Appendix E:

Emissions Test Plan and Test Results

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California Air Resources Board
Monitoring and Laboratory Division

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PROPOSED EXHAUST AND EVAPORATIVE EMISSION TESTING FOR OFF-HIGHWAY MOTORCYCLES

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INTRODUCTION

In July 2013, the Board approved a regulation establishing more stringent evaporative emission standards for green sticker off-highway recreational vehicles (OHRVs). Although the Board at that time decided to continue to exclude red sticker OHRVs from evaporative controls, it directed ARB staff to conduct a comprehensive assessment of the opportunities for both evaporative and exhaust emissions reductions from red sticker OHRVs (RSOHRVs) with a commitment to return to the Board with an update by November 2014, and with a comprehensive assessment for controlling emissions from RSOHRVs by December 2015.

The red sticker program was originally created in 1998 to address the concerns of industry on lack of model availability and race vehicle riding areas. In California, RSOHRVs are two- and four-stroke OHRVs that do not meet standards for exhaust or evaporative emissions. These vehicles are subject to use restrictions on public off-highway vehicle riding areas and during high ozone riding seasons pursuant to 13 California Code of Regulations (CCR) Sections 2412 and 2415. OHRVs that meet emission standards are certified and issued with green stickers. For RSOHRVs, manufacturers are not required to submit emissions data when applying for an ARB Executive Order of Certification. It is estimated that evaporative emission rates for RSOHVRs are 10 to 15 times higher than 2018 green sticker OHRV (GSOHRV) standards, and 30 to 40 times higher than 2018 light-duty vehicle standards [1].

While per vehicle emissions from other mobile sources such as from light- and medium-duty vehicles are trending downward to near zero levels because of stringent new emissions standards, exhaust and evaporative emissions from OHRVs and particularly RSOHRVs are becoming relatively more significant in California. The lack of emissions data for RSOHRVs hinders our ability to properly assess emissions and develop control strategies from this category of vehicles.

The primary objectives of this test plan are to conduct exhaust and evaporative emissions testing for green and red sticker OHRVs at ARB's Haagen-Smit Laboratory (HSL). The specific focus of this test plan is off-highway motorcycles (OHMC). The test data generated from these vehicles will be used to compare emissions between green sticker OHMCs (GSOHMC) and red sticker OHMCs (RSOHMC).

Each test vehicle will be subject to exhaust and evaporative emission tests following the Code of Federal Regulations (CFR) and ARB test procedures. Emission data generated from this testing project will be used to support the development of new control strategies for the RSOHRVs program.

TEST VEHICLES

Eighteen makes and models of OHMCs (twelve RSOHMCs and six GSOHMCs) will be tested in this project. Test vehicles will be obtained through a combination of ARB fleet vehicles, ARB standard procurement contracts through rental agencies and private

owners, and vehicle purchasing. Rental and privately owned vehicles will be tested for tailpipe exhaust and evaporative emissions with no invasive modifications made to the vehicles. Running loss evaporative emission tests will be conducted on selected ARB fleet vehicles since invasive modifications to the air intake and exhaust systems are required for the tests.

Although the RSOHRV program was promulgated in 1998, issuance of the red registration stickers did not begin until 2003. As such, in developing this test program, OHMCs were selected using Department of Motor Vehicle (DMV) registration data for 2004-2012 model year vehicles. Since 2004 marks the first full year of red sticker implementation, that year was selected as the starting point with 2012 being the most recent year of DMV data availability. Using DMV vehicle registration data, ARB delineated and quantified the red-sticker population by make, model and engine type (two-stroke vs. four-stroke). In addition, ARB used estimated sales for the 2011 and 2012 model years as an indicator of model popularity in out years. Based on these data sets, ARB identified manufacturers with the most significant market shares in California. Subsequent to identifying applicable manufacturers, staff generated a preliminary matrix of OHMCs that included the most prominent two- and four-stroke model from each make. This resulted in a 50/50 distribution between two- and four-stroke RSOHMCs. Detailed rationales on OHMC selection criteria are given in Attachment #1 of this test plan. The final test vehicle matrix is shown in the following table.

Proposed Test Vehicle Matrix

Vehicle Category	Model Year Range	Make	Model	Engine Type	Fuel Delivery System
Red Sticker OHMCs	2009 – 2014	Honda	CRF450R	4-Stroke	EFI**
	2012 – 2014	Honda	CRF150R	4-Stroke	Carbureted
	2011 – 2014	Kawasaki	KX250F	4-Stroke	EFI
	2012 – 2014	Kawasaki	KX85	2-Stroke	Carbureted
	2012 – 2014	KTM	300 XC	2-Stroke	Carbureted
	2011 – 2014	KTM	250 SX-F	4-Stroke	EFI
	2012 – 2014	KTM	SX 50	2-Stroke	Carbureted
	2008 – 2014	Suzuki	RMZ450	4-Stroke	EFI
	2010 – 2014	Yamaha	YZ450F	4-Stroke	EFI
	2012 – 2014	Yamaha	YZ250	2-Stroke	Carbureted
	2012 – 2014	Yamaha	YZ125	2-Stroke	Carbureted
	2000*	Suzuki	RM250	2-Stroke	Carbureted
Green Sticker OHMCs	2012-2014	Yamaha	WR450F	4-Stroke	EFI
	2012-2014	Honda	CRF250X	4-Stroke	Carbureted
	2012-2014	KTM	250XCF-W	4-Stroke	EFI
	2003*	Honda	XR50R	4-Stroke	Carbureted
	2007*	Yamaha	WR250FW	4-Stroke	Carbureted
	2007*	Honda	CRF450X7	4-Stroke	Carbureted

* ARB's Fleet Vehicles

** Electronic Fuel Injection

TEST VEHICLE SCREENING PROCESS

ARB will test both unmodified and modified OHMCs. With respect to this test plan, "OEM stock or unmodified" and "modified" refers to OHMC components that could have an effect on exhaust or evaporative emissions. Alterations to suspension, hand and foot controls, lighting, etc. are not of concern.

A. OEM Stock OHMCs

In order to ensure that in-use OHMCs, representing the "OEM stock" categories, remain true to that characteristic, ARB will exercise several safeguards to ensure their suitability for testing.

Prior to acceptance into the test fleet, ARB will conduct a two stage screening process. Stage one involves requesting potential participants to fill out a vehicle screening questionnaire. The questionnaire requests participants to disclose their engine break-in procedures, modifications that potentially effect emissions and operator safety, as well

as asking participants to disclose their preferential fuels and pre-mix ratios, etc. Responses that delineate modifications suspected of having an effect on exhaust and/or evaporative emissions, operator safety or suitability for emission testing will either preclude OHMCs from the inclusion of the "OEM stock" sample set or exclude OHMCs from testing all together. The same criteria will apply to OHMCs whose owners insist on non-OEM pre-mix ratios and/or unconventional fuels.

Candidate OHMCs that pass stage one screening will be advanced to stage two screening which involves vehicle verification and field inspection prior to final acceptance into ARB's test fleet. Subsequent to testing, should one of these bikes demonstrate uncharacteristically high emission levels, ARB will administer a cylinder leak-down test.

B. Modified OHMCs

OHMCs representing the "modified" categories will be subject to the same screening processes as their OEM stock counterparts. However, these vehicles will not be excluded based on their emissions related modifications, non-OEM 2-cycle pre-mix ratios or use of unconventional fuels. "Modified" OHMCs will be excluded on the basis of structural alterations and field inspection results that might impact safety.

When necessary, ARB will perform incidental repairs using stock OEM parts or their aftermarket equivalent. However, all repairs will be limited to low-cost consumable components that include but are not limited to flexible fuel hoses and spark plugs. Although it is ARB's intent to minimize repairs, minor corrective actions may have to be taken due to safety concerns. See Attachment #2 for vehicle screening criteria.

TEST FUEL

Test fuel will be the California Phase III certification gasoline fuel containing 10 percent (E10) ethanol by volume. Phase III E10 certification fuel properties are specified in "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles" Section II.A.100.3.1.2. [2]. Fuel samples will be analyzed for physical and chemical properties. A fuel analysis will be conducted at the beginning and at the end of this project if the same batch of fuel is used. Additionally, a fuel analysis will be conducted if a new batch is used during the course of testing.

