Massachusetts. From January 1, 2018 through December 31, 2018, the I&M Program conducted 4,020,949³ emissions tests, including initial tests and retests. 3,730,261 unique vehicles (74% of the Massachusetts fleet) received an initial emissions test in 2018. Of these vehicles, 3,601,647 were non-diesel fueled (e.g., gasoline, natural gas, etc.) and 128,614 were diesel fueled.

Motorist Compliance and Enforcement

Of the 3,700,353 non-diesel vehicles complying with program's testing requirements and receiving an initial OBD test in 2018, 176,049 (4.8%) failed their initial test. Of the 33,689 diesel vehicles receiving an initial OBD test, 4,675 (13.9%) failed their initial test. Of the 96,898 diesel vehicles receiving an initial opacity test, 2,578 (2.7%) failed their initial test.

Of all non-diesel vehicles tested, 19,277 (0.5%) did not comply with program requirements and pass a subsequent retest, or receive a waiver or hardship extension by March 31, 2019. Two waivers from the requirement that failing vehicles pass an emissions re-test were granted in 2018 (less than 0.01% of vehicles failing initial emissions tests), along with 21 economic hardship extensions. Of all diesel vehicles receiving an OBD test, 701 (2.1%) did not pass a subsequent retest by March 31, 2019.

Vehicles failing to receive safety inspections or emissions tests when required are subject to enforcement by RMV as well as state and local law enforcement agencies.

Station and Inspector Oversight

In 2018, RMV performed 7,324 site audits to determine if program inspectors were correctly performing all safety and emissions tests and if the station's physical conditions continued to meet program requirements. All stations operating throughout the year received at least one visit. Based on the results of the site audits and other data, RMV

³ The 4,020,949 emissions tests reflects one initial test for the year for each vehicle, even though some vehicles go through the emissions test cycle more than once because of off-cycle tests at change of ownership.

held 145 hearings for stations and issued 158 adverse actions against stations (e.g., warning letters, license revocations or license suspensions).

In 2018, 6,632 licensed inspectors performed at least one test. Based on the results of the site audits and other data, RMV held 127 hearings for inspectors, and issued 139 adverse actions against inspectors (e.g., warnings, license revocations or license suspensions).

MassDEP and the Attorney General's Office complement RMV enforcement actions where there is substantial or repeat noncompliance by a station or inspector. In 2018 MassDEP and the Attorney General's Office settled one case against a station by downgrading their inspection license so they could no longer perform diesel opacity tests and commercial safety inspections. MassDEP and the Attorney General's office continued to work on one on-going case where the station and inspector used improper inspection procedures.

2018 Program Changes

Beginning on October 1, 2017, several new measures were implemented to aid with program oversight. A digital image of the inspector is now automatically captured when the inspector logs into the workstation to perform an inspection. This helps verify the identity of the inspector. Also, the inspector is now required to take the following 4 images of the vehicle being inspected using a hand held digital camera: 1) front of the vehicle, 2) rear of the vehicle, 3) vehicle identification number (VIN) tag, and 4) odometer reading. These images help verify the identity of the vehicle being inspected and its mileage. These images all become part of the inspection record.

Beginning in February 2018 the workstation software began to record video of the inspection from one of three inspection bay cameras installed at stations. The other two inspection bay cameras capture several still images throughout the inspection from different views. At the completion of each inspection, the video and images are uploaded to the Vehicle Inspection Database (VID) and become part of the inspection record.

1.2 Contents of This Report

Section 2 of this report describes the Massachusetts I&M Program and provides information on the number of vehicles covered, inspection stations and inspectors, and types of emissions tests administered. The remaining sections of the report describe specific aspects of the program:

- Motorist Compliance with Testing Requirements (Section 3)
- Performance of Emissions Test Equipment (Section 4)
- Station and Inspector Oversight (Section 5)

The attachments to this report contain detailed data on vehicles tested, results of emissions tests, and audit results:

2018 Massachusetts I&M Annual Report

- Attachment A: Index of Report Pages Relevant to EPA Regulation Sections
- Attachment B: 2018 Detailed Emissions Test Data
- Attachment C: 2018 Test Data by Station

2 THE MASSACHUSETTS I&M PROGRAM

2.1 Why Does Massachusetts Have an I&M Program?

The Clean Air Act requires I&M programs in areas in the U.S. most impacted by ozone and carbon monoxide pollution, as well as in states that are part of the Ozone Transport Region (OTR). As a result of having areas designated nonattainment for the 1997 8-hour ozone NAAQS and by virtue of its inclusion in the OTR, Massachusetts has implemented a statewide enhanced I&M program. Massachusetts has since attained the 1997 ozone NAAQS (and was designated as unclassifiable/attainment for the current 2015 ozone NAAQS). To maintain the air quality improvements that have been made, Massachusetts must continue to implement a variety of federally mandated programs,⁴ including the I&M program. EPA sets minimum standards for I&M programs.⁵

The Massachusetts I&M Program (currently known as “Massachusetts Vehicle Check”) was authorized by the Legislature by Chapter 210 of the Acts of 1997, and is jointly administered by MassDEP and RMV. The program’s goals are to implement a comprehensive test that provides the emission reductions needed for the Massachusetts SIP, provide convenience to motorists, ensure vehicle safety, and work well in local inspection shops. To maximize customer convenience, the legislation combines emissions and safety testing, and requires that the combined test be delivered in local inspection stations, convenient to where people live and work.

