

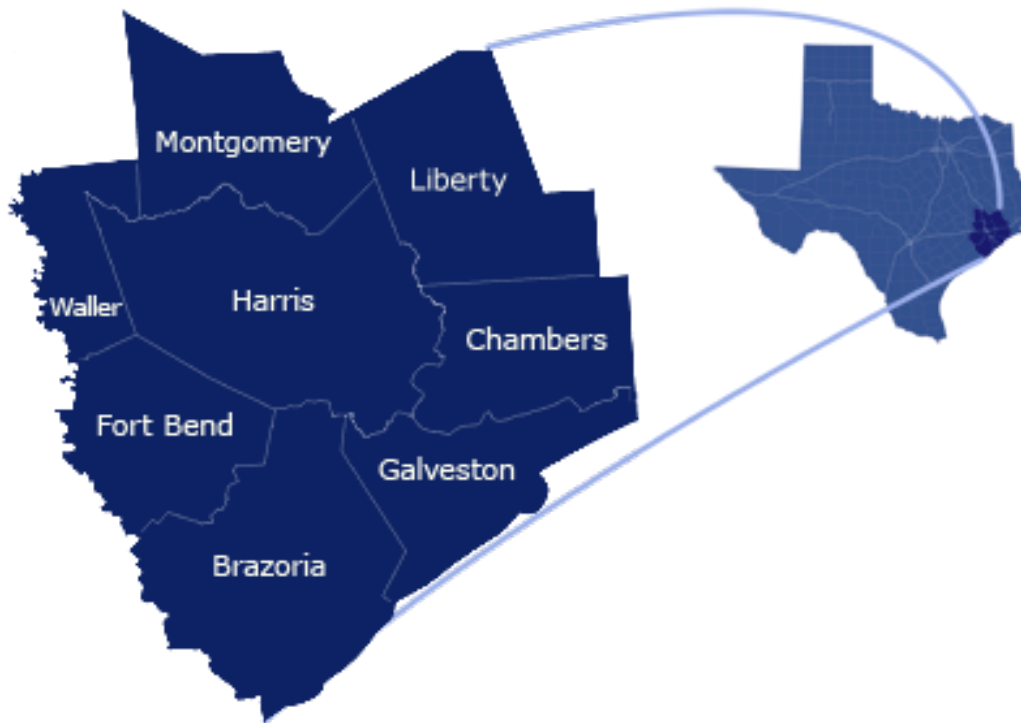
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# Houston-Galveston-Brazoria (HGB)

## PM<sub>2.5</sub> Advance

## Path Forward Update

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PREPARED IN PARTNERSHIP BY MEMBERS OF THE  
H-GAC REGIONAL AIR QUALITY PLANNING ADVISORY COMMITTEE

2015 UPDATE



# HOUSTON-GALVESTON-BRAZORIA (HGB) PM<sub>2.5</sub> ADVANCE PATH FORWARD

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## EXECUTIVE SUMMARY

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H-GAC has developed the following Path Forward update in partnership with the Regional Air Quality Planning Advisory Committee (RAQPAC), as part of our involvement in the voluntary EPA Particulate Matter (PM) Advance Program. Participation in this program is a result of significant collaboration between local governments, key citizen/environmental groups, industry representatives and other regional stakeholders to assist our region in meeting the PM<sub>2.5</sub> air quality standard.

This Path Forward Update includes a variety of voluntary regional air quality improvement efforts. These projects range from the replacement of older heavy-duty truck and marine engines with newer, cleaner models, to funding electric vehicle charging equipment, to voluntary industry and local government air quality initiatives. H-GAC programs alone have resulted in PM<sub>2.5</sub> reductions in our region. Over 50 current H-GAC and partner programs and projects as well as nearly 20 additional potential future initiatives presented in this document will continue to achieve reductions, which will be documented and expanded upon as this effort continues.

On January 12, 2015, the EPA designated the HGB region as “unclassifiable/attainment” for the 2012 primary annual PM<sub>2.5</sub> annual NAAQS. But our region remains below the National Ambient Air Quality Standard for fine particle pollution, and by maintaining and expanding regional collaboration on voluntary projects, our region will position itself to avoid a nonattainment designation and be prepared for future, more stringent standards.

## INTRODUCTION

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### OVERALL PROGRAM OBJECTIVE

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The Particulate Matter (PM) Advance Program (Program) is a voluntary, collaborative effort between local government and key stakeholders to continue to meet the revised PM<sub>2.5</sub> National Ambient Air Quality Standard (NAAQS) which became effective December 14, 2012 (12.0 µg/m<sup>3</sup> annual standard and 35 µg/m<sup>3</sup> 24-hour standard). The NAAQS are health-based air quality standards per the Clean Air Act. Another program goal is to foster an understanding of local air quality issues and promote implementation of near-term initiatives that maintain and/or improve ambient PM<sub>2.5</sub> levels.

### MISSION OF THE LOCAL PROGRAM

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The mission of the Program is to promote, identify, expand, and improve voluntary PM reduction efforts (both existing and potential future opportunities) within the areas where compliance with the 2012 PM<sub>2.5</sub> NAAQS may be at risk. The Program also serves as a catalyst to encourage voluntary accelerated implementation of current clean air strategies and encourages additional voluntary participation in PM reduction efforts such as H-GAC's Clean Vehicles program. Participation in PM Advance will provide an opportunity for stakeholders to voluntarily promote PM reduction efforts and take advantage of funding opportunities.

### VOLUNTARY PROGRAM SCOPE

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Participation in PM Advance allows the region to create a collaborative platform to identify and launch potential PM reductions efforts. Program participants have worked together voluntarily to develop this Path Forward to meet the stated mission. Program participation does not create or remove any statutory or regulatory requirements but can serve as an early action framework to maintain compliance with air quality standards. Please note: this Path Forward update remains a living document; periodic evaluation and updates are anticipated.

### PROGRAM DEVELOPMENT PROCESS

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The H-GAC Regional Air Quality Planning Advisory Committee (RAQPAC) (representing local governments, citizen/environmental groups and business/industry) examined potential voluntary actions to quickly reduce levels of fine particulate matter. The H-GAC Board of Directors authorized H-GAC staff to develop voluntary strategies to reduce fine particulate matter as recommended by RAQPAC and the PM<sub>2.5</sub> Task Force.

The RAQPAC PM<sub>2.5</sub> Task Force convened in order to collaborate on the development of the PM Advance Path Forward. Task Force efforts included meetings to discuss and review of past, present, and potential future PM reduction projects within the eight-county HGB ozone nonattainment area amongst RAQPAC members, stakeholders and interested public. Efforts also included presentations on PM<sub>2.5</sub> composition in Houston by TCEQ and others.