TWO-CYCLE LUBRICANT OILS

Unlike their four-stroke counterparts, two-stroke engines do not rely on a bath of motor oil to lubricate the piston and rings from below. Instead, two-stroke engines rely on a fuel-oil mixture for lubricity. Motorcycle lubricant manufacturers offer a variety of two-cycle oils consisting of castors, full synthetics, semi-synthetic and synthetic esters. With respect to the two-stroke OHMCs representing OEM stock vehicles, ARB will

combine E10 certification fuel with two-cycle oils of an engineering specification and ratio specified by the vehicle manufacturer. Two-stroke OHMCs representing the modified segment will receive pre-mix fuels consisting of a two-cycle oil, blending ratio and fuel specified by the vehicle owner. OHMC from ARB's vehicle fleet will be tested to evaluate the effect of two-cycle lubricant oils.

TEST CYCLES

The primary test cycle for measuring exhaust emissions is the three-phase Federal Test Procedure (FTP) cycle, which consists of a cold start Urban Dynamometer Driving Schedule (UDDS) and a hot start transient phase specified in 40 CFR §86.515-78 (a) (Part 86, Appendix I (c) for Class 1 MCs and Appendix I (b) for Class II and Class III MCs). In addition, selected OHMCs will be tested for the Supplemental FTP cycle (SFTP).

TEST PROJECT DURATION

Approximately four months of continuous testing will be needed for staff to complete the testing for all test vehicles. To account for unforeseen delays and other demands on test cell resources, two additional months have been included in the project timeline. Testing is scheduled to start in March 2014 and is projected to be completed in August 2014. Because of the lengthy fuel preconditioning requirements, vehicle procurement should start as soon as the test plan is approved.

EMISSION TESTING AND TEST PROCEDURE REFERENCES

Each OHMC will be tested for tailpipe exhaust and evaporative emissions. Tailpipe exhaust emission testing will be performed on a chassis dynamometer and constant volume sampler (CVS) system which meets the requirements in the 40 CFR Part 86 [3] for motorcycle testing. Evaporative emissions are directly measured with a hydrocarbon analyzer in a sealed testing enclosure following a defined temperature profile while maintaining atmospheric pressure. Test vehicles are subject to running loss and hot soak preconditioning followed by a three-day diurnal evaporative test. Running loss evaporative emission tests will require modification of the OHMC's air intake system. Test procedure references for exhaust and evaporative tests are listed below:

1. California Evaporative Emissions Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles, December 6, 2012.
2. Title 13 California Code of Regulations §1958, "Exhaust Emission Standards and Test Procedures – Motorcycles and Motorcycle Engines Manufactured on or after January 1, 1978".
3. ARB Test Procedure TP-933: Test Procedure for Determining Evaporative Emissions from Off-Highway Recreational Vehicles.
4. 40 CFR Part 86 Subparts B, E and F.

VEHICLE PRECONDITIONING

A. Pre-Test Fuel Soak

Following vehicle check-in, all OHMCs will be exposed to a fuel soak period. The soaking process is necessary to expose each vehicle's fuel storage and induction system to applicable test fuels prior to testing. The duration of the soak will differ for new and in-use OHMCs. New OHMCs will be soaked for 140 days to fully precondition the fuel system components, while in-use OHMCs, whose fuel system has already been preconditioned with fuel, will be soaked for 30 days only. Vehicle preconditioning will be performed by the staff from the Laboratory Logistics and Test Support Section (LLTSS).

Soak Procedures:

1. Fill the fuel tank to nominal capacity with test fuel.
2. Securely install the fuel cap within 1 minute of filling the fuel tank.
3. Place the OHMC on the dynamometer, start the engine and run at steady state speed of 20 miles per hour for 10 minutes.
4. Shut-down the engine and close the fuel pet cock (if equipped). Begin the soak period. New OHMCs will be soaked for 3360 hours (140 days), while in-use OHMCs will be soaked for only 720 hours (30 days).
5. Throughout the soak period, ambient temperatures must remain between 68°F – 86°F.
6. Record start and end day of the pre-test soak period in the chain-of-custody form (Attachment #3).

B. Normal Vehicle Preconditioning

After the pre-test fuel soak period is complete, the following OHMC preconditioning procedures should be followed:

1. Drain fuel and re-fill tank to 50% capacity with test fuel.
2. Verify that the pressure of the drive tire(s) is set to the pressure specified by manufacturer.
3. Perform one preconditioning UDDS cycle on the OHMC as specified in 40 CFR §86.515-78 (a) [Part 86, Appendix I (c) for Class 1 MCs and Appendix I (b) for Class II and Class III MCs] [4]. Use the equivalent inertial mass (EIM) for each OHMC. The dynamometer coefficients must be confirmed based on the specified EIM with 40 CFR §86.529-98 (b) figure F98-9 prior to vehicle preconditioning.
4. Push the test vehicle into cold soak area and soak (6 to 36 hours for Class I OHMCs, 8 to 36 hours for Class II OHMCs, and 12 to 36 hours for Class III OHMCs) at 68°F to 86°F (20° C to 30° C). Remove the test vehicle key from the ignition and keep it in the LLTSS.

VEHICLE EMISSION TESTING

A. Tailpipe Exhaust Emissions

At the end of the cold soak period, the test vehicle should be pushed to the chassis dynamometer and tested for exhaust emissions.

1. Ensure that connections between the OHMC tailpipe and sampling equipment are leak-tight.
2. Perform a cold start FTP exhaust emissions test cycle by operating the OHMC through one UDDS cycle, and then perform one hot start transient phase within 10 minutes ± 60 seconds of completion of the cold start test.
3. Pollutants to be measured for each phase of the FTP cycle: total hydrocarbons (THC), non-methane hydrocarbons (NMHC), methane (CH_4), carbon monoxide (CO), carbon dioxide (CO_2), and nitrogen oxides (NO_x).
4. Three valid tests will be required on each OHMC. A prior day FTP test can be used as vehicle preconditioning cycle for the following day FTP test.
5. For selected OHMCs, three SFTP tests will be performed after three valid FTP tests are completed. For each SFTP test, gaseous emissions including THC, NMHC, CH4, CO, CO2 and NOx will be measured.

B. Evaporative Emissions

Evaporative emission testing will be conducted in a sealed housing for evaporative determination (SHED) enclosure located in ARB's HSL testing facility. Test procedures for evaporative emission testing will follow requirements specified in ARB TP-933 [5] and 40 CFR Part 86. For OHMCs scheduled to be tested for hot soak and diurnal emissions without a running loss test, the following procedures will be followed:

1. If a foam-type air filter is used on the OHMC, and the air filter is cleaned prior to testing, the OHMC will be soaked for 7 days at a temperature of 95 °F to bake off excess hydrocarbons on the filter.
2. Drain and refill the fuel tank of the vehicle to 50% with test fuel.
3. Soak the vehicle for 12 to 36 hours between the end of the refueling and the start of the cold start preconditioning cycle.
4. During the soak period, perform a tip test for carbureted OHMCS. The tip test procedures are specified in Section C for fuel system leakage tip test.
5. Perform a cold start and a hot start UDDS preconditioning cycle on the dynamometer.
6. The hot soak test must be performed in the SHED within 7 minutes of the completion of the UDDS hot start cycle.
7. Turn off all engine cooling fans when the engine is turned off.
8. During the time between the end of the UDDS hot start cycle and the beginning of the hot soak test, the engine is allowed to be shut off for no more than 4 minutes immediately preceding the start of the hot soak test.

9. Soak the OHMC at 86°±3°F for 90±0.5 minutes.
10. The procedures for measuring hydrocarbon concentrations in the SHED will follow 40 CFR §86.138-96 [6].
11. Upon completion of the hot soak test, proceed to the diurnal test.
12. Begin the three-day diurnal tests by lowering the temperature of the SHED in which the diurnal test will be performed to 72°±3°F within 60 minutes of completing the hot soak test.
13. The diurnal soak period is 6 to 36 hours at 72°±3°F between the end of the hot soak test and the start of the diurnal emission test.
14. Perform the three-day diurnal tests following the procedure described in 40 CFR §86.133-96 [7], incorporated references with ARB TP-933 Section 6.4.1.
15. One complete valid hot soak and diurnal test should be performed. Additional repeat tests may be requested on a vehicle by vehicle basis.

