Goal: Ensure Environmental Protection and Sensitivity

Deliver sustainable transportation infrastructure improvements that protect and reduce impacts to Maryland's natural, historic and cultural resources

OBJECTIVES:

- Protect and enhance the natural, historic and cultural environment through avoidance, minimization and mitigation of adverse impacts related to transportation infrastructure, including support for broader efforts to improve the health of the Chesapeake Bay

- Employ resource protection and conservation practices in project development, construction, operations and maintenance of transportation assets

- Implement initiatives to reduce fossil fuel consumption, mitigate Greenhouse Gas (GHG) and improve air quality

In implementing its policies, programs and projects, MDOT has shown continued commitment to minimizing adverse impacts on the environment, conserving natural resources and integrating sustainability into various aspects of transportation systems. MDOT and its TBUs recognize that the protecting of natural resources and conducting business in an environmentally responsible manner are among the core elements of their overall mission. Among the ways to reduce effects of transportation and the built-environment include effective planning, interdisciplinary approaches to project development, sustainable operations and maintenance procedures.

MDOT's commitment to environmental protection influences a wide variety of plans, projects and initiatives and is present in the day-to-day operations of the TBUs. Examples of the far-reaching environmental initiatives of the Department include the MDOT MPA Innovative and Beneficial Reuse of Dredged Material Initiative, the Port of Baltimore Dray Truck Replacement Program, MDTA's Police Headquarters Shoreline Cleanup and MDOT SHA's tracking of Bay Restoration projects.

MDOT's TBUs often work in close coordination on environmental projects to comply with various laws and ensure a successful outcome of the planned projects. One such project, which won the
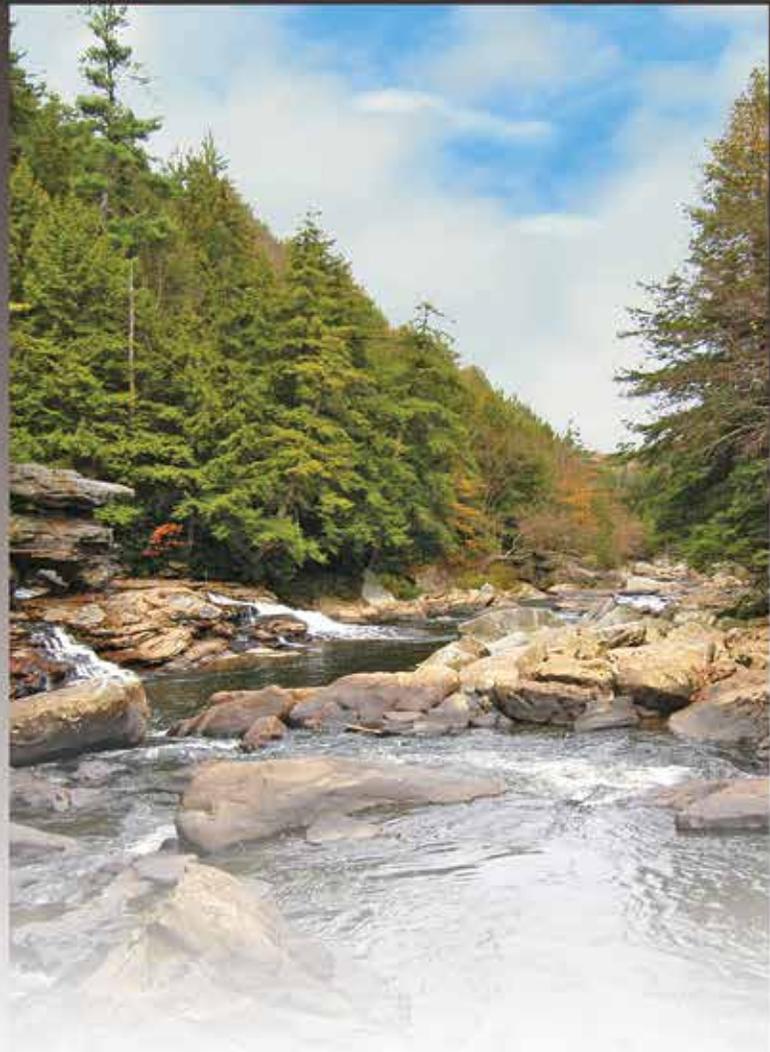
MDOT's 2018 Environmental Excellence Award, is the Broad Creek Stream Restoration project, which was a unique collaboration between MDOT SHA, MDOT MVA and the South River Federation. The project was designed and built to offset the impacts of impervious surfaces in the watershed through restoration of three outfalls and 2,800 linear feet of stream channels.