In November 2016, the Commonwealth contracted with Applus Technologies to supply inspection equipment and operate the Massachusetts I&M Program starting October 1, 2017. This report describes the program in 2018.

2.2 Vehicles Subject to Inspection

40 CFR 51.366 (d) (1) (i): An estimate of the number of vehicles subject to the inspection program, including the results of an analysis of the registration data base;

In 2018, there were approximately 5.08 million vehicles with active registrations in the Massachusetts fleet. Each vehicle registered in Massachusetts must be inspected annually. All vehicles must receive a safety inspection every year, and the vast majority must also receive an emissions test every year. In addition, vehicles are required to receive a safety and an emissions inspection within seven days of transfer of ownership, or within seven days of their initial Massachusetts registration when transferring registration from another state.

In 2018, non-diesel⁶ vehicles were exempted from the emissions inspection if they were:

⁴ These programs are established in legally binding and federally enforceable “State Implementation Plans” or “SIPs.”

⁵ 40 CFR Part 51, Subpart S (§51.350 et seq.)

⁶Non-diesel vehicles are typically fueled with gasoline, including hybrids, but may also be powered by alternative fuels such as natural gas.

- Light duty vehicles older than model year 2004,
- Medium duty vehicles older than model year 2008, or
- Heavy duty vehicles

Diesel vehicles were exempted from the emissions inspection in 2018 if they were:

- Light duty vehicles older than model year 2004,
- Medium duty vehicles with a gross vehicle weight rating (GVWR) of 10,000 lbs. or less and older than model year 2007, or
- Heavy duty vehicles with a GVWR of more than 10,000 lbs. and older than model year 1984.

Also exempted were vehicles of any type that were less than one year old and still registered to the original owner.

2.3 Inspection Stations

40 CFR 51.366 (b) ⁷ (1): The number of inspection stations and lanes: (i) Operating throughout the year; and (ii) Operating for only part of the year;

Most Massachusetts vehicles receive their inspections at local public stations. The program also allows owners of vehicle fleets to purchase their own testing equipment so they can test their own vehicles. The number of public and fleet stations fluctuates slightly from month to month, as businesses join or leave the program.

In 2018, 1,575 stations conducted emissions tests (OBD and/or diesel opacity) throughout the year, and another 178 conducted tests during part of the year. There were 1,637 “workstations” or sets of inspection equipment used for testing emissions throughout 2018, and 146 workstations used for testing emissions during part of the year. A small number of inspection stations have more than one workstation. In Massachusetts, the number of workstations is equivalent to the number of lanes in a centralized testing program. Table 1 shows the numbers of workstations and stations testing emissions throughout the year and for part of the year. As part of the new program contract, all stations were required to retire their existing workstations and begin using new workstations starting October 1, 2017.

At any given time, some of the workstations and stations are not operating, due to factors such as station renovation, or change of ownership or location. Table 1 also shows that the number of workstations and stations testing in any given month is fewer than the total number of workstations and stations, as seen by the number of stations and workstations testing in December.

⁷For all references to 40 CFR 51.366: 57 FR 52987, Nov. 5, 1992, as amended at 61 FR 40945, Aug. 6, 1996; 65 FR 45534, July 24, 2000; 66 FR 18178, Apr. 5, 2001.

Table 1: Number of Stations and Workstations Testing Emissions in 2018

	Workstations	Stations
Testing All Year	1,637	1,575
Testing for Part of Year	146	178
Total During Year	1,783	1,753
Testing in December	1,740	1,685

Table 2 shows the breakdown of fleet and public stations.

Table 2: Public and Fleet Stations in 2018

	Public	Fleet	Total Stations
Testing All Year	1,484	91	1,575
Testing for Part of Year	130	48	178
Total During Year	1,614	139	1,753
Testing in December	1,560	125	1,685

In Tables 1 and 2, a station or workstation must have conducted emissions inspections in each month in 2018 to be counted as “testing all year.” Stations or workstations that were licensed for the entire year, but did not test in one or more months are considered “testing for part of the year,” as are stations that entered or left the program during the year.

2.4 Inspectors

40 CFR 51.366 (b) (5): The number of inspectors licensed or certified to conduct testing;

At the close of calendar year 2018 there were 7,534 trained and licensed inspectors certified to conduct emission tests (see Table 3). However, in 2018 only 6,632 inspectors conducted emissions tests and 6,683 inspectors tested at least one vehicle for safety or safety plus emissions.

**Table 3: Number of Inspectors
January 1, 2018 through December 31, 2018**

	#Inspectors
Inspectors Trained And Licensed on December 31, 2018	7,534
Inspectors Who Inspected at Least One Vehicle in 2018	6,683
Inspectors Who Tested Emissions in 2018	6,632

2.5 Emissions Tests Administered

The Massachusetts I&M Program uses the vehicle's OBD system for emissions testing of most vehicles. These systems include computers and sensors that assess the condition of the vehicle's emissions control systems. The emissions test accesses the OBD system in these vehicles to find out whether the emission control system is working properly. The Massachusetts I&M Program started testing all non-diesel vehicles equipped with modern OBD systems (i.e., OBD II) based on the data in those systems on June 14, 2004. The program that started on October 1, 2008 continued using OBD tests for non-diesel vehicles, and added OBD testing for diesel vehicles that are equipped with these systems.

Massachusetts has used a snap acceleration opacity test for heavy duty diesel vehicles since 2001 (except between August 2008 and October 2009, when the program contractor was preparing, testing, and installing new diesel testing equipment and related software).