For OHMCs scheduled to be tested for running loss, hot soak, and diurnal emission tests, the following steps shall be performed:

1. The fuel tank of the OHMC to be tested shall be drained and refilled to 50% with test fuel.
2. Soak the OHMC for at least 6 hours after being refueled. Following this soak period, conduct a refueling cycle by running the test vehicle through one UDDS driving cycle.
3. Drain and refill the fuel tank of the test vehicle to 50% with test fuel.
4. Soak the OHMC for 12 to 36 hours between the end of the refueling and the start of the cold start preconditioning cycle.
5. During the soak period, perform a tip test for carbureted OHMCS. The tip test procedures are specified in Section C for fuel system leakage tip test.
6. The location and speed of a fan used to cool the OHMC must comply with the requirements described in Appendix B of ARB TP-933.
7. Perform a cold start UDDS and a hot start transient phase driving cycle on the dynamometer with 10 minutes ±1 minute soak time in between the cold and the hot start UDDS tests.
8. The procedures for measuring hydrocarbon concentrations in the SHED, as well as temperatures and other parameters will follow 40 CFR §86.134-96 [8] for running loss tests.
9. Following the completion of the running loss test, proceed to hot soak and diurnal tests as described in the previous steps for hot soak and diurnal tests without the vehicle preconditioning.

C. Fuel System Leakage Tip Test

The tip testing will be conducted only for carbureted OHMCs and should be performed in the soak period of normal vehicle pre-conditioning by staff from the LLTSS. Set-up requires connecting the carburetor or fuel tank vent lines to an enclosed reservoir made of nonabsorbent gasoline resistant material. The reservoir should be placed such that all lines connected to it from the vehicle's fuel system components drain into the

canister when the OHMC is in both its upright and tipped position. Place a catch pan lined with an absorbent pad under the OHMC while the tip test is being conducted. The catch pan must be designed so that any spillage emissions that are not captured by the reservoir are contained in the catch pan.

Total emissions from the tip test will be determined by measuring the weight change for the reservoir and catch pan with pad.

Tip Test Procedure:

1. Measure the initial weight of the reservoir and catch pan with pad (tare weight).
2. Connect all vent lines from the fuel system components to the reservoir.
3. Drain and fill the fuel tank to 50% of nominal capacity.
4. Open the fuel tank petcock if equipped, and allow time for the float bowl to fill.
5. Place a catch pan and pad below the motorcycle.
6. In less than two seconds, tip the OHMC over to 30±2 degrees and hold it there for a 60 to 70 seconds following ARB TP-933 6.1.1 and 6.1.2.
7. Record the time the OHMC was tipped at 30±2 degrees.
8. Repeat steps (5) and (6), but tip the OHMC to the opposite side.
9. Upon completion, immediately disconnect the reservoir and measure the final weight from the reservoir and catch pan with pad.
10. Subtract the post-test weight from the tare weight to calculate the resulting emissions.

The estimated test durations and test sequences for exhaust and evaporative emission testing is provided in Attachment #4.

QUALITY ASSURANCE/QUALITY CONTROL

Staff from the Laboratory Testing Support Section will validate quality assurance/quality control data for background, recovery and retention checks to ensure that the testing enclosure and analyzers associated with the analytical bench meet the requirements of 40 CFR Part 86. All standards used in the verification of temperature, pressure, flow and concentration must carry a current calibration certification. In addition, all fuels used for testing will be evaluated by ARB's Chemical Analysis and Emissions Research Branch to ensure they meet the specifications delineated in "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles" Section II.A.100.3.1.2 Quality Assurance/Quality Control.

The SHED temperature data is collected on a minute by minute basis. The engineer conducting the testing will monitor the temperature in order to identify temperature data that is operating outside of the specified parameters specified in the 40 CFR Part 86. This temperature data will be flagged by the engineer. The engineer must then determine if the flagged data should be accepted or rejected.

DATA REPORTING FROM TEST ENGINEERS

The test engineers, using ARB's standard operating procedures in order to ensure a valid test, will review each exhaust test, the emission results, presence of violations, and other critical parameters. They will notify the project engineer immediately regarding any problems with the test data for further instructions. If a test is aborted, or invalid data is identified by the test engineers, the test will be repeated. Reasons for test aborts also will be documented. The test engineers will verify each test result and provide the testing information from each OHMC to the project engineers. The project engineers will be responsible for validation of each test on VTS and prepare a project summary within 60 days of receiving emissions data.

PROJECT CONTACTS

The test engineers may contact the project engineers by e-mail or phone if there are any questions requiring a change to tests or sequences for a given test vehicle. The project engineers and test engineers can be contacted by phone or by e-mail.

Project Engineers:
MLD Project Lead: Sherry Zhang szhang@arb.ca.gov (626)350-6400
MLD Project Engineer: Whitney Okabayashi wokabaya@arb.ca.gov (916) 324-3997

Test Engineers:
ECARS Exhaust Testing Engineer: Travis Wong wtravis@arb.ca.gov (626) 350-6517
ECARS SHED Testing Engineer: Brian Weitz bweitz@arb.ca.gov (626) 350-6589

REFERENCES

1. ARB Red Sticker Off-Highway Recreational Vehicle (OHRV) Workshop, December 2013
2. California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles
3. 40 CFR Part 86 Subparts B, E and F
4. 40 CFR §86.515-78 U.S.EPA Urban Dynamometer Driving Schedule
5. ARB Test Procedures TP-933: Test Procedure for Determining Evaporative Emissions from Off-Highway Recreational Vehicles
6. 40 CFR §86.138-96 Hot soak test
7. 40 CFR §86.133-96 Diurnal emission test
8. 40 CFR §86.134-96 Running loss test

Attachment #1: Test Vehicle Selections

Although the RSOHRV program was promulgated in 1998, issuance of the red registration stickers did not begin until 2003. As such, for this test program, OHMCs were selected using DMV registration data for 2004-2012 model year vehicles. Since 2004 marks the first full year of red-sticker implementation, that year was selected as the starting point with 2012 being the most recent year of DMV data availability. Using software capable of deciphering vehicle identification codes (VIN) ARB delineated and quantified the RSOHMC population by make, model and engine type (two-stroke vs. four-stroke). In addition, ARB used estimated sales for the 2011 and 2012 model years as an indicator of model popularity in out years. Based on these data sets, ARB identified manufacturers with the most significant market shares in California. Subsequent to identifying applicable manufacturers, staff generated a preliminary matrix of OHMCs that included the most prominent two- and four-stroke model from each make. This resulted in a 50/50 distribution between two- and four-stroke RSOHMCs. Although ARB concedes that consumer preference has shifted toward four-stroke engines, new two-stroke vehicles remain in the product lines of several manufacturers. In addition, two-cycle exhaust emissions test results from other engine categories have historically demonstrated considerable variability. Repeat testing will generate additional data that will improve ARB's confidence in emissions measurement.

After its initial development, ARB re-evaluated the OHMC matrix and identified models known to be discontinued (Honda CR250R and Suzuki RM250). While the CR250R was removed from the matrix, the RM250 remains. The RM250 ceased production after the 2008 model year, but remains in the matrix since it is a vehicle already owned by ARB. It will serve as an additional data point in the two-stroke side of the RSOHMC sample set. Once ARB had narrowed its matrix down to current production vehicles, it then evaluated the extent to which engine displacement categories were represented. The following additions were made:

- KTM 300XC supplants the discontinued Honda CR250R
- Honda CRF150R was added as the four-stroke counterpart to the 80/85cc two-cycle category
- Yamaha YZ250 was added to represent modern 250cc two-strokes
- Yamaha YZ125 supplants the PW50 to represent modern 125cc two-strokes

The final test vehicle matrix is depicted in the following table.