Interagency coordination efforts, including Maryland's Green Infrastructure Plan and Chesapeake Bay Restoration priorities, have successfully facilitated coordinating transportation with land use, natural features and other components to help ensure that transportation improvements have minimal or mitigated impacts to the environment.

MDOT is demonstrating leadership and vision by installing solar photovoltaic systems on sites owned by MDOT's TBUs that are being considered for development. MDOT is the first State DOT to establish a comprehensive solar program looking at all of its facilities for potential installation of solar. MDOT makes a continued commitment to environmental compliance, continuous improvement of its environmental performance through established processes and adherence to sustainable practices, while maintaining outreach and communication about its environmental activities with the public.

MDOT ENVIRONMENTAL INITIATIVES

- **MDOT MAA:** MDOT MAA is investing in clean and innovative technology, including the procurement of 20 new electric buses for shuttle bus operations at the BWI Marshall Airport.

- **MDOT TSO:** MDOT's Renewable Energy Master Contract for sites owned by MDOT business units is to be considered for photovoltaic system development. More than 874 facilities, including agency buildings, parking garages and parking lots can potentially be considered for solar installation. MDOT TSO issued six Master Services Agreements (MSA) for qualified contractors to design, construct, commission, finance, operate and maintain renewable energy facilities at MDOT locations throughout Maryland.

- **MDOT MTA:** As part of MDOT MTA's bus replacement program, the delivery of 172 40-foot clean diesel buses was completed in FY 2017 and an additional 140 buses have been ordered for delivery in FY 2018 and FY 2019 for its transition to cleaner fuel vehicles and improved air quality.

- **MDTA:** MDTA continues to implement an active environmental management program through the deployment of Electric Vehicle (EV) charging stations.

- **MDOT MPA:** With a Diesel Emissions Reduction Act (DERA) grant from the U.S. Environmental Protection Agency, MDOT MPA continues to replace dray trucks, and helped the Canton Railroad install idle-reduction technology in six switcher locomotives that operate at the Port, thereby reducing emissions from transportation in and around the terminals.

- **MDOT MVA:** MDOT MVA continues its energy conservation efforts including management of its carbon footprint, mitigation of emissions and reducing facility energy consumption by 20% by FY 2020, while providing comfortable cooling and heating temperatures aligned with Maryland's Energy Code.

- **MDOT SHA:** MDOT SHA completed a statewide coastal vulnerability assessment. Data from the vulnerability assessment is being integrated into planning and programming to ensure resilient and reliable transportation. Vulnerability assessment data is available for counties to utilize and has been incorporated into county reports that will provide roadway vulnerability information for all state and locally maintained roads. The completed data is available in a viewer with free access for county planners and emergency services, and is being integrated into asset management systems and project planning. Pilot studies were completed to determine methodology for assessing vulnerability to flooding in non-coastal locations and is being implemented in FY 2019. National Environmental Policy Act (NEPA) review for MDOT SHA projects now includes screening for locations subject to future sea level inundation. MDOT SHA achieved its highest percentage of recycled asphalt pavement usage in asphalt mix in CY 2017, using 455,554 tons in MDOT SHA construction projects.

OBJECTIVE:

Protect and enhance the natural, historic and cultural environment through avoidance, minimization and mitigation of adverse impacts related to transportation infrastructure, including support for broader efforts to improve the health of the Chesapeake Bay

ACRES OF WETLANDS OR WILDLIFE HABITAT CREATED, RESTORED OR IMPROVED*

ON TRACK

MDOT agencies are in compliance with the various permits that are granted to construct projects needed to improve the transportation system on land and offshore.
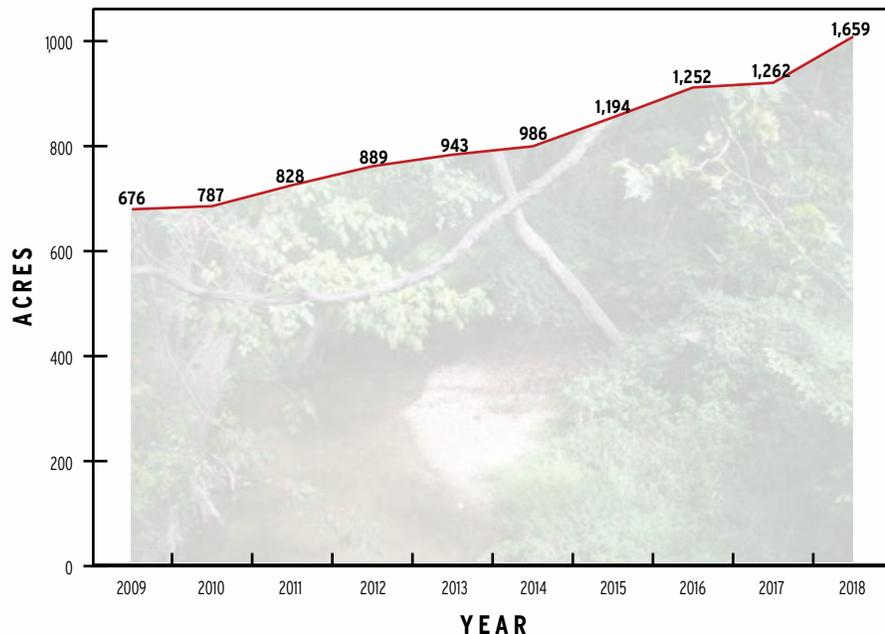
* This measure now includes data provided by MDOT MPA, MDOT SHA and MDTA.