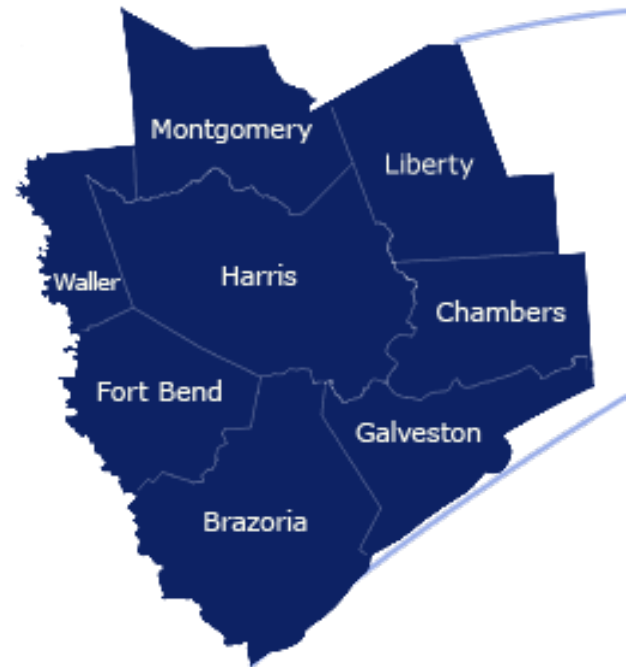
## THE REGION

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### HOUSTON-GALVESTON AREA COUNCIL

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The Houston-Galveston Area Council (H-GAC) is the region-wide voluntary association of local governments for the 13-county Gulf Coast Planning region of Texas. H-GAC is also the Metropolitan Planning Organization (MPO) for the eight-county Houston-Galveston-Brazoria (HGB) area. This area includes Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery and Waller Counties. The scope of this report focuses on the eight-county HGB area.



### POPULATION & EMPLOYMENT<sup>1</sup>

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The HGB region has experienced dramatic changes in its population size and composition over the last few decades, and these trends are expected to continue. The region is projecting a significant increase in population and employment over the next 25 years. There are currently nearly 6.5 million residents and 2.9 million jobs within the region. By 2040, the regional population is expected to reach 9.6 million residents (an increase of 3.1 million people). Similarly, the region is expected to create an additional 1.5 million jobs for a total of over 4 million and see an almost 60% increase in vehicular travel and a doubling of the movement of freight. Projected population growth will also result in economic changes stemming from increased purchasing power and tax revenue.

### TRANSPORTATION SYSTEM

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Every day, more than 169 million miles are traveled on the system's roadways<sup>2</sup>. Within our region, there are approximately 26,000 centerline miles of locally-owned roads and almost 4,000 centerline miles of state-owned facilities<sup>3</sup>. In addition, the region currently has over 190 miles of High Occupancy Vehicle (HOV)/High Occupancy Toll (HOT) lanes in operation<sup>4</sup>. Regional transit includes bus routes, the METRORail light rail system, commuter transit routes, smaller vehicle routes, and ferries. The HGB region's transportation system also includes bikeways, freight rail, ports, airports, and pipelines.

Congestion remains a major challenge facing the HGB region. The number of morning and evening peak hours continues to increase as the number of commuters travelling to and from work increase. Congestion in our region will continue to grow given the projected population, employment, and economic growth facing our region.

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<sup>1</sup> H-GAC 2040 RTP

<sup>2</sup> H-GAC TDM, 2014 (typical fall weekday VMT - all HGB roadways)

<sup>3</sup> TxDOT Standard Reports 2012

<sup>4</sup> H-GAC 2012 Regional Mobility Report



## AIR QUALITY BACKGROUND: AIR POLLUTION

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Air pollution occurs when the air contains gases, particles, fumes or odors that could be harmful to the health and/or comfort of humans and animals or which could cause damage to plants and materials.

The substances that cause air pollution are called pollutants. The U.S. Environmental Protection Agency (EPA) has set both primary and secondary standards (National Ambient Air Quality Standards or NAAQS) for six “criteria” pollutants including particulate matter.

H-GAC and its partners continue to work to reduce air pollution and help the region meet these federal air quality standards. The region has made considerable progress in reducing ground-level ozone and particle matter emissions over the last few years.

### PARTICULATE MATTER (PM)

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Particle pollution is a complex mixture of extremely small particles (particulate matter also known as PM). Components of PM include particles and/or liquids such as dust, fly ash, soot, smoke, aerosols, fumes, mists, and condensing vapors that can be suspended in the air. EPA groups particle pollution into two categories: Inhalable coarse particles (PM<sub>10</sub>) and fine particles (PM<sub>2.5</sub>). The size of particles is directly linked to their potential for causing health problems. Particles that are smaller than 10 micrometers in diameter (PM<sub>10</sub> and PM<sub>2.5</sub>) are able to pass through the throat and deep into the lungs where they can cause serious health effects. Fine particulate matter (PM<sub>2.5</sub>) generally consists of soot (elemental organic carbon from many sources, but also soil and sources of sulfates, nitrates, and other ionic species formed in the atmosphere from many sources.

### PAST AND PRESENT STATUS OF PM<sub>2.5</sub> IN HGB

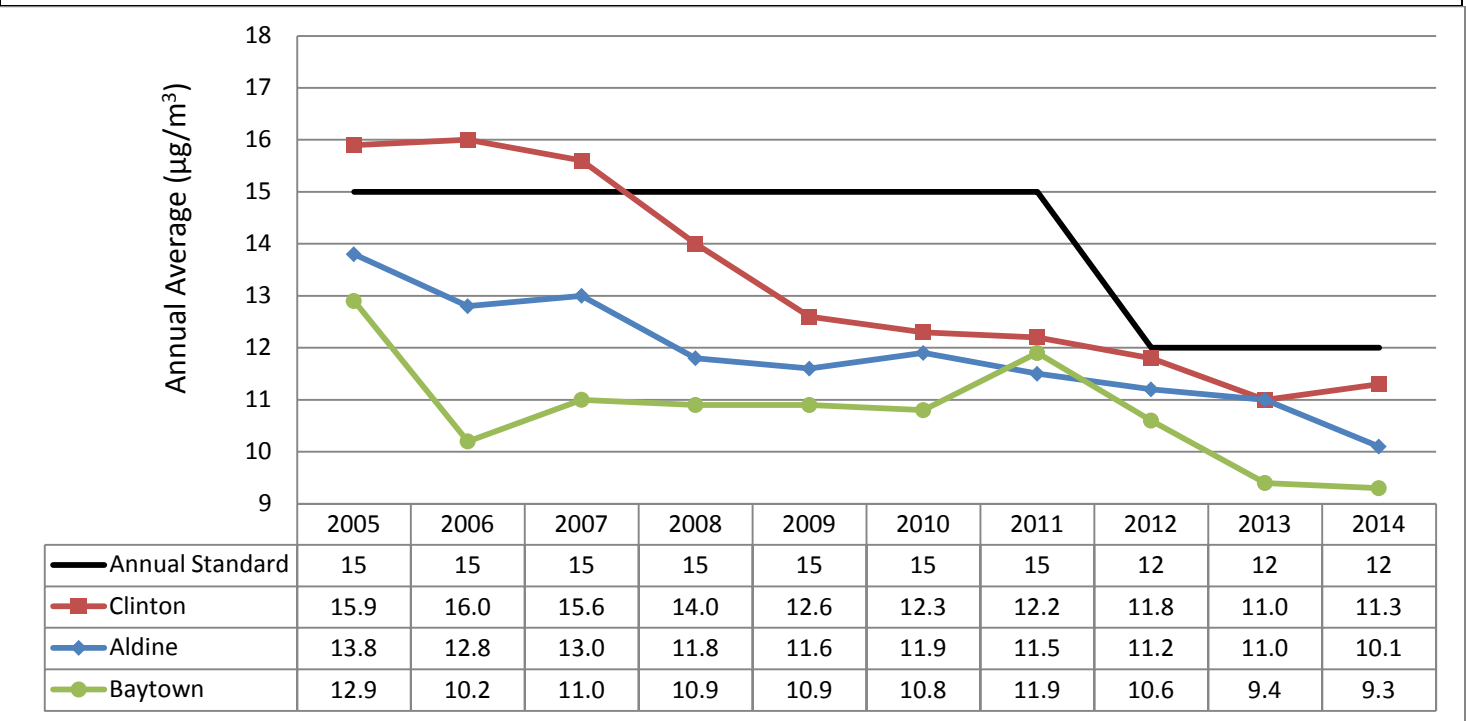
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The HGB area has experienced significant improvements in PM<sub>2.5</sub> levels over the past ten years. Historically, the HGB area has been designated as “unclassified/attainment” for particulate matter standards for both the PM<sub>2.5</sub> and PM<sub>10</sub> standards. Details of the particulate matter NAAQS are found in the table below. Note that in 2012, EPA lowered the primary annual NAAQS for fine particles (PM<sub>2.5</sub>) to 12.0µg/m<sup>3</sup> to be more protective of public health.