Proposed Test Vehicle Matrix

Vehicle Category	Model Year Range	Make	Model	Engine Type	Fuel Delivery System
Red Sticker OHMCs	2009 – 2014	Honda	CRF450R	4-Stroke	EFI**
	2012 – 2014	Honda	CRF150R	4-Stroke	Carbureted
	2011 – 2014	Kawasaki	KX250F	4-Stroke	EFI
	2012 – 2014	Kawasaki	KX85	2-Stroke	Carbureted
	2012 – 2014	KTM	300 XC	2-Stroke	Carbureted
	2011 – 2014	KTM	250 SX-F	4-Stroke	EFI
	2012 – 2014	KTM	SX 50	2-Stroke	Carbureted
	2008 – 2014	Suzuki	RMZ450	4-Stroke	EFI
	2010 – 2014	Yamaha	YZ450F	4-Stroke	EFI
	2012 – 2014	Yamaha	YZ250	2-Stroke	Carbureted
	2012 – 2014	Yamaha	YZ125	2-Stroke	Carbureted
	2000*	Suzuki	RM250	2-Stroke	Carbureted
Green Sticker OHMCs	2012-2014	Yamaha	WR450F	4-Stroke	EFI
	2012-2014	Honda	CRF250X	4-Stroke	Carbureted
	2012-2014	KTM	250XCF-W	4-Stroke	EFI
	2003*	Honda	XR50R	4-Stroke	Carbureted
	2007*	Yamaha	WR250FW	4-Stroke	Carbureted
	2007*	Honda	CRF450X7	4-Stroke	Carbureted

* ARB's Fleet Vehicles

** Electronic Fuel Injection

Model year ranges associated with EFI equipped OHMCs are specific to those years in which fuel injection was offered as standard equipment. With respect to most two-stroke and carbureted vehicles, the model years correspond with the last three years of product availability. The only exception is the 2000 Suzuki RM250, which appears in the matrix as an extra data point due to its presence in ARB's existing test fleet. With respect to the GSOHMCs, all vehicles (with the exception of the Honda XR50) were selected based on their performance, which is similar to their RSOHMC counterparts.

Attachment #2: Pre-Test Vehicle Screening

All in-use vehicles will be subject to a pre-acceptance screening. Vehicles representing the OEM stock category will be evaluated against criteria A thru J, while vehicles of the modified category will be evaluated against criteria I thru J. Structural alterations and certain symptoms of inadequate maintenance will automatically exclude any vehicle from selection.

A. Fuel Storage

The following fuel storage modifications will automatically preclude vehicles from testing unless the owner can restore the OHMC to stock OEM configuration prior to ARB acceptance:

1. Auxiliary fuel tanks
2. Non-OEM oversized fuel tanks (e.g. desert tanks)

B. Air Intake

The following air intake modifications will automatically preclude vehicles from testing unless the owner can restore the OHMC to stock OEM configuration prior to ARB acceptance:

1. Aftermarket high flow air filter
2. Air box vents
3. Removed air box lid
4. Removed air box (i.e. air filter connected direct to carb. or throttle body)

C. Exhaust System

The following exhaust system modifications will automatically preclude vehicles from testing unless the owner can restore the OHMC to stock OEM configuration prior to ARB acceptance:

1. Aftermarket performance silencer/muffler
2. Aftermarket head pipe or expansion chamber
3. Air-injection block-off kit

D. Ignition System

The aftermarket programmable CDI ignition system modifications will automatically preclude vehicles from testing unless the owner can restore the OHMC to stock OEM configuration prior to ARB acceptance:

E. Fuel Delivery and Induction Systems

The following fuel delivery and induction system modifications will automatically preclude vehicles from testing unless the owner can restore the OHMC to stock OEM configuration prior to ARB acceptance:

1. Carburetor re-jetting
2. Aftermarket performance accelerator pump
3. Aftermarket performance float bowl
4. Carburetor air flow manipulator (e.g. x-wing)
5. Carburetor or throttle body boring
6. Carburetor or throttle body polishing
7. Aftermarket velocity stack
8. Remapped or aftermarket programmable ECU
9. Aftermarket performance reeds and/or reed blocks
10. Non-OEM carburetor or throttle body

F. Engine Internal

The following internal engine modifications will automatically preclude OHMCs from testing:

1. Aftermarket performance cam shafts
2. High compression piston and/or big bore kit
3. Modified cylinder heads (porting, polishing, milling, re-chambering, etc.)
4. Modified valve trains (e.g. performance springs, lighter valves, oversized valves etc.)
5. Lightened connecting rod
6. Modified crank shaft (e.g. polished, lightened, balanced, etc.)
7. Re-stroking

G. Drive Train

The non-OEM front and rear sprocket sizes drive train modifications will automatically preclude OHMCs from testing unless the owner can restore the OHMC to stock OEM configuration prior to ARB acceptance:

H. General Maintenance Issues

In addition to flagging certain non-OEM components, ARB will also screen each in-use vehicle for structural modifications and maintenance deficiencies that could either preclude a vehicle from dynamometer testing or present a safety risk to staff. Cracked or leaking fuel lines will not preclude vehicles from testing if they can be repaired to OEM configuration. However, supermoto conversions with license plates

and OHMCs structurally altered for hill climbing will be eliminated from consideration.

I. General Maintenance Disqualifiers

Prior to acceptance into ARB's test fleet, all OHMCs will be subjected to:

1. An operational field verification to ensure that the OHMCs are in good operating condition
2. Motorcycle Safety Foundation's (MSF) T-CLOCS safety inspection

Attachment #3: Chain-of-Custody Form
(under development)

Attachment #4: Test Sequence and Duration Matrices

Exhaust Emission Testing

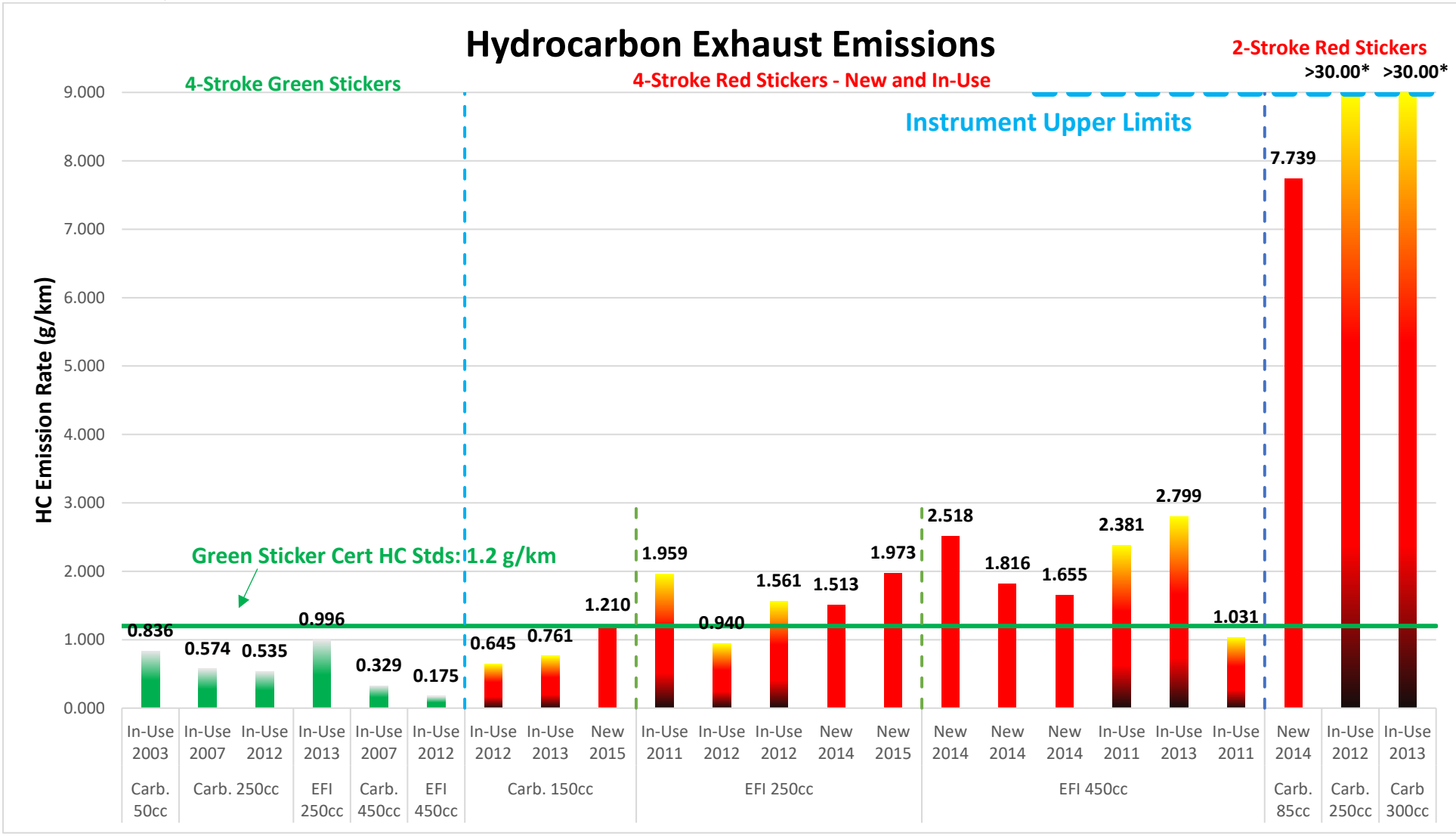
	Monday	Tuesday	Wednesday	Thursday	Friday
Week1	QC/Veh. Prep.	FTP1-Veh.1	FTP2-Veh.1	FTP3-Veh.1	SFTP1-3*
	QC/Veh. Prep.	FTP1-Veh.2	FTP2-Veh.2	FTP3-Veh.2	
Week2	QC/Veh. Prep.	FTP1-Veh.3	FTP2-Veh.3	FTP3-Veh.3	SFTP1-3*
	QC/Veh. Prep.	FTP1-Veh.4	FTP2-Veh.4	FTP3-Veh.4	
Week3	QC/Veh. Prep.	FTP1-Veh.5	FTP2-Veh.5	FTP3-Veh.5	SFTP1-3*
	QC/Veh. Prep.	FTP1-Veh.6	FTP2-Veh.6	FTP3-Veh.6	
Week4	QC/Veh. Prep.	FTP1-Veh.7	FTP2-Veh.7	FTP3-Veh.7	SFTP1-3*
	QC/Veh. Prep.	FTP1-Veh.8	FTP2-Veh.8	FTP3-Veh.8	
Week5	QC/Veh. Prep.	FTP1-Veh.9	FTP2-Veh.9	FTP3-Veh.9	SFTP1-3*
	QC/Veh. Prep.	FTP1-Veh.10	FTP2-Veh.10	FTP3-Veh.10	
Week6	QC/Veh. Prep.	FTP1-Veh.11	FTP2-Veh.11	FTP3-Veh.11	SFTP1-3*
	QC/Veh. Prep.	FTP1-Veh.12	FTP2-Veh.12	FTP3-Veh.12	
Week7	QC/Veh. Prep.	FTP1-Veh.13	FTP2-Veh.13	FTP3-Veh.13	SFTP1-3*
	QC/Veh. Prep.	FTP1-Veh.14	FTP2-Veh.14	FTP3-Veh.14	
Week8	QC/Veh. Prep.	FTP1-Veh.15	FTP2-Veh.15	FTP3-Veh.15	SFTP1-3*
	QC/Veh. Prep.	FTP1-Veh.16	FTP2-Veh.16	FTP3-Veh.16	
Week9	QC/Veh. Prep.	FTP1-Veh.17	FTP2-Veh.17	FTP3-Veh.17	SFTP1-3*
	QC/Veh. Prep.	FTP1-Veh.18	FTP2-Veh.18	FTP3-Veh.18	