3 MOTORIST COMPLIANCE WITH TESTING REQUIREMENTS

3.1 Overall Motorist Compliance with Testing Requirements

40 CFR 51.366 (d) (1) (ii): The percentage of motorist compliance based upon a comparison of the number of valid final tests with the number of subject vehicles;

Table 4 summarizes the overall compliance rate for 2018, which compares the total number of unique vehicles receiving an I&M test (including safety-only tests) to the number of unique registered vehicles that were estimated to be due for an inspection during this period.

Table 4: 2018 Overall Testing Compliance Rates

	Vehicle Count	Compliance %
Average Number of Vehicles Registered in MA in 2018	5,078,009	
Unique Vehicles Tested in 2018 (Safety Only or Safety and Emissions Tests)	4,798,387	94.5%

Please note that Table 4 may overstate compliance with testing requirements: the *average number of vehicles registered in the Commonwealth* can fluctuate from month to month, as vehicles are removed from the fleet and possibly replaced with new or out of state vehicles. By contrast, the *unique vehicles tested in 2018* counts all Massachusetts-registered vehicles that were tested during the year, even though they may only have been part of the fleet for a portion of the year. A compliance rate specifically for emissions tests in this period is not available, since the program does not track the number of registered vehicles that are exempt from the emissions testing requirement (e.g., those that are less than one year old, or are non-diesel and are older than model year 2004).

Of the 176,049 non-diesel vehicles that failed their initial OBD test, 19,277(10.9% of the failing vehicles, and 0.5% of all non-diesel vehicles tested) did not pass a subsequent retest, or receive a waiver or economic hardship extension by March 31, 2019. (The retest would be considered a “final test” as per EPA’s requirement noted above). Of the 33,689 diesel vehicles receiving an OBD test, 701 (2.1% of all diesels OBD tested) did not pass a subsequent retest by March 31, 2019. Two waivers from the requirement that failing vehicles pass an emissions re-test were granted in 2018 along with 21 economic hardship extensions (less than 0.1% of vehicles failing initial emissions tests).

The 19,978 vehicles (non-diesel and diesel) with no known outcome do not include vehicles that have expired or cancelled registrations. If those vehicles are included, the total number of vehicles with no known outcome increases to 37,129 (1.0% of vehicles tested). Vehicles failing to receive safety inspections or emissions tests when required are subject to enforcement by RMV as well as state and local law enforcement agencies.

3.2 Registration File Audits and Compliance with Deadlines

40 CFR 51.366 (d) (2) (ii): [Registration denial based enforcement programs shall provide. . .] The number of registration file audits, number of registrations reviewed, and compliance rates found in such audits. . . .

40 CFR 51.366 (d) (3): Computer-matching based enforcement programs shall provide the following additional information:

(i) The number and percentage of subject vehicles that were tested by the initial deadline, and by other milestones in the cycle;

In 2018, RMV completed a scan of the vehicle registration database each month. These registration reviews examine the testing status of each registered vehicle to determine compliance with testing requirements. The results of these reviews are summarized in Table 5, below.

These registration reviews are snapshots in time, and therefore tend to understate compliance. Registration reviews determine whether the most recent inspection for each vehicle was performed within the last 12 months and was a “pass.” The I&M regulations allow up to 60 days for emissions repairs and re-testing. The registration reviews count vehicles that failed their emissions test as “out of compliance” if they did not complete repairs and pass a re-inspection by the time of the registration review, even though the vehicle may still be within its 60-day period. Also, registration reviews only capture compliance status at a particular moment in time. A vehicle that was tested seven weeks late in 2018 would ultimately have been in compliance but would have been counted as out-of-compliance on two registration reviews.

Table 5: 2018 RMV Registration Reviews

Date	Active Registrations	Number Non-Compliant	Percent In Compliance
1/15/2018	5,048,021	549,800	89.1%
2/15/2018	5,030,150	622,013	87.6%
3/15/2018	5,036,676	627,412	87.5%
4/16/2018	5,051,098	633,950	87.4%
5/15/2018	5,068,474	618,131	87.8%
6/15/2018	5,089,737	619,548	87.8%
7/16/2018	5,098,701	631,229	87.6%
8/15/2018	5,105,469	626,920	87.7%
9/15/2018	5,109,821	633,603	87.6%
10/15/2018	5,109,506	636,735	87.5%
11/15/2018	5,093,179	590,432	88.4%
12/15/2018	5,095,277	588,438	88.5%
Average	5,078,009	614,017	87.9%

3.3 Parking Lot Audits

40 CFR 51.366 (d) (4) (iii): [Sticker-based enforcement systems shall provide . . .] The number of parking lot sticker audits conducted, the number of vehicles surveyed in each, and the noncompliance rate found during those audits.

In 2018, RMV conducted audits of vehicle stickers at 111 Massachusetts parking lots. Table 6 summarizes the results of these audits.

Table 6: 2018 Parking Lot Audits

Parking lot audits conducted	111
Vehicles surveyed	2,761
Vehicles with valid inspection stickers	2,595
Compliance rate	94.0%

3.4 Other Compliance Surveys

40 CFR 51.366 (d) (1) (vi): The number of compliance surveys conducted, number of vehicles surveyed in each, and the compliance rates found;

RMV conducted registration file audits and vehicle sticker audits at Massachusetts parking lots, as described in Sections 3.2 and 3.3 respectively. No other compliance surveys were conducted in 2018.