<b>Pollutant</b>		<b>Primary NAAQS</b>	<b>Averaging Period</b>	<b>Designation</b>
Particulate Matter (PM <sub>10</sub> )		150 µg/m <sup>3</sup>	24-hour	Attainment/ Unclassifiable
Particulate Matter (PM <sub>2.5</sub> )		12.0 µg/m <sup>3</sup> (2012 standard)	Annual (Arithmetic Mean)	Attainment/ Unclassifiable
		15.0 µg/m <sup>3</sup> (1997 standard)	Annual (Arithmetic Mean)	Attainment/ Unclassifiable
		35 µg/m <sup>3</sup>	24-hour	Attainment/ Unclassifiable
		35 µg/m <sup>3</sup>	24-hour	Attainment/ Unclassifiable

Air monitoring data collected, compiled, and validated by the Texas Commission of Environmental Quality (TCEQ) identifies the certified PM<sub>2.5</sub> annual design value<sup>5</sup> for 2010-2012 for the HGB region as 12.1 micrograms per cubic meter (µg/m<sup>3</sup>). Over the subsequent years, TCEQ closely monitored PM<sub>2.5</sub> concentrations and found a continuing decline in annual PM<sub>2.5</sub> averages in the HGB area (see table below). On January 15, 2015, the EPA published designations for the 2012 primary annual PM<sub>2.5</sub> NAAQS. The HGB region was classified as “unclassifiable/attainment.”

Preliminary Annual PM<sub>2.5</sub> Averages for Clinton, Aldine and Baytown Regulatory Monitors<sup>6</sup>



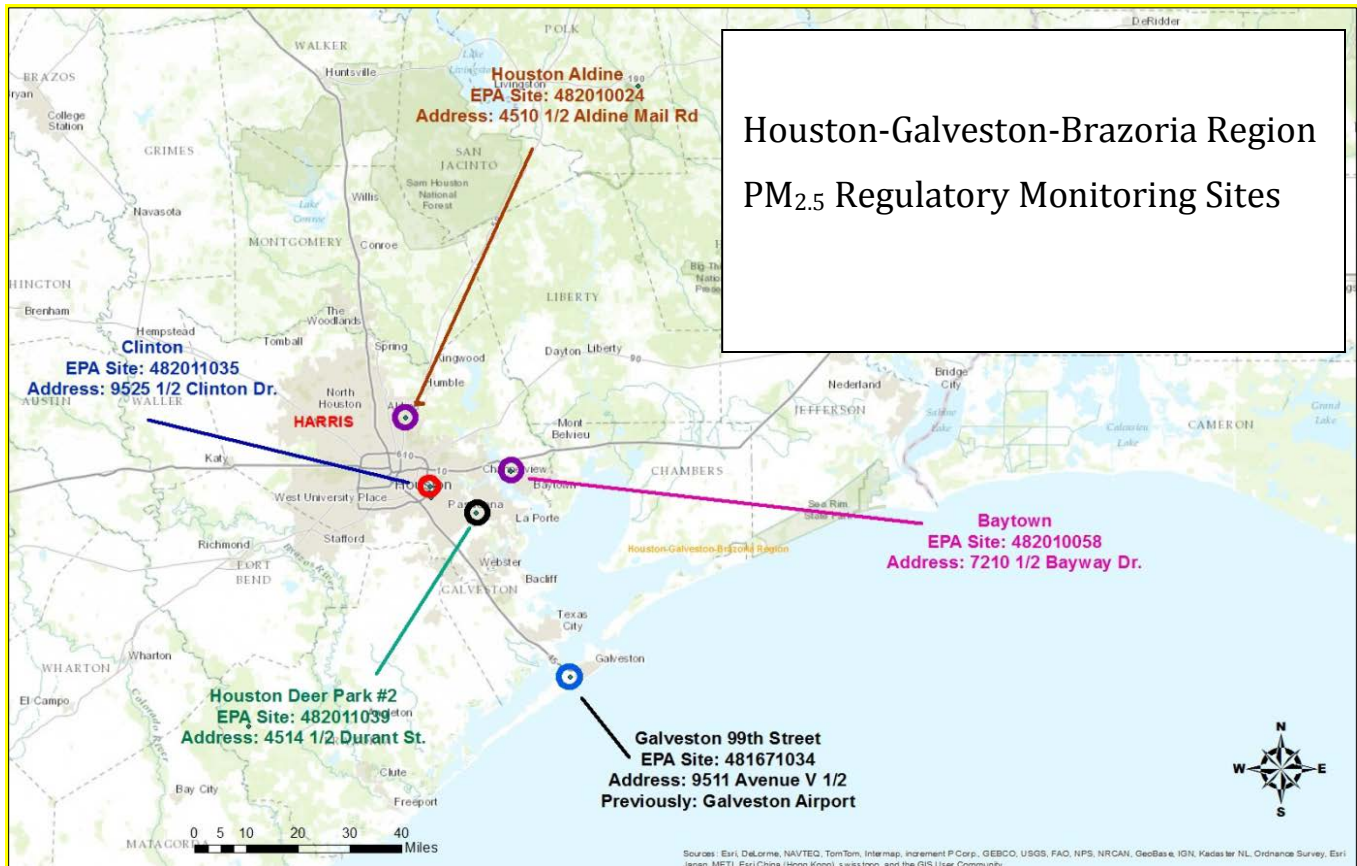
EPA promulgated final area designations for the 2012 PM<sub>2.5</sub> NAAQS on December 18, 2014. Air monitoring data can be retrieved from the TCEQ Texas Air Monitoring Information System (TAMIS) web: [www17.tceq.texas.gov/tamis](http://www17.tceq.texas.gov/tamis).