Why Did Performance Change?

- MDOT SHA and MDTA create wetlands to mitigate the unavoidable environmental impacts from transportation projects that impact sensitive areas, consistent with compliance requirements

- MDOT MPA made significant progress in improving water quality by installing engineered stormwater treatment technologies that remove a variety of stormwater pollutants at cargo terminals

What Are Future Performance Strategies?

- Long term mitigation efforts include Hart-Miller Island North Cell restoration, Masonville's eastern uplands and the Poplar Island Expansion

- The Environmental Strategic Plan will drive future programs and initiatives such as including developing a clean air strategy for the terminal based on emerging technologies and programs; implementing a "trash-free port" pilot program

- Award a stormwater improvements contract to remove a variety of stormwater pollutants at four terminals: Seagirt, Masonville, Fairfield and South Locust Point

WATER QUALITY TREATMENT TO PROTECT AND RESTORE THE CHESAPEAKE BAY

ON TRACK

This measure tracks MDOT SHA compliance with achieving impervious surface reduction as required by the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit. This measure reports the acres of impervious surface treatment associated with Bay restoration projects to determine overall progress toward the 20% goal during their five-year permit term.
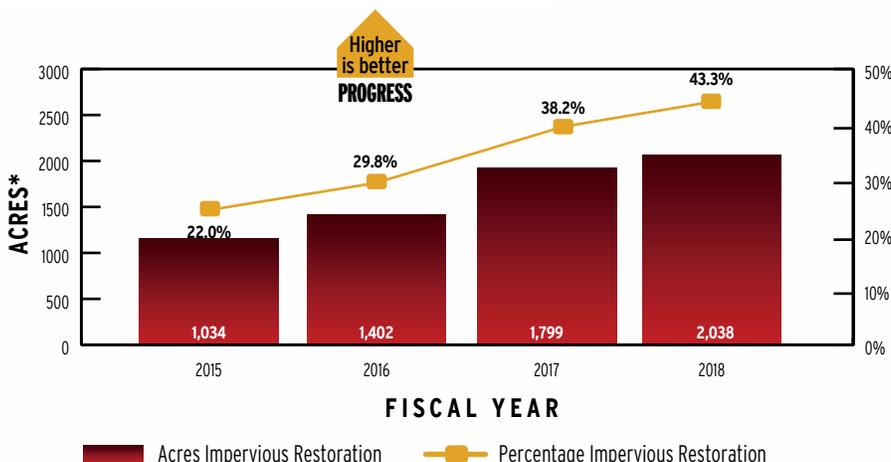
Target: 4,709 Acres by October 2020
* Number of Acres each year are rounded.

Why Did Performance Change?

- MDOT SHA treated a cumulative 9% of MDOT's impervious surface not previously treated

- Continued implementation of stormwater management and total maximum daily load (TMDL) improvements to reduce pollution entering local waterways and ultimately the Chesapeake Bay

What Are Future Performance Strategies?

- MDOT SHA's Full Delivery Stream Restoration projects will deliver over 150,000 linear feet of stream restoration (1,500 MS4 restoration credit acres) when completed

- MDOT SHA is using a contracting approach to increase efficiency across the project implementation activity spectrum

OBJECTIVE:

Employ resource protection and conservation practices in project development, construction, operation and maintenance of transportation assets

RECYCLED/REUSED MATERIALS FROM MAINTENANCE ACTIVITIES AND CONSTRUCTION/DEMOLITION PROJECTS*

ON TRACK

Maryland's Department of the Environment (MDE) has established a "Zero Waste" Action Plan. This measure tracks the reduction of the TBU's impact on solid waste landfill through recycling/reuse of metal, asphalt and concrete. Due to the number and type of construction/demolition activities and projects, we recognize that there may be variability among reporting periods and TBUs.