RMV recognizes the need to have a registration enforcement program to enhance its efforts to ensure that motorists comply with the requirements of the Massachusetts I&M Program. However, RMV's aging information technology infrastructure cannot support a registration enforcement program while also meeting the data requirements of the other federal programs that RMV works under (which are increasing at unparalleled levels). RMV is continually exploring more cost-effective ways to get this job done in a proficient manner, and is scheduled to replace its primary registration, license, and title database (Automated License and Registration System (ALARS)) with a new system called ATLAS beginning in March of 2018 and concluding in November 2019. The replacement is expected to provide significantly more efficient data processing, which would allow RMV to move forward with the development and implementation of a successful registration enforcement program. It is anticipated that registration enforcement will begin in 2020 provided the ATLAS project remains on schedule.

3.5 Motorist Time Extensions

40 CFR 51.366 (d) (1) (v): The number of time extensions and other exemptions granted to motorists;

Massachusetts offers an economic hardship repair extension for non-commercial vehicles that do not pass their initial emissions test and a re-test. Motorists are eligible for this extension if they meet all of the following criteria:

- the cost of repairing or replacing a single component to correct a diagnostic trouble code (DTC) for the component is more than 1.5 times the repair expenditure limit applicable for the model year of the vehicle:
 - \$1,345 for vehicles five model years old or newer;
 - \$1,195 for vehicles over five but not exceeding 10 model years old; and
 - \$1,045 for vehicles over 10 model years old.
- the vehicle does not qualify for a waiver;
- the economic hardship repair extension is not for an emissions inspection or re-inspection associated with initial registration or transfer of ownership;
- MassDEP or its designee agrees with the findings of the registered repair technician regarding the cause of the failure, and the appropriateness and reasonableness of the repair estimate;
- the motorist has used all relevant warranty coverage including recalls to repair the vehicle;
- all safety inspection requirements are met;
- the vehicle is registered with RMV as a private passenger motor vehicle or auto home; and
- the emission control system is present and there is no evidence of tampering.

An economic hardship repair extension is valid until the vehicle's next emissions inspection. This extension cannot be renewed or extended: at the end of the extension period, the vehicle must pass its emissions test.

In 2018, 21 economic hardship extensions were issued.

3.6 Waivers of Emission Standards

A non-commercial vehicle that does not pass a re-test is eligible for a waiver of the emissions standards if the following criteria are satisfied:

- At least the following amount has been spent for a Registered Emissions Repair Technician to repair the vehicle's emissions system (including labor and materials)⁸:
 - \$895 for a vehicle five model years old or newer
 - \$795 for a vehicle more than five but less than ten model years old
 - \$695 for a vehicle more than ten model years old
- The vehicle's emissions-control system must be intact with no evidence of tampering;
- The vehicle must have passed its safety inspection within the previous 60 days; and
- The vehicle's OBD system must connect successfully with the inspection station's computer, must be "ready" for its re-test, and cannot be showing DTCs for engine misfire, catalytic converter efficiency failure, or energy storage for a hybrid vehicle.

To obtain a waiver, the motorist must bring the vehicle to a Motorist Assistance Center (MAC) for an evaluation of eligibility. If the MAC determines that the vehicle meets all the requirements for a waiver, the MAC provides a waiver authorization, which the motorist must bring to an inspection station to obtain a valid sticker.

A waiver is valid until the vehicle's next emissions inspection.

In 2018, two waivers were issued.

3.7 Preventing False Registration by Motorists

40 CFR 51.366 (d) (2) (i): [Registration denial based enforcement programs shall provide . . .] A report of the program's efforts and actions to prevent motorists from falsely registering vehicles out of the program
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⁸ Only the cost of repairs performed by a Registered Emissions Repair Technician qualifies for a waiver. Expenditures for repairs made by non-registered technicians are not eligible.

area or falsely changing fuel type or weight class on the vehicle registration, and the results of special studies to investigate the frequency of such activity; and

40 CFR 51.366 (d) (3) (ii): [Computer-matching based enforcement programs shall provide . . .] A report on the program's efforts to detect and enforce against motorists falsely changing vehicle classifications to circumvent program requirements, and the frequency of this type of activity;

40 CFR 51.366 (d) (4) (ii): [Sticker-based enforcement systems shall provide . . .] A report on the program's efforts to detect and enforce against motorists falsely changing vehicle classifications to circumvent program requirements, and the frequency of this type of activity;

The reporting requirements for efforts to prevent false registration are not relevant to Massachusetts because:

- All of Massachusetts is covered by the program;
- All vehicles are required to be inspected annually for either safety or safety and emissions;
- If a motorist falsely reports fuel type or weight in order to avoid an emissions inspection, the inspector enters corrected data based on his or her examination of the fuel cap and the vehicle information appearing on the vehicle's door label. In addition, the workstation uses a separate VIN decoder to pre-populate critical fields (model year, fuel type, and GVWR) that determine whether a vehicle receives an emissions test. Changes to these fields by inspectors are flagged by the software for investigation by RMV.

3.8 Additional Sticker-Related Activities

40 CFR 51.366 (d) (4): Sticker-based enforcement systems shall provide the following additional information:

(i) A report on the program's efforts to prevent, detect, and enforce against sticker theft and counterfeiting, and the frequency of this type of activity;

In 2018, state and local police issued 66,860 inspection sticker motor-vehicle violations. Most of these violations were for expired stickers, but some violations lead to the discovery of sticker theft and counterfeiting. Sticker tracking efforts to detect theft and counterfeiting are discussed in section 5.1 and 5.4.3 of this report. Digital audits also detect theft and counterfeiting, and are discussed in section 5.2.