<sup>5</sup> A “design value” for an area is a statistic that is compared to the National Ambient Air Quality Standards (NAAQS) to determine the attainment status of the area. An areas value is calculated using an arithmetic mean of the annual PM<sub>2.5</sub> averages for three consecutive years at each regulatory monitor. If an area has more than one regulatory monitor, the monitor with the highest value sets the design value for the area (EPA, 2014).

<sup>6</sup> 2014 values in this chart are preliminary, other years are certified. Only the data from these regulatory monitors will be used by EPA for attainment demonstration purposes. Source: TCEQ

## HGB MONITORING NETWORK

Over time, the monitoring system in the HGB region has expanded significantly. There are 5 sites with regulatory PM<sub>2.5</sub> monitors, 11 local conditions (acceptable) monitors, and many more non-regulatory monitors in our region. The City of Houston, Harris County, University of Houston, Texas Commission on Environmental Quality (TCEQ), and Houston Regional Monitoring Corporation (HRM) and others operate these monitors. Most of these monitoring stations measure the concentrations of the criteria pollutants in the air, as well as air temperature, wind velocity, and other meteorological parameters. Some of the monitoring stations also measure the levels of an additional set of selected chemicals, and some measure pollen and mold spores.



The following table of monitoring sites lists the 5 HGB PM<sub>2.5</sub> monitor sites which are also classified as Federal Reference Method (FRM) monitor sites by the EPA. PM<sub>2.5</sub> data from the Houston Aldine, Baytown and Clinton monitors determine HGB attainment with the PM<sub>2.5</sub> NAAQS. The Galveston and Deer Park PM<sub>2.5</sub> monitors are shaded in gray below because they were added in 2013 and have not yet collected a full set of PM<sub>2.5</sub> data. TCEQ has plans to add another PM monitor in the HGB region near an HGB roadway (to be co-located with a current or future NO<sub>2</sub> monitor).

These federal monitors utilize the appropriate sampling and analysis methods and quality assurance/quality control (QA/QC) protocols for use in determining attainment demonstration status with the fine particulate matter standard. Monitoring sites with FRM monitors are considered regulatory monitors. There are numerous additional PM<sub>2.5</sub> monitors within our region that are not considered regulatory monitors, but data from these other monitoring sites is used by TCEQ to help understand air quality data and trends and help predict possible alerts.

HGB Region PM <sub>2.5</sub> Regulatory Monitoring Sites <sup>7</sup>						
Region	Name	CAMS ID	Address	AQS Number	Sampler Type	Operational Date
12	Houston Aldine	C0008	4510½ Aldine Mail Road, Houston	482010024	PM <sub>2.5</sub> (FRM)	8/14/2000
12	Baytown	C0148	7210½ Bayway Drive, Baytown	482010058	PM <sub>2.5</sub> (FRM)	1/6/1999
12	Clinton	C0403	9525 Clinton Drive, Houston	482011035	PM <sub>2.5</sub> (FRM & co-located)	1/1/1999 & 4/6/1999
12	Galveston 99 <sup>th</sup> Street	C1034	9511 Avenue V½, Galveston Airport, Galveston	481671034	PM <sub>2.5</sub> (FRM)	5/1/2013
12	Houston Deer Park <sup>2</sup>	C0035	4514½ Durant Street, Deer Park	482011039	PM <sub>2.5</sub> (FRM & FEM)	8/10/2013

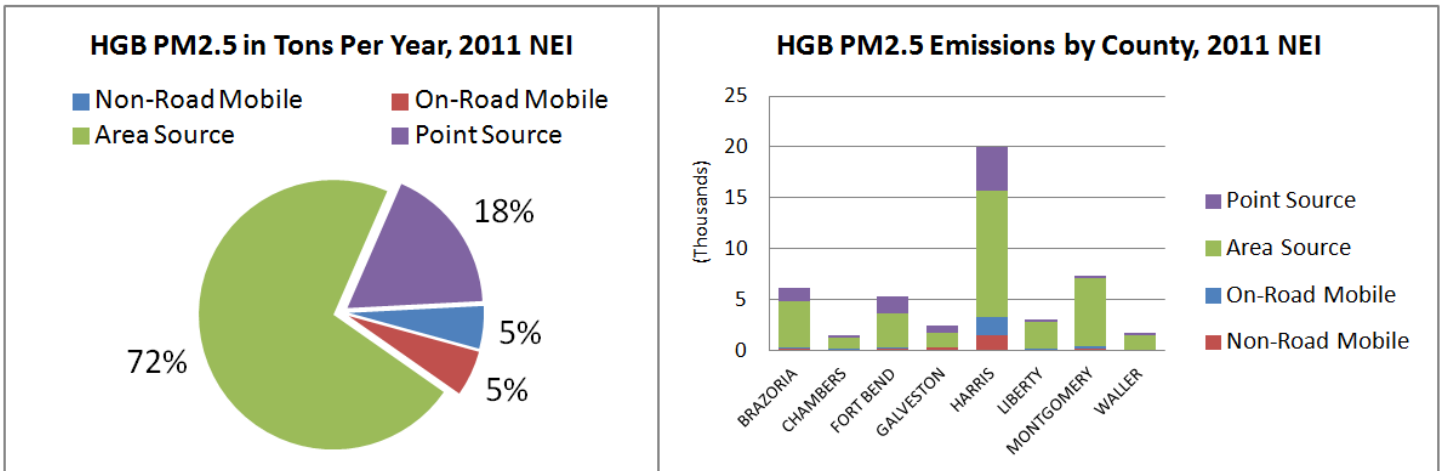
Monitors in gray have become operational within the last three years. As such, they cannot yet be used to determine attainment. To view the data from all of TCEQ's continuous monitors, please follow this link: [www.tceq.texas.gov/airquality/monops/sites/mon\\_sites.html](http://www.tceq.texas.gov/airquality/monops/sites/mon_sites.html). Please be aware that the PM<sub>2.5</sub> monitors at these sites are non-continuous monitors. Data from these monitors will not be available until the filter has been collected and analyzed in the laboratory.

## HGB PM<sub>2.5</sub> INVENTORY

The following PM<sub>2.5</sub> inventory is based on TCEQ's adjusted 2011 National Emissions Inventory (NEI) data. The NEI is a comprehensive, detailed estimate of criteria and hazardous air emissions sources. The NEI is prepared every three years by the EPA based primarily upon emission estimates and emission model inputs provided by State, Local, and Tribal air agencies for sources in their jurisdictions, and supplemented by data developed by EPA. The 2011 NEI was built from emissions data in the Emissions Inventory System (EIS). The 2011 version of the NEI is the most current edition available. Publication of the 2014 inventory is expected in mid-2016.

<sup>7</sup> The Galveston and Deer Park PM<sub>2.5</sub> monitors were added in 2013 and have not yet collected a full data set.