* For selected OHMCs only

Evaporative Emission Testing

	Monday	Tuesday	Wednesday	Thursday	Friday
Week2	QC	Veh.1	Veh.1	Veh.1	Test Makeup
Week3	QC	Veh.2	Veh.2	Veh.2	Test Makeup
Week4	QC	Veh.3	Veh.3	Veh.3	Test Makeup
Week5	QC	Veh.4	Veh.4	Veh.4	Test Makeup
Week6	QC	Veh.5	Veh.5	Veh.5	Test Makeup
Week7	QC	Veh.6	Veh.6	Veh.6	Test Makeup
Week8	QC	Veh.7	Veh.7	Veh.7	Test Makeup
Week9	QC	Veh.8	Veh.8	Veh.8	Test Makeup
Week10	QC	Veh.9	Veh.9	Veh.9	Test Makeup
Week11	QC	Veh.10	Veh.10	Veh.10	Test Makeup
Week12	QC	Veh.11	Veh.11	Veh.11	Test Makeup
Week13	QC	Veh.12	Veh.12	Veh.12	Test Makeup
Week14	QC	Veh.13	Veh.13	Veh.13	Test Makeup
Week15	QC	Veh.14	Veh.14	Veh.14	Test Makeup

Released March 5, 2019



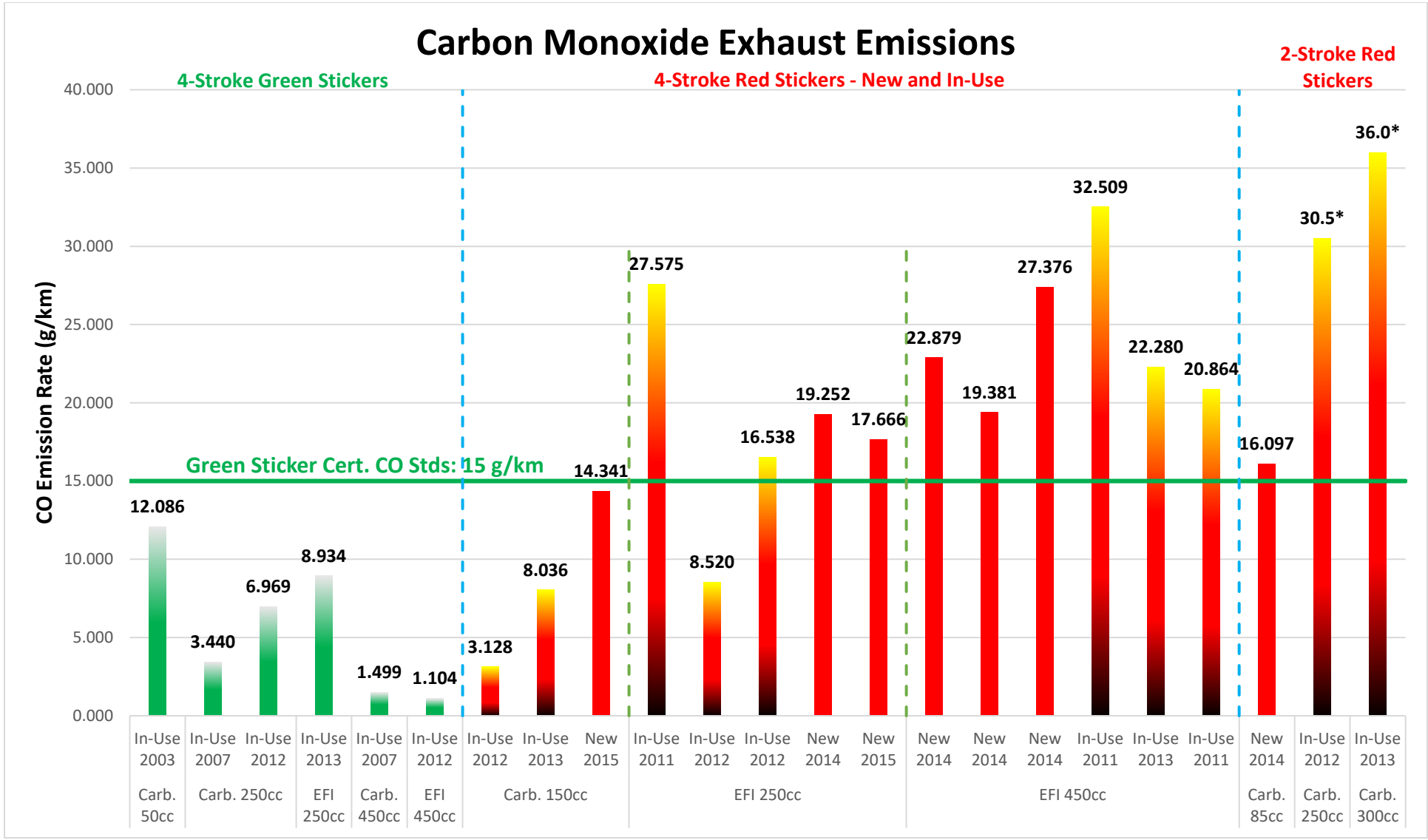
* One Test Only

In-use Green Sticker New Red Sticker In-use Red Sticker

Average HC Emissions:

4S In-Use Green Stickers:	0.57 g/km
4S in-Use Red Stickers:	1.63 g/km
4S New Red Stickers:	2.63 g/km