TONS

	2015	2016	2017
Concrete	28,508	59,901	25,454
Metals	5,382	18,662	16,679
Asphalt	370,590	479,089	505,456

CALENDAR YEAR

* Due to the number and type construction/demolition activities and projects, there is variability among reporting periods and TBUs.
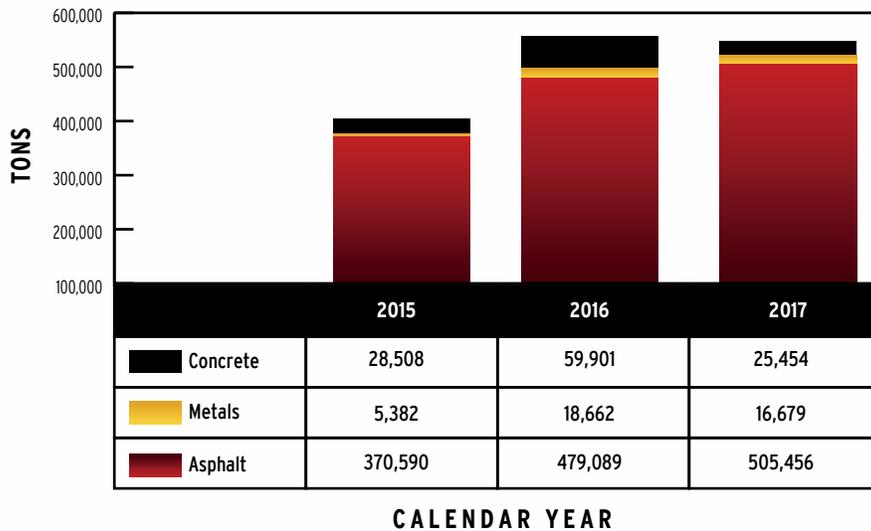
Why Did Performance Change?

- MDOT SHA achieved the highest percentage of Recycled Asphalt Pavement (RAP) usage in asphalt mix in CY 2017
- MDOT SHA contractors can now choose recycled concrete-graded aggregate base (RC-GAB) instead of conventional GAB material provided the material specifications are met

What Are Future Performance Strategies?

- MDOT SHA will partner with the aggregate industry to devise methods and plans to encourage production and use of more RC, and will coordinate with the pavement design group to recommend increasing recycling road projects where applicable
- The TBUs established plans to recycle and/or reuse their solid waste metal, asphalt and concrete and will establish central data collection mechanisms and procedures, requiring contractors to segregate, collect, weigh and recycle these materials

UTILITY ELECTRICITY USE & RENEWABLE ENERGY GENERATION

MDOT is committed to reducing electricity consumption through efficiency measures and renewable energy sources to help Maryland reach its clean energy and GHG reduction goals. Reducing energy consumption and generating renewable energy can save Maryland taxpayers money, generate revenue and decrease harmful air emissions. MDOT measures both the consumption of utility energy and the amount of renewable energy generated by MDOT.

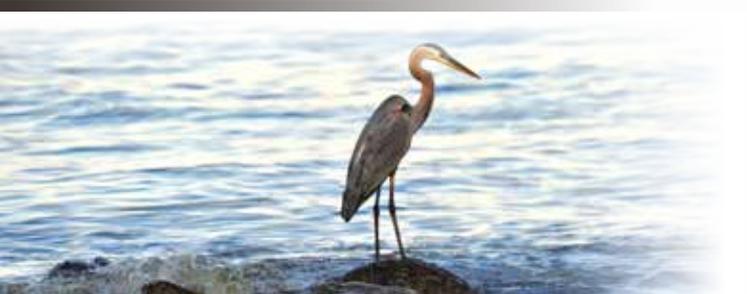| MEGAWATT HOURS IN THOUSANDS (FY)	2013	2014	2015	2016	2017
Electricity Use	396	393	383	384	364
Renewable Energy Generation	1.88	1.525	1.759	1.998	1.629

Why Did Performance Change?

- TBUs completed a comprehensive Energy Plan that details its energy-consuming facilities, existing and future energy conservation strategies, and future energy conservation goals
- Continued to implement energy conservation measures that upgrade lighting, HVAC units, windows and roofs
- MDOT contractors will design, construct, commission, finance, operate and maintain photovoltaic (PV) facilities at MDOT locations throughout Maryland

What Are Future Performance Strategies?

- MDOT's Energy Managers Workgroup continues to meet bimonthly to discuss current trends and challenges, share best practices and determine ways to responsibly leverage MDOT resources
- Continue to increase capacity for renewable energy generation by constructing new solar PV facilities

OBJECTIVE:
Implement initiatives to reduce fossil fuel consumption, mitigate greenhouse gases and improve air quality

TRANSPORTATION-RELATED EMISSIONS BY REGION

ON TRACK

MDOT plans, programs and projects continue to meet federal and State requirements for air quality. MDOT efforts also result in GHG emissions reductions, which assist the State in meeting its GHG goals.