TCEQ PM<sub>2.5</sub> Inventory for HGB<sup>8</sup>



These data are split into four emission categories: point, on-road mobile, non-road mobile, and area (non-point) sources. Point sources are individually inventoried and usually located at a fixed, stationary location (heaters, boiler and cooling water towers at large industrial facilities), although portable sources are also included (some rock crushing operations). On-road mobile sources include emissions from vehicles found on roads and highways (cars, trucks, and buses); while non-road mobile sources include mobile sources not found on roads and highways (lawn mowers, construction vehicles, farm machinery, rail, airplanes, and commercial marine vessels). Area (non-point) sources include those sources that are inventoried collectively because they are too small in magnitude or too numerous to inventory as individual point sources, and which can often be estimated more accurately as a single aggregate source (residential heating, leaf blowers, and unpaved roads). The estimated emission values for TCEQ non-point sources in the chart below are taken from the Texas Air Emissions Repository (TexAER).

TCEQ PM<sub>2.5</sub> Inventory for HGB (tons per year)<sup>9</sup>

	Point Source	On-Road Mobile	Non-Road Mobile	Area Source
Brazoria	1,343.49	105.59	192.32	4,485.76
Chambers	264.91	89.22	33.73	1,098.25
Fort Bend	1,663.28	161.94	168.96	3,334.43
Galveston	714.32	95.70	247.64	1,363.36
Harris	4,235.57	1,794.99	1,490.56	12,445.15
Liberty	3.98	60.53	65.99	2,658.58
Montgomery	84.48	199.81	151.08	6,788.87
Waller	7.43	42.01	33.92	1,418.63
<b>Total</b>	<b>8,317.46</b>	<b>2,549.79</b>	<b>2,384.20</b>	<b>33,593.03</b>

<sup>8</sup> TCEQ's adjusted 2011 NEI data follows the same quality assurance and quality control process as data in the Reasonable Further Progress (RFP) and Attainment Demonstration (AD) State Implementation Plan (SIP).

<sup>9</sup> TCEQ Data Sources: 2011 rail and locomotive - 2011, 2011 area source v2, 2011 commercial marine vessels, 2011 AERR on road annual criteria, 2011 non-road annual criteria pollutants, 2011 At 2011 Drilling Rigs Controlled, 2011 aviation - if non-road. Point Source PM estimates obtained from TCEQ for 2013. The data is subject to revisions or updates.

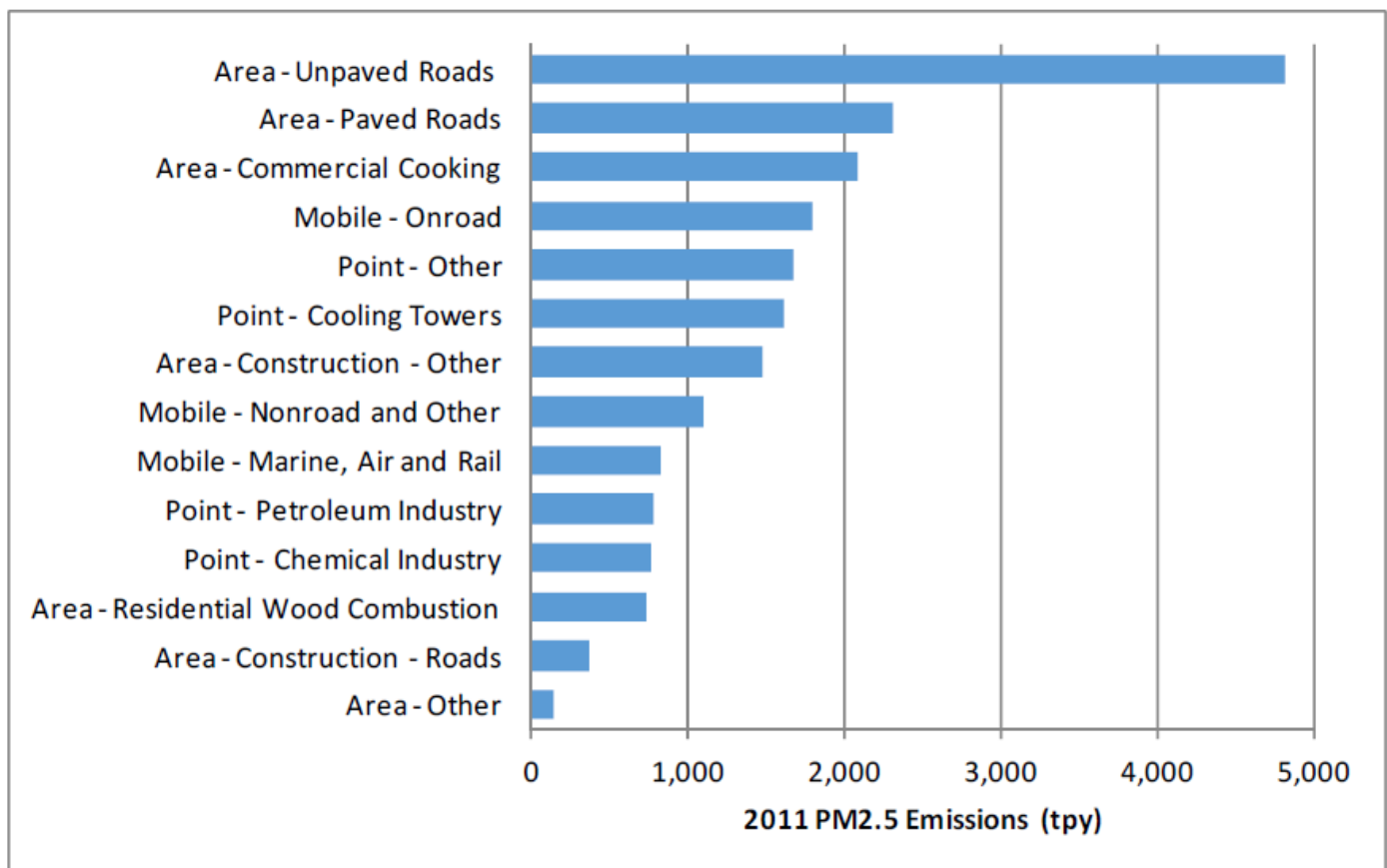
## HARRIS COUNTY PM<sub>2.5</sub> INVENTORY SUMMARY

Recent ambient air quality monitoring data indicate that the Houston area (Clinton Drive PM<sub>2.5</sub> monitor located within Harris County) has measured near the level of the annual average PM<sub>2.5</sub> NAAQS. Houston Advanced Research Center (HARC), in partnership with Harris County, spearheaded an effort to further investigate sources of PM<sub>2.5</sub> within Harris County: the Harris County PM<sub>2.5</sub> Emissions Inventory project.

This project was funded by a Coastal Improvement Assistance Program (CIAP) grant, administered by the U.S. Fish and Wildlife Service through Harris County. The aim of this portion of the grant was to review the PM<sub>2.5</sub> inventories developed by TCEQ and EPA for Harris County, make adjustments when technically justified, and provide a list of potential controls, including their efficiencies and costs that might be used to reduce PM<sub>2.5</sub> emissions based on the revised inventory.