Carbon Monoxide Exhaust Emissions



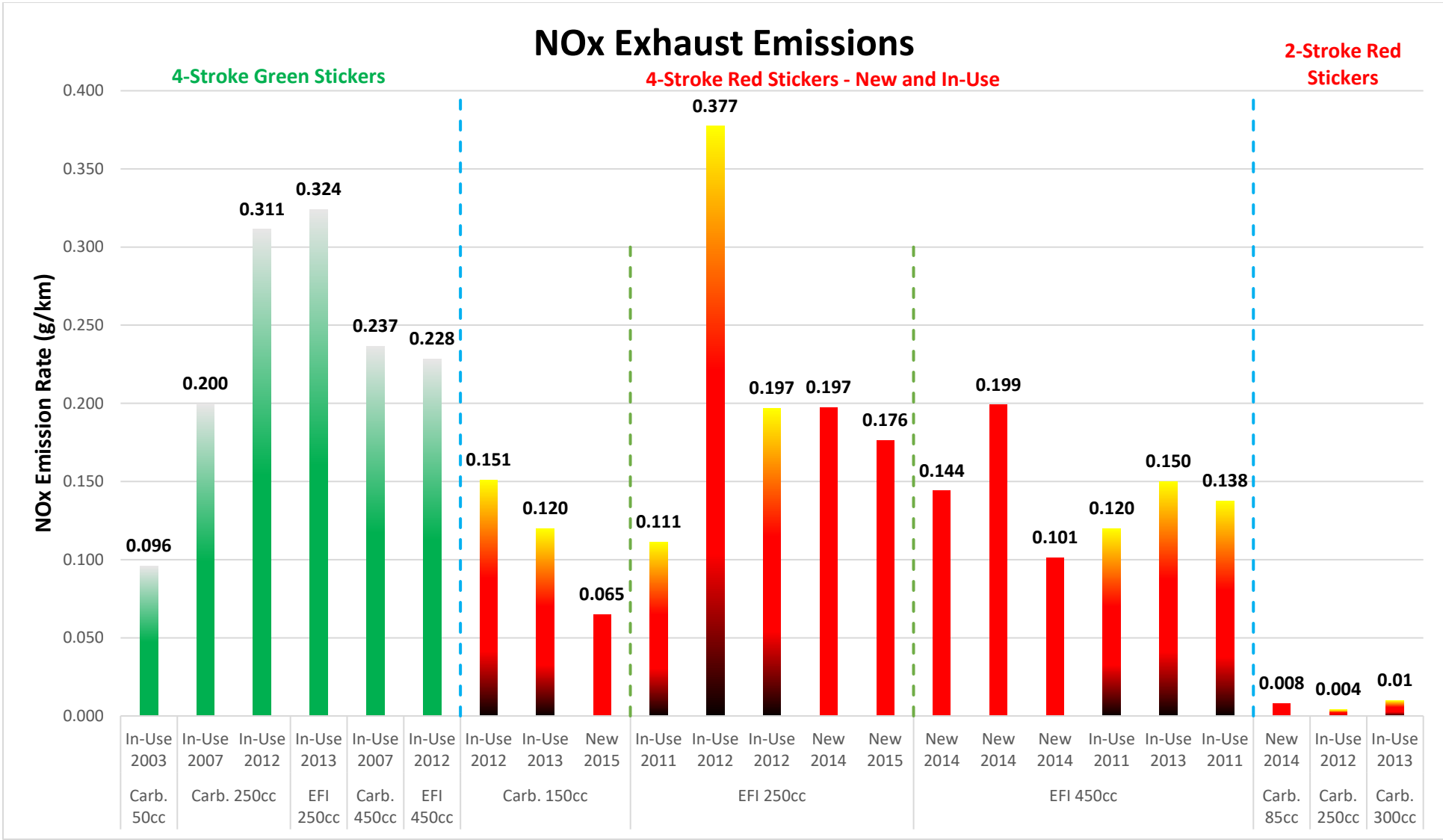
* One Test Only

In-use Green Sticker New Red Sticker In-use Red Sticker

Average CO Emissions:

4S In-Use Green Stickers:	5.67 g/km
4S in-Use Red Stickers:	17.43 g/km
4S New Red Stickers:	19.57 g/km
2S Red Stickers:	27.53 g/km

NOx Exhaust Emissions

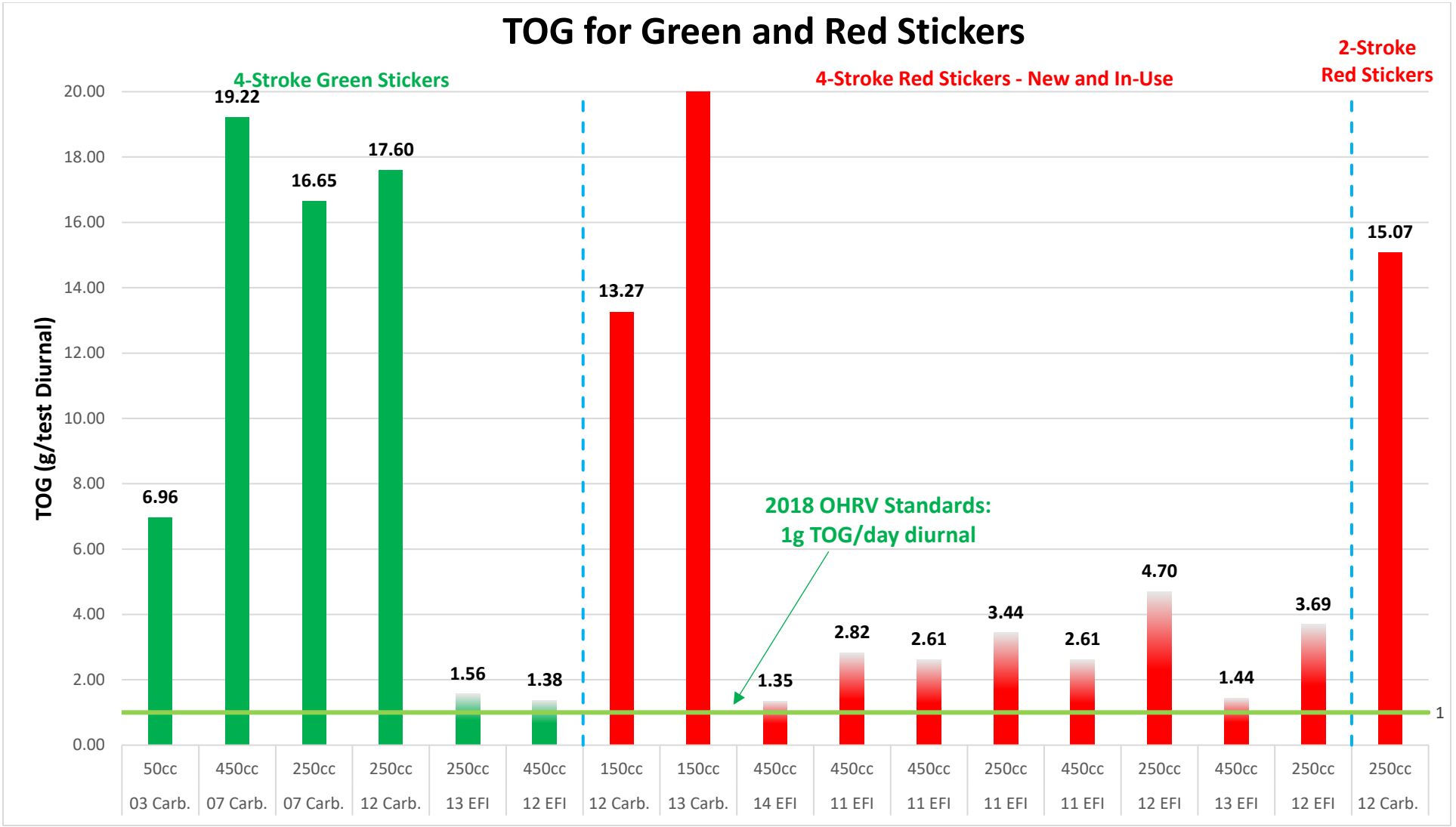


In-use Green Sticker New Red Sticker In-use Red Sticker

Average NOx Emissions:

4S In-Use Green Stickers:	0.233 g/km
4S in-Use Red Stickers:	0.173 g/km
4S New Red Stickers:	0.127 g/km
2S Red Stickers:	0.007 g/km