PERFORMANCE MEASURE	REGION	CALENDAR YEAR				% CHANGE 2005-2014
		2008	2011	2014	2017	
Volatile Organic Compound (VOC) Tons per Day	Baltimore	52.8	45.5	41.3	25.9	-51%
	Washington	44.2	39.2	35.4	23.9	-46%
	Other	25.8	20.7	21.1	13.4	-48%
Nitrogen Oxide (NOx) Tons per Day	Baltimore	107.8	89.5	79.5	53.7	-50%
	Washington	84.0	74.4	63.3	45.3	-46%
	Other	52.7	44.4	44.2	32.8	-38%
Carbon Monoxide (CO) Tons per Day	Baltimore	541.9	445.1	431.8	365.0	-33%
	Washington	433.4	363.6	352.6	335.5	-23%
	Other	273.2	202.4	229.1	180.1	-34%
Particulate Matter (PM2.5) Tons per Day	Baltimore	4.6	3.5	3.4	2.2	-52%
	Washington	3.6	2.9	2.7	1.9	-48%
	Other	1.9	1.4	1.5	1.1	-44%

* All emission estimates developed as part of the USEPAs National Emissions Inventory (NEI). The NEI is published every three years.

** All Washington data represents Maryland's share of emissions in the Washington region non-attainment areas, including Charles, Frederick, Montgomery and Prince George's counties.

Why Did Performance Change?

- MDOT MAA procured 20-60' articulated shuttle buses powered by Compressed Natural Gas (CNG) for transportation between the BWI Marshall Airport terminal and the Consolidated Rental Car Facility

- MDOT continued to invest in projects promoting alternative methods of transportation; in 2018, $17 million was set aside for 43 bicycle and pedestrian projects

- MDOT MTA and Locally Operated Transit Systems (LOTS) continue to update and renew their bus fleets to maintain the average age of the fleet, resulting in reduced emissions, fuel consumption and noise

- Coordinated with local businesses, public stakeholders and rideshare companies to address diverse emissions reductions strategies such as telecommuting, carpool lot locations and congestion mitigation

- With DERA grants, replaced more than 173 dray trucks that routinely call at the Seagirt Marine Terminal
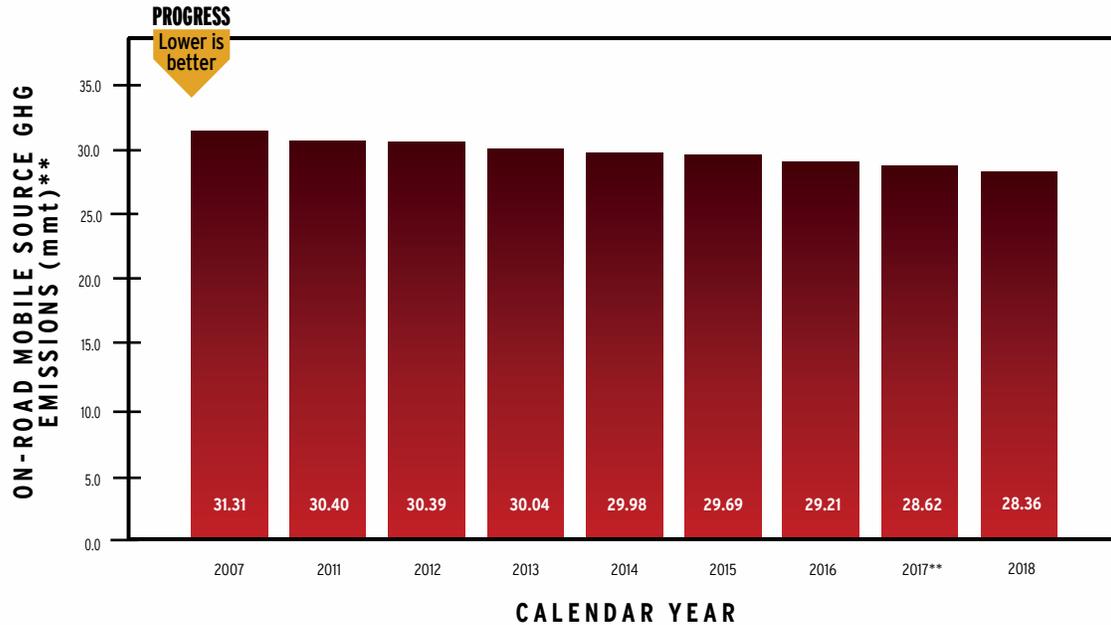
What Are Future Performance Strategies?