This inventory summary is broken down into three categories of emissions: point, mobile and area sources using NEI inventory definitions. This inventory summary identifies unpaved roads as the predominant source of PM<sub>2.5</sub> within Harris County.

### 2011 Harris County Annual PM<sub>2.5</sub> Emissions





## PAST AND PRESENT INITIATIVES

### AIR QUALITY PROGRAMS AT H-GAC

H-GAC has partnered with local and regional government agencies, citizen and environmental groups, business and industry-based organizations and other stakeholders to proactively pursue air quality improvements within our region. Currently, over 12 major emission reduction programs are underway at H-GAC due to the region's ozone non attainment status. These programs have multi-pollutant benefits and, despite their main focus on reducing ground-level ozone, these programs have produced in significant PM<sub>2.5</sub> reductions in the past. In 2014 alone, these programs resulted in over 8 tons of PM<sub>2.5</sub> reductions in our region.

2014 Current Control Programs Reductions (tpy) <sup>10</sup>			
Measure	PM <sub>2.5</sub> (tons)	NOx (tons)	VOC (tons)
Clean Vehicles Program			
<i>Non-Drayage Projects</i>	0.04	114.00	0.43
<i>Drayage Trucks</i>	6.43	83.52	5.86
Clean School Bus Program			
<i>Drayage Trucks</i>	1.80	20.59	1.56
<i>Local Government Projects</i>		23.95	
Clean Vessels for Texas Waters	0.16	14.94	
Clean School Bus Program		22.00	
Commute Solutions (Clean Air Champions, Ridematch and Telework )		12.79	12.65
Commute Solutions: METRO Star Vanpool		51.00	
Commute Solutions: Commuter and Transit Pilot Projects		15.42	16.16
Totals	8.43	358.21	16.16

### CLEAN VEHICLES & CLEAN SCHOOL BUS PROGRAMS

Since 1995, the Clean Vehicles Program has provided grant assistance to replace older diesel engines in both public and private fleets within the HGB region. This fuel neutral program is designed to reduce on-road vehicle emissions by rapid turnover to newer lower emitting engines, retrofit of existing engines with approved devices, or introduce new lower emission technologies. In 2014, the Clean Vehicles Program reduced close to 6.5 tons of PM<sub>2.5</sub> emissions.

The Clean School Bus program serves the following counties: Angelina, Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Hardin, Harris, Houston, Jasper, Jefferson, Liberty, Matagorda, Montgomery, Nacogdoches, Newton, Orange, Polk, Sabine, San Augustine, San Jacinto, Trinity, Tyler, Walker, Waller, and

<sup>10</sup> 2014 Air Quality Program emission reductions calculated using EPA MOVES emission factors.

Wharton. The goal of the program is to reduce children's exposure to diesel exhaust and reduce the amount of air pollution created by diesel school buses.

#### CLEAN VESSELS FOR TEXAS WATERS

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In 2011, EPA awarded H-GAC almost \$1 million to repower 3 high-emitting tug vessels with 8 new, cleaner engines. The repowered vessels mainly operate in the HGB non-attainment area—docking ships and fueling marine vessels. The project has already completed the replacement of 3 engines, with the remainder scheduled for re-fit in 2015. This project has reduced over 1 ton of PM<sub>2.5</sub> emissions, with 0.16 tons reduced in 2014 alone.

#### COMMUTE SOLUTIONS: CLEAN AIR CHAMPIONS

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The Clean Air Champion program is an outreach program designed to partner with local employers to implement alternative commuting and clean fleet policies. Organizations that meet the requirements of the Clean Air Champion program earn the distinction of being recognized as a regional leader of employee benefits offerings—a designation that gives them a competitive advantage in recruiting the best and brightest employees.

#### COMMUTE SOLUTIONS: RIDE MATCH (NURIDE)

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NuRide is one of the largest and most successful incentive-based online rideshare programs in the nation. NuRide rewards people for trips in which they choose to walk, bike, telecommute, carpool, vanpool, take transit, or work a compressed week. To date the NuRide program has over 27,000 users, resulting in over 13 million VMT reduced.

#### COMMUTE SOLUTIONS: TELEWORK

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The Telework Program helps regional employers and employees by educating about the benefits of teleworking and offering financial incentives to develop and implement telework as well as alternative work schedule programs. Over 1,700 new teleworkers participated in the program in 2014 resulting in over 6 million VMT reduced.

#### COMMUTE SOLUTIONS: METRO STAR VANPOOL PROGRAM

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STAR, the regional vanpool and rideshare program provided by METRO is one of the largest programs of its kind in the nation. The program provides a 15-, 12-, or 7-passenger van along with insurance, maintenance, roadside assistance and administrative coordination. Average fares are about \$135 per month, and the average round-trip traveled is 66 miles. Additionally, program participants receive a \$35 per month subsidy to help offset vanpool costs. Volunteers within the vanpool groups do the driving. There are currently over 700 vanpools in operation with over 7,300 riders in the region. This program has reduced over 61 million VMT to date.



## COMMUTE SOLUTIONS: TRANSIT PILOT PROJECTS

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More than 13 pilot projects have been implemented in the HGB region using a combination of federal funds and local matching funds, resulting in over 32,000,000 VMT reduced.

## ENERGY CORRIDOR DISTRICT'S CARSHARE PROGRAM

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The Energy Corridor in partnership with Enterprise Holdings provides commuters access to vehicles on days they use a commute alternative. CarShare vehicles are available for hourly rental at two different sites for personal or work errands throughout the day, with fuel, physical damage/liability protection, vehicle maintenance, and 24/7 roadside and member assistance included. This program assists in making alternative mode use more attractive to users.

## DRAYAGE LOAN PROGRAM

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Since 2010, the H-GAC Drayage Loan Program has offered independent owner operator and/or trucking companies servicing HGB ports the opportunity to apply for financing to support the purchase of cleaner, safer and more fuel efficient drayage trucks. Almost 900 tons of NOx reductions and 14 tons of PM emission reductions are anticipated over the life of the program. This program has been a collaborative effort between H-GAC, Environmental Defense Fund, and the Port of Houston Authority.

## PEDESTRIAN & BICYCLIST PROGRAM

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In Houston, 1% to 3% of trips are made via bike/walk modes—equal to 38,689 to 116,068 trips per day for an approximate daily VMT reduction of between 58,035 and 174,101 miles. According to a frequency distribution analysis of trips by trip length (prepared by the Texas Transportation Institute<sup>11</sup>), there are 3,868,922 trips per day that are 2 miles or less in length for home-based work, home based non-work, and non-home based non work trips.

Regionally, there is a vibrant move toward more bicycle use. The City of Houston offers over 300 miles of an interconnected bikeway network spanning across 500 square miles. The network includes bike lanes, bike routes, signed-shared lanes and shared-use paths, commonly referred to as 'hike and bike' trails, which includes rails to trails, and other urban multi-use paths. In addition to these bicyclist transportation facilities, there are over 80 miles of hike and bike and nature trails found in City of Houston parks. In addition, Harris County and many municipal utility districts have constructed over 160 miles of bikeways within the City limits.