4 PERFORMANCE OF EMISSIONS TEST EQUIPMENT

The Massachusetts Vehicle Check program uses two methods to ensure that the emissions test equipment is operating properly:

- The workstations have been designed to run daily “self-checks” so that equipment with significant issues is identified (and repaired) as quickly as possible,
- After an OBD test fails due to communication problems with the vehicle, the OBD scan tool must pass its self-check described below to continue testing.

4.1 Test Equipment Self Checks

Workstations have been designed to run several daily “self-checks” to ensure that they are operating properly. Every 24 hours, the workstation is programmed to require the inspector to perform equipment checks that ensure the functionality of the OBD scan tool, printer, barcode scanner, and, if equipped, diesel opacity meter. The self-checks include:

- A daily “loopback” check that tests the continuity of the OBD scan tool cable and pins in the Diagnostic Link Connector (DLC). If a loopback test fails, the workstation is locked out from performing OBD tests until a loopback check can be passed. Inspectors are also required to perform a loopback check prior to a vehicle failing its emissions test for failure to communicate with the workstation. This is to verify that the emissions test failure is not due to an equipment-related problem.
- A daily printer/barcode scanner check that tests print quality and the proper function of the barcode scanner. The workstation prints sample 1D and 2D barcodes and sample Vehicle Inspection Report (VIR) text. The inspector examines the quality of the printed sample and records a failure if the text is not legible. If the print quality is good, the inspector is then prompted to scan the 1D and 2D barcodes. If the workstation cannot read the barcodes, the workstation records a failure. Failure to read the barcodes can be caused by a faulty barcode scanner or poor print quality. If the printer/barcode scanner check fails, the workstation is locked out from performing all inspections until it can pass the check.
- For workstations equipped with diesel opacity meters, the three daily self-checks are electronic zero and span; accuracy at 37.5% opacity by extinguishing three of eight light pulses; and current draw of the sample fan. All three checks have tolerances which must be met to pass. If any of the three checks fails, the workstation is locked out from performing diesel opacity tests until all three checks pass.

All inspection stations were required to purchase new workstation equipment provided by Applus Technologies for program tests beginning on October 1, 2017. The new equipment includes a California Bureau of Automotive Repair (BAR) certified Data Acquisition Device (DAD) for performing OBD scans. This new scan tool includes a more comprehensive daily self-check than the previous scan tool. For this reason, the Commonwealth has discontinued performing separate OBD test equipment audits beginning October 1, 2017. OBD data from covert vehicle audits are used to verify that the workstations are consistently and correctly reading OBD data from the vehicle.

5 STATION AND INSPECTOR OVERSIGHT

The Massachusetts I&M Program uses overt, digital and covert audits to assess station and inspector performance. The results of each type of audit conducted in 2018 are described in this section.

5.1 Overt Performance Audits

40 CFR 51.366 (b) (2): The number of inspection stations and lanes operating throughout the year:
(i) Receiving overt performance audits in the year;
(ii) Not receiving overt performance audits in the year;

RMV conducts regular site visits/performance audits to determine if the inspectors are correctly performing all tests and if the station's physical conditions continue to meet program requirements. RMV typically visits inspection stations at least three times during the year, and performs additional visits to follow up on past problems or to investigate stations or inspectors based on consumer complaints or data analysis.

The Contractor maintains records of all inspections in a database to which MassDEP and RMV have access. RMV conducts monthly "digital audits" before visiting stations, to identify stations that may need investigation. A "digital audit" is a query of the database for information that may indicate issues warranting attention during the site visit. Digital audit items include the station's emissions testing and inspection failure rates and vehicle characteristics recorded during the inspection that do not match the vehicle information in the registration database.

RMV site visits cover a wide range of items including:

- Observing inspectors performing an inspection;
- Examining station and inspector licenses;
- Collecting voided inspection stickers and checking to see that stickers are stored in a secure location;
- Examining the inspection equipment and bay;
- Supplementing the inspector's training; and
- Investigating consumer complaints and/or anomalous digital audit findings.

RMV staff prepares a written report summarizing the results of each inspection. Violations of policies or regulations identified at site visits are forwarded to RMV headquarters for possible enforcement action.

In 2018, RMV conducted 7,324 overt station visits/audits. All 1,753 stations and 1,783 workstations that conducted emissions inspections during this period received at least one audit.

5.2 Digital Audits

In addition to RMV's overt station visits/audits, in 2018 MassDEP continued an initiative that started in late 2008 to use digital audits of the inspection database to identify suspected improper emissions inspections, and in many cases, to determine that an improper inspection occurred. When the data indicated that an improper inspection most likely occurred, MassDEP staff visited the station to confirm the accuracy of digital audit findings and to gather more information about the unusual situations that had been identified. RMV staff participated in many of these station visits.

During 2018, the program continued to focus on data mining to identify fraudulent inspection practices. On a monthly basis, MassDEP reviews all potential violations for the entire network during the previous month.

These digital audits were an effective tool for identifying improper inspections, particularly cases in which stations were "clean scanning" by conducting OBD tests on different vehicles than the ones brought in for inspection, and using the results from the fraudulent tests to issue stickers. In 2018, 4,501 suspect tests were identified through data mining of 4,798,387 inspections and flagged for evaluation. Of these, a total of 161 were potential violations referred to RMV staff. There were 118 inspector errors, 31 fraudulent tests, and 12 instances of the inspector and/or station inspecting outside their license class.