TOG for Green and Red Stickers



Carbureted Green Sticker | EFI Green Sticker | Carbureted Red Sticker | EFI Red Sticker

Average TOG Emissions:

Carbureted Green Stickers:	15.11 g/test
EFI Green Stickers:	1.47 g/test
Carbureted Red Stickers:	16.56 g/test
EFI Red Stickers:	2.83 g/test

Motorcycle 1

Manufacturer: A
Engine Type: 4-Stroke
Displacement: 49cc
Delivery Date: At Lab

Model Year: 2003
Fuel Delivery System: Carbureted
Vehicle Condition: CARB Fleet
Sticker: Green

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 5/6/2014	2nd Test 5/7/2014	3rd Test 5/7/2014	Average	Max
HC (g/km)	1.2	0.847	0.837	0.824	0.836	0.847
CO (g/km)	15	12.477	11.841	11.940	12.086	12.477
NOx (g/km)	N/A	0.096	0.095	0.097	0.096	0.097
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested

This vehicle completed all exhaust tests and was not tested for evaporative emissions

Motorcycle 2

Manufacturer: A
Engine Type: 4-Stroke
Displacement: 449cc
Delivery Date: At Lab

Model Year: 2007
Fuel Delivery System: Carbureted
Vehicle Condition: CARB Fleet
Sticker: Green

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 5/16/2014	2nd Test 5/21/2014	3rd Test 5/22/2014	Average	Max
HC (g/km)	1.2	0.324	0.333	0.329	0.329	0.333
CO (g/km)	15	1.596	1.422	1.479	1.499	1.596
NOx (g/km)	N/A	0.236	0.238	0.236	0.237	0.238
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested

This vehicle completed all exhaust tests and was not tested for evaporative emissions

Motorcycle 3

Manufacturer: B
Engine Type: 2-Stroke
Displacement: 249cc
Delivery Date: At Lab

Model Year: 2000
Fuel Delivery System: Carbureted
Vehicle Condition: CARB Fleet
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test N/A	2nd Test N/A	3rd Test N/A	Average	Max
HC (g/km)	1.2	N/A	N/A	N/A	N/A	N/A
CO (g/km)	15	N/A	N/A	N/A	N/A	N/A
NOx (g/km)	N/A	N/A	N/A	N/A	N/A	N/A
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested

This vehicle was not tested as it was in repair

Motorcycle 4

Manufacturer: C
Engine Type: 4-Stroke
Displacement: 249cc
Delivery Date: At Lab

Model Year: 2007
Fuel Delivery System: Carbureted
Vehicle Condition: CARB Fleet
Sticker: Green

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 5/16/2014	2nd Test 5/20/2014	3rd Test 5/21/2014	Average	Max
HC (g/km)	1.2	0.576	0.608	0.608	0.597	0.608
CO (g/km)	15	3.275	3.334	3.710	3.440	3.710
NOx (g/km)	N/A	0.289	0.026	0.284	0.200	0.284
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested

This vehicle completed all exhaust tests and was not tested for evaporative emissions

Motorcycle 5

Manufacturer: B
Engine Type: 4-Stroke
Displacement: 449cc
Delivery Date: At Lab

Model Year: 2014
Fuel Delivery System: EFI
Vehicle Condition: CARB Fleet
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 5/28/2014	2nd Test 5/29/2014	3rd Test N/A	Average	Max
HC (g/km)	1.2	2.558	2.478	N/A	2.518	2.558
CO (g/km)	15	22.97	22.78	N/A	22.875	22.97
NOx (g/km)	N/A	0.140	0.148	N/A	0.144	0.148
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	0.151	1.266	1.177	1.122	1.188	1.266

Failed due to difficulty to kick start

Motorcycle 6

Manufacturer: D
Engine Type: 4-Stroke
Displacement: 449cc
Delivery Date: 5/27/2014

Model Year: 2014
Fuel Delivery System: EFI
Vehicle Condition: Leased
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 5/29/2014	2nd Test 6/3/2014	3rd Test 6/4/2014	Average	Max
HC (g/km)	1.2	1.748	1.932	1.769	1.816	1.932
CO (g/km)	15	16.41	21.76	19.97	12.086	21.76
NOx (g/km)	N/A	0.221	0.183	0.193	0.199	0.221
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested

This vehicle completed all exhaust tests and was not tested for evaporative emissions

Motorcycle 7

Manufacturer: A
Engine Type: 4-Stroke
Displacement: 449cc
Delivery Date: 5/27/2014

Model Year: 2014
Fuel Delivery System: EFI
Vehicle Condition: Leased
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 6/4/2014	2nd Test 6/5/2014	3rd Test 6/6/2014	Average	Max
HC (g/km)	1.2	1.591	1.667	1.706	1.655	1.706
CO (g/km)	15	25.63	28.84	27.65	27.373	28.84
NOx (g/km)	N/A	0.104	0.097	0.103	0.101	0.104
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested

This vehicle completed all exhaust tests and was not tested for evaporative emissions

Motorcycle 8

Manufacturer: E
Engine Type: 4-Stroke
Displacement: 250cc
Delivery Date: 6/10/2014

Model Year: 2014
Fuel Delivery System: Carbureted
Vehicle Condition: Leased
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 6/13/2014	2nd Test 6/17/2014	3rd Test 6/19/2014	Average	Max
HC (g/km)	1.2	1.495	1.475	1.570	1.513	1.570
CO (g/km)	15	19.39	18.73	19.65	19.257	19.65
NOx (g/km)	N/A	0.197	0.195	0.200	0.197	0.200
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested

This vehicle completed all exhaust tests and was not tested for evaporative emissions

Motorcycle 9

Manufacturer: D
Engine Type: 2-Stroke
Displacement: 85cc
Delivery Date: 6/10/2014

Model Year: 2014
Fuel Delivery System: Carbureted
Vehicle Condition: Leased
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 6/18/2014	2nd Test 6/20/2014	3rd Test 6/20/2014	Average	Max
HC (g/km)	1.2	8.264	7.426	7.526	7.739	8.264
CO (g/km)	15	16.33	16.01	15.95	16.097	16.33
NOx (g/km)	N/A	0.009	0.007	0.008	0.008	0.009
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested

This vehicle completed all exhaust tests and was not tested for evaporative emissions

Motorcycle 10

Manufacturer: C
Engine Type: 4-Stroke
Displacement: 449cc
Delivery Date: 7/16/2014

Model Year: 2012
Fuel Delivery System: EFI
Vehicle Condition: Procured
Sticker: Green

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 7/25/2014	2nd Test 7/31/2014	3rd Test 8/12/2014	Average	Max
HC (g/km)	1.2	0.166	0.161	0.199	0.175	0.199
CO (g/km)	15	1.090	1.062	1.161	1.104	1.161
NOx (g/km)	N/A	0.224	0.227	0.234	0.228	0.234
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	0.944	1.252	1.195	1.172	1.206	1.252

This vehicle completed all exhaust and evaporative emissions testing

Motorcycle 11

Manufacturer: A
Engine Type: 4-Stroke
Displacement: 149cc
Delivery Date: 8/4/2014
Model Year: 2012
Fuel Delivery System: Carbureted
Vehicle Condition: Procured
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 8/20/2014	2nd Test 8/21/2014	3rd Test 8/26/2014	Average	Max
HC (g/km)	1.2	0.645	0.640	0.651	0.645	0.651
CO (g/km)	15	3.424	3.091	2.87	3.128	3.424
NOx (g/km)	N/A	0.146	0.150	0.157	0.151	0.157
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	3.129	15.138	10.845	8.933	11.639	15.138

This vehicle completed all exhaust and evaporative emissions testing

Motorcycle 12

Manufacturer: E
Engine Type: 2-Stroke
Displacement: 293cc
Delivery Date: 8/4/2014
Model Year: 2013
Fuel Delivery System: Carbureted
Vehicle Condition: Procured
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test N/A	2nd Test N/A	3rd Test N/A	Average	Max
HC (g/km)	N/A	N/A	N/A	N/A	N/A	N/A
CO (g/km)	N/A	N/A	N/A	N/A	N/A	N/A
NOx (g/km)	N/A	N/A	N/A	N/A	N/A	N/A
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested

Failed to complete testing due to HC being too high

Motorcycle 13

Manufacturer: A
Engine Type: 4-Stroke
Displacement: 450cc
Delivery Date: 9/3/2014