The annual pollutant reduction as a result of increased walking and biking is 21,182,775 miles and 14,121,485 trips, reducing 11.6 tons of VOC; 12.6 tons of NOx; 0.33 tons of PM<sub>2.5</sub>; and 9,550 tons of CO<sub>2</sub> annually.

## VOLUNTARY IDLING REDUCTION PROGRAM

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In 2012, in partnership with local governments, citizen and environmental groups, business and industry-based organizations and other stakeholders H-GAC developed a voluntary idling reduction

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<sup>11</sup> TTI analysis of the 2009 Houston Household Travel Survey File TLFH.Hou.Reg.3WayWith.Proxy.Adj transmitted by H-GAC on 1/24/12

program and adopted a voluntary diesel idling reduction policy. This anti-idling policy aims to lower nitrogen oxide (NOx) and other emissions by placing a five-minute idle limit on motor vehicles. Along with promoting this voluntary policy region-wide, H-GAC provides idling reduction bumper stickers and signs within our region free of charge. The Port of Houston Authority has been a major partner in developing and supporting this program, posting over 100 idling reduction signs at the Turning Basin terminal within the Port.

The following organizations within the 8-county nonattainment region have anti-idling policies in place:

Alain Garcia Independent Trucking	Davenport Transportation & Rigging	Klein ISD Magnolia ISD
Alief ISD	Dickinson ISD	Liberty ISD
Alvin ISD	Fast Trac Transportation	Museum Park Super Neighborhood
Angleton ISD	Fort Bend ISD	North Forest ISD
AT&T	Friendswood ISD	Our Lady Queen of Peace Catholic School
Barbers Hill ISD	Galena Park ISD	Pasadena ISD
Brazosport ISD Transportation Services	Galveston ISD	Pearland ISD
City of Houston Clear Creek ISD	Goose Creek Consolidated ISD	Santa Fe ISD
Columbia-Brazoria ISD	Harris County	Sheldon ISD
Conroe ISD Transportation Department	High Island ISD	Spring ISD
Cypress-Fairbanks ISD	Houston Astros	Sweeny ISD
Transportation Department	Houston Biodiesel	Texas City ISD
Damon ISD	Houston ISD	Tomball ISD
Danbury ISD	Huffman ISD	TxDOT
	Humble ISD	UPS Waller ISD
	Jose Alfaro Independent Trucking	Westside High School, HISD

## REGIONAL TECQ TEXAS EMISSION REDUCTION PLAN (TERP)

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The Texas Commission on Environmental Quality’s (TCEQ) regional Texas Emission Reduction Plan (TERP) program - established by the 77th Texas Legislature in 2001, through enactment of Senate Bill (SB) 5 - has been an important voluntary project in Texas. TCEQ provides TERP funding for emission reduction projects to participants in Texas. These projects include a number of voluntary financial incentive programs (including Emission Reduction And Incentive Grants, Rebate Grants, Third-Party and American Recovery and Reinvestment Act Rebate Grants, as well as other assistance programs), to help improve the air quality in Texas. Between 2008 and 2013 TCEQ regional TERP has funded over 3,200 vehicle replacements totaling over \$160 million dollars. During the 84<sup>th</sup> Session of the Texas Legislature in 2015, the TERP program was extended for an additional two years with a 50% increase in funding. These TERP grants are estimated to reduce between 65 and 275 tons of PM emissions per year<sup>12</sup>.

## REGIONAL TEXAS EMISSION REDUCTION PLAN (TERP)

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The first H-GAC Regional TERP program provided over \$3 million in grant funds, resulting in over 405 tons of NOx emission reductions from on-road vehicles and off road equipment (Local Government and Drayage Loan Trucks). PM reductions were not enumerated, but estimated to be in the range of 10 to 40 tons.

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<sup>12</sup> ENVIRON 2014

The second H-GAC Regional TERP program, which is currently open to Local Governments, has currently provided \$78,015 grant funds contracting for a NOx emission reduction of 7.8 tons from off road equipment. Again, PM reductions were not enumerated but estimated to be at least 0.2 to 0.7 tons.

## CLEAN AIR EDUCATION

**AIR QUALITY FORECAST AND PM ACTION DAY E-MAIL ALERT SYSTEM.** TCEQ provides free e-mail alerts for the Today's Texas Air Quality Forecast and PM Action Days for several metropolitan areas throughout Texas, including the Houston area. The TCEQ informs the public typically a day in advance when conditions are forecast to be favorable for high PM levels in any of the participating areas

**DRIVE CLEAN ACROSS TEXAS** is the nation's first statewide public outreach and education campaign designed to raise awareness and change attitudes about air pollution.

**MYSOLUTIONIS.COM.** H-GAC has developed a single website address for all air quality initiatives and commute solutions programs. This one website provides air quality information to promote awareness amongst area residents, HR Management, Fleet management, partners, and stakeholders. This site also includes upcoming event information and links to recent air quality publications and educational resources.

**OZONE VIEWER MOBILE APP.** The Houston Clean Air Network (Houston CAN) is a coalition of clean air advocates and health, science and environmental professionals representing businesses, government agencies, schools, community groups and the general public. The Houston CAN in partnership with Air Alliance Houston, American Lung Association and others - has developed an Ozone Viewer Mobile App to help increase education and awareness surrounding air quality in our area. This app can be viewed online at: [houstoncleanairnetwork.com](http://houstoncleanairnetwork.com).

**AIR QUALITY REFERENCE GUIDE.** The Air Quality Reference Guide provides up to date information about air pollution in the Houston-Galveston region.

## DUST SUPPRESSION PROJECTS IN THE CLINTON DRIVE AREA

TCEQ, EPA Region 6, the City of Houston, Harris County Precinct 2, Port of Houston Authority, Port Terminal Rail Authority and local industry have partnered to address PM<sub>2.5</sub> sources and implement dust suppression strategies to reduce PM<sub>2.5</sub> emissions near the Clinton Drive area.

TCEQ approved a supplemental environmental project (SEP) to pave the parking lot directly adjacent to the Clinton Drive monitoring station. The paving was completed in summer 2009.

The City of Houston has installed barriers to keep trucks from driving onto the unpaved shoulder. Additionally, a traffic light was installed at Clinton Drive and Industrial Park East to control traffic. A landscaping project was completed along Clinton Drive. Since implementation, these dust suppression projects have proven PM<sub>2.5</sub> reduction benefits (not solely PM<sub>10</sub> benefits). Speciation data from the Clinton Drive monitor show decreases in dust and soil following the implementation of dust suppression measures.

The Port of Houston Authority (PHA) has established a program to regularly apply emulsified asphalt to reduce dust emissions at Industrial Park East (IPE) at the Turning Basin Terminal (since 2007).