In addition to digital audits to identify fraudulent inspections, MassDEP increased the data mining for vehicles that appeared to be tampered based on their OBD results. These vehicles are flagged so that they automatically fail their next regular inspection and receive a referral to a MAC for further investigation. If the MAC determines the vehicle has been tampered, the motorist is required to return the vehicle to stock condition before it is allowed to be re-inspected. Data mining for tampered vehicles was temporarily suspended for most of 2018 as efforts were being focused on improving workstation software after the new program roll out. As a result, in 2018 only 22 vehicles were flagged and referred to the MAC for suspected tampering.

Starting in 2018, workstation software was implemented that triggers a "test interruption" when certain anomalies are found, including:

the inspector does not sign on the signature pad following a commercial safety inspection.

When a test interruption occurs, the test is automatically stopped and a contractor representative contacts the inspector by remote access to the workstation or phone to determine if proper inspection procedures are being followed. Additional actions for test interruptions are planned for the future. In 2018 there were 5,218 test interruptions that were responded to by the contractor.

5.3 Covert Audits

Covert audits, or “covert performance audits,” are under-cover inspections done with vehicles set to fail one or more parts of the emissions test. This section summarizes covert audits performed by the Contractor. While RMV staff also conducts covert audits as part of their enforcement activities, the results of their covert audits are not included in the following tables.

In 2018 the Contractor performed 908 covert vehicle audits. Of these, none were scheduled in response to Agency requests and all 908 audits were selected randomly or targeted based on data analysis. Some stations received more than one covert audit, as summarized in Table 7.

Table 7: 2018 Covert Vehicle Audits per Station

Number of Audits Per Station	Count of Stations
1	788
2	65
<hr/>	
Total Number of Stations Audited	843
Total Number of 2018 Audits	908

Beginning with the new program contract in 2017, inspection bay cameras were added to the program which allow for more effective covert visual audits. In 2018 the Contractor performed 2,000 covert visual audits. Each covert visual audit consists of the following:

- A review of 2 complete recent inspections (videos and images) to check for proper inspection procedures;
- A review of 10 previous inspections images to ensure the inspectors and vehicles inspected are properly identified; and
- A report detailing any deficiencies.

Some stations received more than one covert visual audit, as summarized in Table 8.

Table 8: 2018 Covert Visual Audits per Station

Number of Audits Per Station	Count of Stations
1	1,021
2	294
3	101
4	22
<hr/>	
Total Number of Stations Audited	1,438
Total Number of 2018 Audits	2,000

For all covert visual audits in 2018, auditors verified that the inspector plugged into the correct vehicle when prompted for the OBD scan.

5.3.2 Covert Auditors and Covert Vehicles

40 CFR 51.366 (b) (8): The total number of covert vehicles available for undercover audits over the year; (b) (9): The number of covert auditors available for undercover audits.
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Covert audit vehicles are selected to represent the range of OBD communication protocols. Five vehicles were used for covert audits in 2018, representing two OBD communication protocols:

- ISO 9141, and
- CAN

In 2018, four covert auditors conducted covert vehicle audits.

5.3.3 Number of Covert Audits Conducted in 2018

40 CFR 51.366 (b) (2): The number of inspection stations and lanes operating throughout the year: . . . (iii) Receiving covert performance audits in the year; (iv) Not receiving covert performance audits in the year;
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Table 9 summarizes the number of covert vehicle audits conducted during 2018 for each type of inspection station. Only public stations can receive covert vehicle audits because fleet stations only test vehicles that are part of the company’s fleet, making it impossible for the Contractor to present a covert (or “undercover”) vehicle for testing. Also, covert vehicle audits are not conducted at stations that inspect only heavy duty vehicles.

Table 9: Number of Inspection Stations and Covert Vehicle Audits in 2018

	2018 Covert Vehicle Audits			Stations NOT Receiving Covert Audits
	2018 # of Stations	Audited Stations	# Of Audits	
Fleet stations	91	0	0	91
Public stations	1,484	843	908	641
All stations	1,575	843	908	732

Since the inspector is required to drive the vehicle into the inspection bay during a covert audit, the covert auditor has no control over which workstation is used at stations with multiple workstations. Most stations only have one workstation. As a result, covert vehicle audits statistics are only reported by station, not by workstation.

Table 10 summarizes the number of covert visual audits conducted during 2018 for each type of inspection station.

Table 10: Number of Inspection Stations and Covert Visual Audits in 2018

	2018 Covert Visual Audits			Stations NOT Receiving Covert Audits
	2018 # of Stations	Audited Stations	# Of Audits	
Fleet stations	91	2	2	89
Public stations	1,484	1,436	1,998	48
All stations	1,575	1,438	2,000	137

5.3.4 Covert Vehicle Audit Overview

A “false pass” on a covert vehicle audit is an inspection that passes a vehicle that was set to fail its OBD test.

Covert vehicles are set to fail the OBD test in a variety of ways including:

- Malfunction Indicator Lamp (MIL) commanded on and DTCs being set,
- failing to communicate, and
- failing because the readiness monitors are not set.

In addition to these three types of OBD failures, the MIL bulb on the dashboard was made inoperable for some of the vehicles that were set to fail with DTCs set.