- The CTP FY2018-FY2023 set aside $3.310 billion for transit projects that will increase transit reliability and contribute to emissions reductions, including two recent successful Transportation Investment Generating Economic Recovery (TIGER) grant recipients for Bus Rapid Transit (BRT)

- The MDOT MTA has developed and awarded the first few statewide Transit Innovation Grants aimed at incorporating innovative transit-related investments to modernize Maryland's transit

- MDTA will continue to update its toll facilities to be all-electronic and reduce the amount of time spent idling in payment lines

- MDOT developed a Corridor Priority Tool to evaluate truck volumes, freight density, intermodal connections and bottlenecks to identify Maryland's critical urban and rural freight corridors and to prioritize freight-related projects

- MDOT MAA is looking to procure inductive electric shuttle buses using the Volkswagen settlement grant opportunity

TRANSPORTATION-RELATED GHG EMISSIONS

Maryland has made substantial progress in combating air pollution and GHG emissions, with transportation policies and investments playing a key role in these improvements. MDOT programs supporting fuel and vehicle technology improvements, transportation demand management (TDM), transit and projects that reduce roadway congestion, all support air quality goals.

PROGRESS
Lower is better

Chart: ON-ROAD MOBILE SOURCE GHG EMISSIONS (mmt)** vs CALENDAR YEAR

Calendar Year	Emissions (mmt)
2007	31.31
2011	30.40
2012	30.39
2013	30.04
2014	29.98
2015	29.69
2016	29.21
2017**	28.62
2018	28.36

Target: 25% below 2006 emissions by 2020. For on-road transportation, the goal equals 23.5 mmt CO2e in 2020 and 40% below 2006 emissions by 2030*

* The MDOT selected GHG emission reduction goal is consistent with the statewide target set in the 2009 Greenhouse Gas Reduction Act and the subsequent 2016 Greenhouse Gas Reduction Act reauthorization.

** MMT CO2e stands for million metric tons of carbon dioxide equivalents, the standard unit of measurement for GHG emissions. Emissions are calculated using the most recent data and version of EPAs MOVES model available at time of analysis. MOVES2014a is used for analysis year 2016, 2017, and 2018. 2017 annual VMT revised to reflect actual MDOT SHA reported 2017 HPMS VMT.

Why Did Performance Change?

- On-road transportation GHG emissions continue to decrease in Maryland as the efficiency of the on-road vehicle fleet improves even as vehicle miles traveled (VMT) growth continued in 2017 and 2018

- MDOT SHA's Coordinated Highways Action Response Team (CHART) program continues to yield substantial GHG reductions associated with the efficient management of incidents, traveler information and other on-road infrastructure technologies that reduce delay

- MDOT's design-build approach to improve reliability and reduce congestion along the I-270 corridor will utilize innovative technology to manage congestion and reduce GHG emissions

- As part of its continued effort to refine its TDM approach, MDOT, in 2017, initiated a listening campaign of commuters and residents and held interviews of large employers to understand motivating factors and barriers to maximizing the use of TDM options

What Are Future Performance Strategies?

- MDOT MPA will initiate a study to determine carbon sequestration in the created wetland/coastal ecosystems at Hart Miller Island

- MDOT SHA completed a statewide coastal vulnerability assessment; pilot studies to determine methodology for assessing vulnerability to flooding in non-coastal locations were completed, which are being implemented in FY 2019