Model Year: 2009
Fuel Delivery System: EFI
Vehicle Condition: Procured
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test N/A	2nd Test N/A	3rd Test N/A	Average	Max
HC (g/km)	N/A	N/A	N/A	N/A	N/A	N/A
CO (g/km)	N/A	N/A	N/A	N/A	N/A	N/A
NOx (g/km)	N/A	N/A	N/A	N/A	N/A	N/A
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested

Failed to complete test due to failed kick start

Motorcycle 14

Manufacturer: C
Engine Type: 4-Stroke
Displacement: 449cc
Delivery Date: 9/22/2014

Model Year: 2011
Fuel Delivery System: EFI
Vehicle Condition: Procured
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 9/25/2014	2nd Test 9/26/2014	3rd Test 10/1/2014	Average	Max
HC (g/km)	1.2	2.337	2.479	2.326	2.381	2.479
CO (g/km)	15	31.92	32.90	32.71	32.51	32.90
NOx (g/km)	N/A	0.117	0.121	0.122	0.120	0.122
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	0.833	2.597	2.455	2.372	2.475	2.597

This vehicle completed all exhaust and evaporative emissions testing

Motorcycle 15

Manufacturer: A
Engine Type: 4-Stroke
Displacement: 450cc
Delivery Date: 10/7/2014
Model Year: 2003
Fuel Delivery System: EFI
Vehicle Condition: Procured
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 10/17/2014	2nd Test 10/21/2014	3rd Test 10/22/2014	Average	Max
HC (g/km)	1.2	1.072	1.022	1.000	1.031	1.072
CO (g/km)	15	20.48	20.33	21.79	20.867	21.79
NOx (g/km)	N/A	0.130	0.142	0.138	0.137	0.142
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	0.340	2.437	2.269	2.175	2.294	2.437

This vehicle failed the test due to kick start taking too long, and engine stall.

Motorcycle 16

Manufacturer: D
Engine Type: 4-Stroke
Displacement: 250cc
Delivery Date: 10/7/2014
Model Year: 2011
Fuel Delivery System: EFI
Vehicle Condition: Procured
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 10/17/2014	2nd Test 10/21/2014	3rd Test 10/23/2014	Average	Max
HC (g/km)	1.2	1.941	1.977	1.960	1.959	1.977
CO (g/km)	15	26.739	28.260	27.730	27.576	28.260
NOx (g/km)	N/A	0.111	0.116	0.107	0.111	0.116
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	0.328	3.140	2.990	2.920	3.017	3.140

This vehicle completed all exhaust and evaporative emissions testing

Motorcycle 17

Manufacturer: E
Engine Type: 4-Stroke
Displacement: 250cc
Delivery Date: 10/22/2014

Model Year: 2012
Fuel Delivery System: EFI
Vehicle Condition: Procured
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 12/5/2014	2nd Test 12/12/2014	3rd Test 12/16/2014	Average	Max
HC (g/km)	1.2	0.908	1.013	0.899	0.919	1.013
CO (g/km)	15	7.957	9.340	8.264	8.520	9.340
NOx (g/km)	N/A	0.390	0.382	0.360	0.377	0.390
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	1.369	4.336	4.060	3.963	4.120	4.336

Failed due to bad battery and engine stall

Motorcycle 18

Manufacturer: B
Engine Type: 4-Stroke
Displacement: 449cc
Delivery Date: 11/3/2014

Model Year: 2013
Fuel Delivery System: EFI
Vehicle Condition: Procured
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 11/6/2014	2nd Test 12/3/2014	3rd Test 12/4/2014	Average	Max
HC (g/km)	1.2	2.786	2.850	2.762	2.780	2.850
CO (g/km)	15	22.266	21.964	22.610	22.280	22.610
NOx (g/km)	N/A	0.151	0.154	0.145	0.150	0.154
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	0.0890	1.348	1.241	1.188	1.259	1.348

This vehicle completed all exhaust and evaporative emissions testing

Motorcycle 19

Manufacturer: A
Engine Type: 4-Stroke
Displacement: 249cc
Delivery Date: 2/10/2015

Model Year: 2012
Fuel Delivery System: Carbureted
Vehicle Condition: Procured
Sticker: Green

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 5/13/2015	2nd Test 5/14/2015	3rd Test 5/15/2015	Average	Max
HC (g/km)	1.2	0.524	0.534	0.547	0.535	0.547
CO (g/km)	15	7.185	6.556	7.165	6.969	7.185
NOx (g/km)	N/A	0.310	0.313	0.311	0.311	0.313
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	4.232	21.945	14.117	10.251	15.438	21.945

This vehicle completed all exhaust and evaporative emissions testing

Motorcycle 20

Manufacturer: D
Engine Type: 4-Stroke
Displacement: 250cc
Delivery Date: 5/12/2015

Model Year: 2015
Fuel Delivery System: EFI
Vehicle Condition: Leased
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 5/19/2015	2nd Test 5/20/2015	3rd Test 5/28/2015	Average	Max
HC (g/km)	1.2	2.101	1.927	1.891	1.973	2.101
CO (g/km)	15	17.782	17.491	17.725	17.666	17.782
NOx (g/km)	N/A	0.171	0.184	0.174	0.176	0.184
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested

This vehicle completed all exhaust tests and was not tested for evaporative emissions

Motorcycle 21

Manufacturer: A
Engine Type: 4-Stroke
Displacement: 149cc
Delivery Date: 5/12/2015

Model Year: 2015
Fuel Delivery System: Carbureted
Vehicle Condition: Leased
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 5/14/2015	2nd Test 5/15/2015	3rd Test 5/20/2015	Average	Max
HC (g/km)	1.2	1.216	1.223	1.191	1.210	1.223
CO (g/km)	15	14.494	13.986	14.453	14.311	14.494
NOx (g/km)	N/A	0.065	0.066	0.064	0.065	0.066
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	3.129	15.138	10.845	8.933	11.649	15.138

This vehicle completed all exhaust and evaporative emissions testing

Motorcycle 22

Manufacturer: E
Engine Type: 4-Stroke
Displacement: 249cc
Delivery Date: 12/10/2015

Model Year: 2013
Fuel Delivery System: EFI
Vehicle Condition: Procured
Sticker: Green

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 1/14/2016	2nd Test 1/15/2016	3rd Test 1/20/2016	Average	Max
HC (g/km)	1.2	0.972	1.025	0.991	0.996	1.025
CO (g/km)	15	8.834	8.999	8.969	8.934	8.999
NOx (g/km)	N/A	0.315	0.317	0.340	0.324	0.340
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	0.217	1.390	1.384	1.343	1.372	1.390

This vehicle completed all exhaust and evaporative emissions testing

Motorcycle 23

Manufacturer: D
Engine Type: 4-Stroke
Displacement: 250cc
Delivery Date: 2/10/2016

Model Year: 2012
Fuel Delivery System: EFI
Vehicle Condition: Procured
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 2/25/2016	2nd Test 4/6/2016	3rd Test 4/7/2016	Average	Max
HC (g/km)	1.2	1.610	1.688	1.385	1.561	1.688
CO (g/km)	15	16.838	17.342	15.434	16.538	17.342
NOx (g/km)	N/A	0.190	0.136	0.114	0.147	0.190
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	0.569	3.389	3.238	3.088	3.238	3.389

This vehicle completed all exhaust and evaporative emissions testing

Motorcycle 24

Manufacturer: A
Engine Type: 4-Stroke
Displacement: 149cc
Delivery Date: 3/4/2016

Model Year: 2003
Fuel Delivery System: Carbureted
Vehicle Condition: Procured
Sticker: Red

Emissions Results:

Pollutant (Exhaust)	Standard	1st Test 4/5/2016	2nd Test 4/8/2016	3rd Test 4/22/2016	Average	Max
HC (g/km)	1.2	0.777	0.807	0.700	0.761	0.807
CO (g/km)	15	8.702	8.814	6.592	8.036	8.814
NOx (g/km)	N/A	0.109	0.136	0.114	0.120	0.136
Evaporative	**Hot Soak**	**Day 1 Diurnal**	**Day 2 Diurnal**	**Day 3 Diurnal**	**Average**	**Max**
ROG (Grams THC)	4.680	26.315	16.996	12.867	18.726	26.315

This vehicle completed all exhaust and evaporative emissions testing