For most covert audits, the vehicles were also set to fail the safety test.

5.3.5 Covert Vehicle Audit Results by Type of OBD Failure

- | |
|--|
| 40 CFR 51.366 (b) (3): The number of covert audits:
(i) Conducted with the vehicle set to fail per test type;
(ii) Conducted with the vehicle set to fail any combination of two or more test types
(iii) Resulting in a false pass per test type;
(iv) Resulting in a false pass for any combination of two or more test types; |
|--|

Since OBD tests are the only type of emissions test covered by the covert vehicle audit program, there were no audits set to fail two or more test types. For the 908 covert vehicle audits with OBD set to fail, there were zero false passes.

5.4 Station and Inspector Enforcement

- | |
|---|
| 40 CFR 51.366 (b) (6): The number of hearings:
(i) Held to consider adverse actions against inspectors and stations; and
(ii) Resulting in adverse actions against inspectors and stations; |
|---|

- | |
|--|
| 40 CFR 51.366 (b) (4): The number of inspectors and stations:
(i) That were suspended, fired, or otherwise prohibited from testing as a result of covert audits;
(ii) That were suspended, fired, or otherwise prohibited from testing for other causes; and |
|--|

- | |
|--|
| 40 CFR 51.366 (b) (2): The number of inspection stations and lanes operating throughout the year: . . .
(v) That have been shut down as a result of overt performance audits; |
|--|

Based on the results of the site audits, covert audits, and other data, RMV held 145 hearings for stations and issued 158 adverse actions against stations (e.g., warning letters, license revocations, or license suspensions). The written violations in 2018 resulted in 51 station license suspensions or revocations.

Based on the results of the site audits, covert audits and other data, RMV held 127 hearings for inspectors, and issued 139 adverse actions against inspectors (e.g., warnings, license revocations, or license suspensions). The written violations in 2018 resulted in 56 inspector license suspensions or revocations.

5.4.2 Fines Collected

40 CFR 51.366 (b) (4): The number of inspectors and stations: . . . (iii) That received fines;
40 CFR 51.366 (b) (7): The total amount collected in fines from inspectors and stations by type of violation;

In 2018, there were no enforcement cases where fines were assessed. MassDEP and the Attorney General’s Office continued to work on one on-going case where stations and inspectors used improper inspection procedures that may result in fines in the future.

5.4.3 Station Compliance Documents - Issued and Missing Documents

40 CFR 51.366 (d) (1) (iii): The total number of compliance documents issued to inspection stations;
(iv) The number of missing compliance documents;

Inspection stations are responsible for the compliance documents (stickers) shipped to them. Failure to properly account for unused stickers may subject a station or inspector to enforcement action. The sticker accounting system is designed to track all stickers from the time they are delivered to the inspection stations to when they are placed on vehicles or are voided and collected by RMV Field Investigators.

In 2018, 5,715,400 stickers were issued to inspection stations, 5,259,837 stickers were placed on vehicles, and 360,262 unused or voided stickers were picked up and destroyed by RMV. Zero stickers were reported as stolen. The software used to track voided and unused stickers was not developed until late 2018. As a result, voided stickers picked up from stations by RMV throughout the year prior to the software implementation were not tracked. This is the reason for the 95,301 stickers for which there is no accounting, but which may have been voided, picked up and destroyed by RMV. Please note: the inspection sticker is created by “on-demand” printing by the workstation sticker printer as inspections are completed and contains data specific to the vehicle such as VIN, license plate, and vehicle make. As such, there is little incentive to use a voided sticker for a different vehicle because it would be obvious from the sticker printing that the vehicle data did not match .

Table 11 summarizes the sticker accounting for 2018 stickers based on the data available.

Table 11: 2018 Inspection Stickers

	Number of Stickers
Total Number Printed	5,750,000
Assigned to Station	5,715,400
Total used (on vehicles)	-5,259,837
Collected and destroyed by RMV (as recorded by software)	360,262
Missing compliance documents	95,301
Reported stolen	0
Remaining "unaccounted for"	95,301

6 EMISSIONS TEST RESULTS

6.1 Emissions Tests and the Massachusetts Fleet

The Massachusetts I&M Program administered OBD and opacity emissions tests during all of 2018.

In 2018, 176,049 (4.8%) of the 3,700,353 non-diesel (gasoline, natural gas, etc.) vehicles receiving initial OBD tests failed their initial tests. Of the 33,689 diesel vehicles receiving an initial OBD test, 4,675 (13.9%) failed their initial tests. Of 96,898 diesel vehicles receiving an initial opacity test, 2,578 (2.7%) failed their initial opacity tests. The Massachusetts Program requires that failing vehicles be repaired and re-tested within 60 days of failing their initial emissions test.