- MDOT is leading implementation of the bicycle and pedestrian priority area (BPPA) program, supporting localities in designating areas and developing plans leading toward implementation of network improvements in these areas
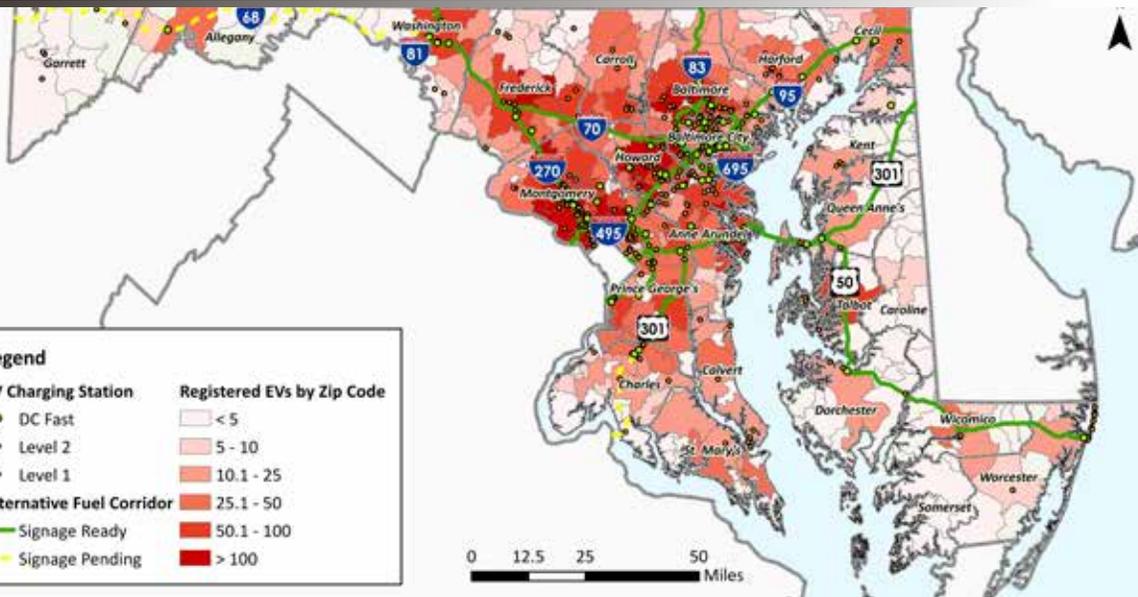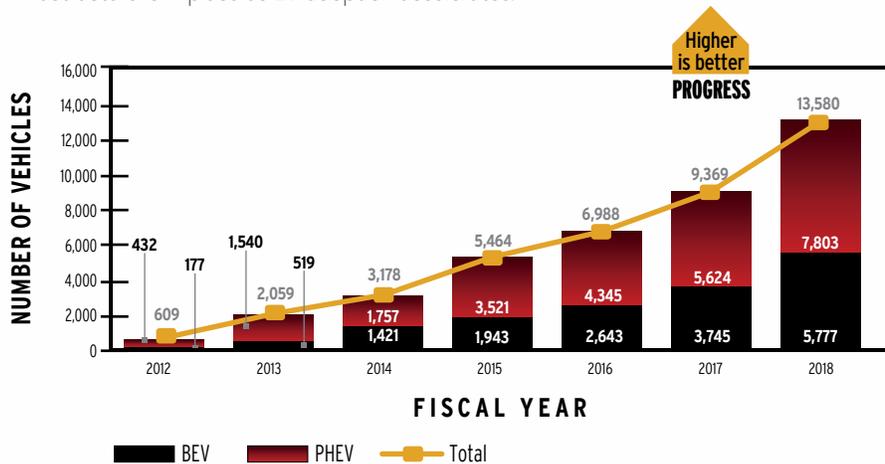
OBJECTIVE:

Implement initiatives to reduce fossil fuel consumption, mitigate greenhouse gases and improve air quality

TOTAL ELECTRIC VEHICLES (EVS) REGISTERED IN MARYLAND AND TOTAL PUBLICLY AVAILABLE EV CHARGING INFRASTRUCTURE

ON TRACK

Maryland has a goal of 60,000 EV registrations in the State by 2020 and 300,000 by 2025. These goals represent a key component of ensuring that Maryland meets our GHG emission reduction goal of 40% from 2006 levels by 2030.

Drivers in Maryland are encouraged to buy EVs through tax benefits and rebates, leading to an increase in EVs across the state. The installation of electric vehicle supply equipment (EVSE) will continue to be critical in addressing range-anxiety and ensuring that adequate EV charging infrastructure is in place as EV adoption accelerates.

Higher is better

PROGRESS

Chart: NUMBER OF VEHICLES by FISCAL YEAR

Fiscal Year	BEV	PHEV	Total
2012	432	177	609
2013	1,421	1,757	2,059 / 1,540
2014	1,421	1,757	3,178 / 519
2015	1,943	3,521	5,464
2016	2,643	4,345	6,988
2017	3,745	5,624	9,369
2018	5,777	7,803	13,580

Legend: ■ BEV ■ PHEV —■— Total

Legend

EV Charging Station
- ○ DC Fast
- • Level 2
- • Level 1

Alternative Fuel Corridor
- —— Signage Ready
- - - - Signage Pending

Registered EVs by Zip Code
- ☐ < 5
- 5 - 10
- 10.1 - 25
- 25.1 - 50
- 50.1 - 100
- > 100

0   12.5   25   50
Miles

Why Did Performance Change?