Table 12 summarizes the failure rates for initial OBD tests in Massachusetts in 2018:

Table 12: 2018 Failure Rate for Initial Emissions Tests by Test Type and Fuel

Test Type	Fuel	Failure Rate
Opacity	Diesel	2.7%
OBD	Non-Diesel	4.8%
OBD	Diesel	13.9%
All Initial OBD Tests		4.8%
All Initial Emissions Tests		4.8%

Of the initial emissions test failures, please note:

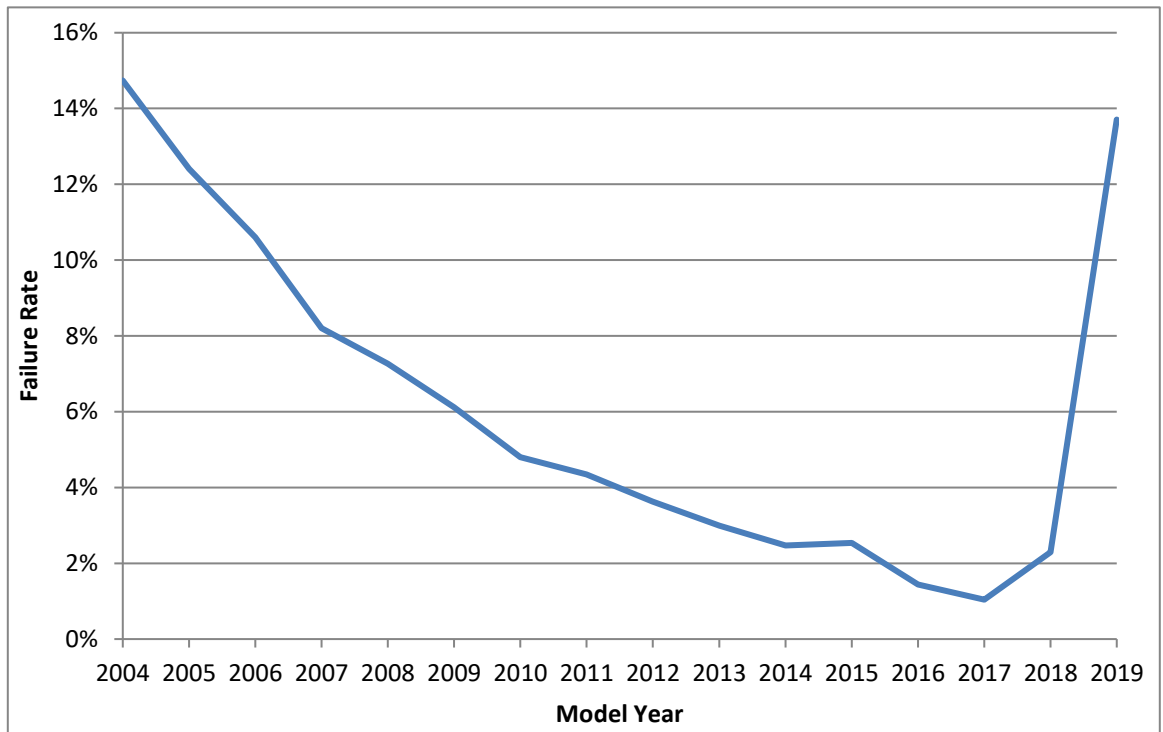
- Approximately 95.8% of retested vehicles passed the retest.
- 19,978 (11.1%) of the vehicles that failed an initial OBD test and were still registered in Massachusetts had not passed a retest, obtained a waiver, or been granted a hardship extension by March 31, 2019.⁹
- Two waivers and 21 hardship extensions were granted (less than 0.1% of the vehicles that failed their initial emissions test).

Details of all emissions test results are included in Attachment B.

⁹ 37,129 vehicles failed an initial OBD test and had not passed a retest by March 31, 2019 .

Figure 1 shows the initial OBD failure rates by model year. As can be seen, the age of the vehicle has a significant impact on failure rate. Please note that the spike in the failure rate in for model year 2019 is based on a very small sample size (372.) While this includes some new vehicles that have changed ownership within the first year, most of these failures were for readiness for new vehicles that inadvertently received an emissions test due to inspector error. The Massachusetts I&M Program is not designed to achieve a specific overall failure rate or a specific failure rate for any particular test or type of vehicle.

Figure 1: 2018 Failure Rates by Model Year – Initial OBD Tests Only



6.2 Overall Conclusions about Program Operation During 2018

2018 was the tenth full year of operation for the enhanced Massachusetts I&M Program. The program is meeting its goals of a comprehensive test that maintains the emission reductions needed for the Massachusetts SIP, is convenient to motorists, ensures vehicle safety, and works well in local inspection shops.

Most vehicles that failed their initial emissions test were repaired successfully and passed their re-test. The program continues to issue a very small number of waivers, far below the commitment in the Massachusetts SIP to limit waivers to no more than 1% of vehicles that fail an initial emissions test.

Attachment A: Index of Report Pages Relevant to EPA Regulation Sections

**Massachusetts Enhanced Emissions and Safety Test
Inspection and Maintenance Program**

Attachment A: Index of Report Pages Relevant to EPA Regulation Sections

Rules

40 CFR 51.366 (a) (1), (2) & (5)	Attachment B
40 CFR 51.366 (a) (3) &(4)	Attachment C
40 CFR 51.366 (b) (1) (i) & (ii).....	6
40 CFR 51.366 (b) (2) (i) & (ii).....	18
40 CFR 51.366 (b) (2) (iii) & (iv).....	20
40 CFR 51.366 (b) (2) (v).....	22
40 CFR 51.366 (b) (3) (i), (ii), (iii) & (iv)	22
40 CFR 51.366 (b) (4) (i) & (ii).....	22
40 CFR 51.366 (b) (4) (iii).....	22
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40 CFR 51.366 (c) (1), (2), (3), (4).....	16
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Attachment B: Detailed 2018 Emissions Test Data

**Massachusetts Enhanced Emissions and Safety Test
Inspection and Maintenance Program**

Attachment C: 2018 Test Data by Station

**Massachusetts Enhanced Emissions and Safety Test
Inspection and Maintenance Program**