- The Maryland EV Excise Tax Incentive was renewed during the 2017 Legislative Session, making EVs more financially accessible to more Maryland residents by offering a tax rebate of up to $3,000 for the purchase of an EV

- MDOT successfully submitted and received additional designation of alternative fuel/electric vehicle corridors under the Fixing America's Surface Transportation (FAST) Act; the new corridors include US 301, I-83, I-81, and I-695 and were added to the four existing corridors I-95, US 50, I-270 and I-70/I-68

- MDOT continued a direct EV outreach campaign throughout 2018 and has engaged 3,600 Marylanders across 12 Counties. The outreach campaign is designed to educate Marylanders on the benefits/advantages of EVs and to dispel any commonly held misbeliefs surrounding EVs and EVSE
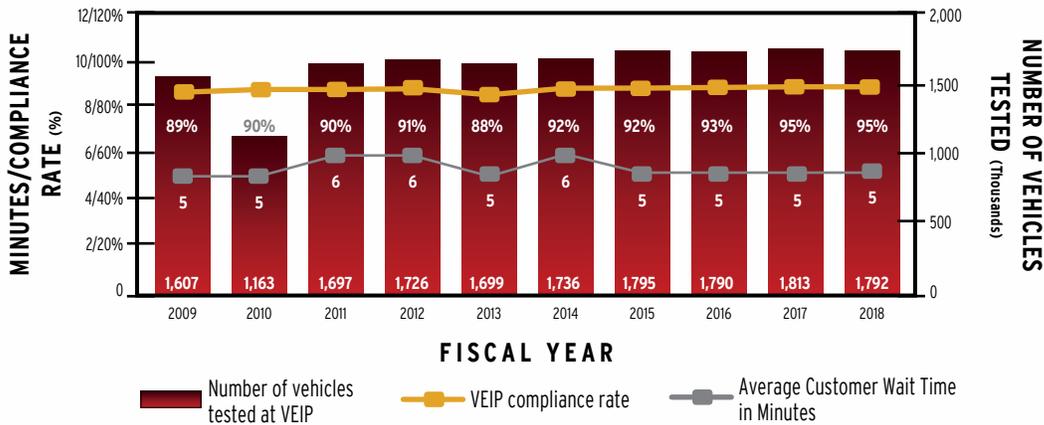
What Are Future Performance Strategies?

- MDOT will continue to lead the Electric Vehicle Infrastructure Council (EVIC) to promote and incentivize EV adoption and EVSE installation

- Maryland will continue to participate in State and region-wide efforts to install signage along our EV charging corridors

COMPLIANCE RATE AND NUMBER OF VEHICLES TESTED FOR VEHICLE EMISSIONS INSPECTION PROGRAM (VEIP) VERSUS CUSTOMER WAIT TIME

ON TRACK

Monitoring the VEIP testing compliance rate ensures system effectiveness and identifies vehicles exceeding allowable standards. Tracking the average wait time at VEIP stations ensures that the 15-minute average wait time requirement is met. Timely and efficient customer service helps the state meet federal clean air standards by identifying polluting vehicles and encouraging regular vehicle maintenance. In 2018, MDOT MVA implemented a recommendation from the Governor's Regulatory Reform Commission's 2016 report, extending initial VEIP inspections for new vehicles by one year, saving Maryland taxpayers money while maintaining critical environmental protections.

Chart: MINUTES/COMPLIANCE RATE (%) and NUMBER OF VEHICLES TESTED (Thousands) by FISCAL YEAR

Fiscal Year	Compliance	Wait Time	Vehicles Tested
2009	89%	5	1,607
2010	90%	5	1,163
2011	90%	6	1,697
2012	91%	6	1,726
2013	88%	5	1,699
2014	92%	6	1,736
2015	92%	5	1,795
2016	93%	5	1,790
2017	95%	5	1,813
2018	95%	5	1,792

Legend: Number of vehicles tested at VEIP — VEIP compliance rate — Average Customer Wait Time in Minutes

* 2018 data is preliminary and subject to change. 14 counties offer VEIP tests: Anne Arundel, Baltimore, Baltimore City, Carroll, Harford, Howard, Queen Anne's, Cecil, Washington, Calvert, Charles, Frederick, Montgomery and Prince George's.

Why Did Performance Change?

- MDOT MVA sent e-mails to customers needing to have their vehicle's emissions inspected
- MDOT MVA modified VEIP kiosk screens for more flexibility to accept late fee payments and process VEIP test for vehicles beyond their expiration date
- MDOT MVA coordinated with VEIP kiosk support to secure two dedicated technicians who were allowed to access the system remotely and auto correct software

What Are Future Performance Strategies?

- Continue to monitor performance of the installed vehicle emissions self-serve kiosks and research emerging technologies for future changes to the program
- Add a cable to the On Board Diagnostics (OBD) device at the VEIP kiosk to improve connectivity
- Install Spanish language option at select VEIP kiosks