PHA has also paved 18 acres of land and 500 feet of roadway at IPE. Since 2008, PHA has sprayed approximately 48 acres with emulsified asphalt. PHA has also reconstructed the Upper Level Road at Turning Basin, which added capacity from two lanes to four lanes from the main entry gate off of I-610 to the Port Coordination Center. Additionally, the reconstruction of High Level Road from the Main Gate the Port Coordination Center has been completed. This roadway and existing lanes have been widened and expanded to allow for increased throughput while suppressing dust.

In addition, industry has undertaken dust suppression efforts near the Port. The Port Terminal Railroad Association (PTRA) has stopped steel loading activities on a dirt area to the south of the Clinton Drive monitor to reduce dust. DuPont, a PHA tenant, implemented new dust control best management practices at its fluorspar unloading and storage facility. Valero Asphalt paved its large land leases located across Clinton Drive to the southeast of the Clinton monitor.

## CITY OF HOUSTON

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### RENEWABLE ENERGY

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The City is the largest municipal purchaser of green power in the nation with more than 50 percent of the City's energy supply coming from either wind or solar sources. The City is planning to continue to expand this portfolio through the construction of 30 MW of solar power which will be used to power City facilities.

### GREEN BUILDINGS AND ENERGY EFFICIENCY

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For City buildings, there is an aggressive program in place to improve energy efficiency. So far, 6 million square feet of city facilities have been retrofitted and are reducing energy usage by 30 percent each year. By 2020, the City has also committed to improving energy efficiency by 20 percent at an additional 30 million square feet of facilities. The City has also adopted an aggressive stance on the creation of LEED certified buildings targeting Silver certification for all new construction. So far, this has resulted in the completion of 23 LEED certified projects with another 9 currently being planned.

For residents, the City administers the Department of Energy's (DOE) Residential Energy Efficiency Program (REEP). Through this program, the City has helped 13,000 residents benefit from the program which has resulted in 12 to 18 percent kWh reductions for participants with an average savings of \$60 to \$125 per month. In addition, the City has been working to create home-grown programs to help improve residential efficiency: the 5-Star Program with local builders to encourage the construction of new, energy efficient residences in historic neighborhoods as well as an effort with the Houston Advanced Research Center to streamline and refine the permitting process for installing rooftop solar on existing residences. In 2014, the City of Houston also adopted a Residential Buildings Energy Efficiency Code that is 15% in excess of the Texas standard.

## GREEN FLEETS

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Through the City's Houston Drives Electric program, Houston has become a leader in government electric vehicle (EV) fleets. Through this program, the City has recently added 27 Nissan Leafs to its vehicle fleet for a total of 42 electric and plug-in hybrid fleet vehicles. In addition to the purchase of these more efficient vehicles, the City has created the Houston Fleet Share program to serve as a central, shared motor pool. This has resulted in a 50% increase in vehicle utilization with more needs met using fewer vehicles. As a result, 44 older and less efficient vehicles have been sold and 84 others have been reassigned.

Participation in Department of Energy's (DOE) EV Project, with partner Ecotality, added 77 additional Blink charging stations in Houston, including 24 at the airports and 29 in downtown Houston. Through this program participants, including the City of Houston and other businesses, received charging stations at no cost and an additional credit to install the charging station. In addition, the City has offers 24-hour permitting for residential charging stations and is working on additional incentives to spur the adoption of EV technology.

## ANTI-IDLING POLICIES

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In 2011, the City adopted an anti-idling policy for municipal vehicles. Section 7.2.29 of the Administrative Procedure for Motor Vehicle Assignment and Use states:

“No employee shall cause or allow an engine of a City vehicle that is within his or her custody or control to idle for more than five consecutive minutes in a one-hour period when the City vehicle is not in motion or when the other engine is not being used for its primary function.”

Furthermore, the City is currently developing an anti-idling ordinance for all motor vehicles over 14,000 pounds operated within the city limits of Houston.

## HOUSTON AIRPORT SYSTEM EMISSIONS REDUCTIONS

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To reduce emissions from flights, winglets are being utilized to reduce fuel consumption by 6%. Improvements to airfield runways, taxiways, and gates/ramp reduced aircraft taxi and idle times which resulted in both fuel consumption and associated emissions reductions and improved air quality. Additionally, the use of auxiliary power units (APUs). APUs are small on-board turbines that are operated to provide electrical power and air conditioning to an aircraft when it is parked at a gate and the main engines are shut down. Installation of gate electrification equipment enables parked aircraft to forego the use of APUs which results in a reduction in both jet-fuel consumption and associated emissions. In total, emission reductions from ground service equipment have resulted in a 75% NO<sub>x</sub> reduction equal to 1.150 tons per day.

At Houston George Bush Intercontinental Airport, rental car companies formerly operated out of separate facilities located both on and off airport property. Houston Airport System constructed a Consolidated Rental Car Facility on airport property south of the terminal area which significantly reduced the mix of numbers, types, and ages of the existing buses operated by the various rental car companies. This resulted in a reduction in both diesel fuel consumption and associated emissions. A similar facility is being planned for William P. Hobby airport. In 2014, the IAH's Rental Car Bus Fleet was replaced with clean burning diesel engines, which resulted in PM<sub>2.5</sub> and other emissions reductions.

## HOUSTON BIKE SHARE PROGRAM

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In April, 2013, the City expanded Houston Bike Share ([www.houston.bicycle.com](http://www.houston.bicycle.com)) to encourage biking in Houston. Houston now has over 250 bikes and 30 kiosks throughout downtown and adjacent neighborhoods (Montrose, Midtown, East End, Heights, and the Museum District). The Houston Bike Share program Phase III expansion plans include bike share kiosks at the city's universities, the Texas Medical Center, and additional neighborhoods.

## METAL RECYCLERS TASK FORCE

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The City and a metal recyclers' task force are working together in characterizing emissions from metal recyclers, assessing the potential risks that may be posed by the emissions, recommending and implementing best emissions-mitigating-practices, such as altering metal cutting methods to reduce fine particulate emissions.

## SAFE PASSAGE ORDINANCE AND COMPLETE STREETS POLICY

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The City approved a Safe Passage ordinance in May 2013 to keep bicyclists and pedestrians safer on city streets and encourage more outdoor activity. In October 2013, Mayor Parker unveiled a transformative new approach for Houston streets that will accommodate the needs of all users, not just those behind the wheel. The Mayor's Complete Streets and Transportation Plan is meant to provide safe, accessible and convenient use by motorists, public transit riders, pedestrians, bicyclists, and people of all abilities. In 2014, the City and BikeHouston created a bike safety campaign, Goal Zero, to enforce and educate motorists and cyclists about the Safe Passage ordinance.

## SPACE UNITS

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In 2011, 17 mobile solar-powered generators (SPACE units) were acquired through a partnership with the College of Architecture at the University of Houston's Green Building Components Program and placed at fire stations, parks, neighborhood centers and schools; these units reduce the use of diesel generators in an emergency.

## VOLUNTARY ENVIRONMENTAL COMPLIANCE AGREEMENTS

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The City and industrial businesses have voluntarily implemented environmental compliance agreements that help reduce emissions. By these agreements businesses have modified operational controls minimizing particulate and visible emissions, such as from painting and abrasive blasting operations in the ship channel area.

## HARRIS COUNTY ENHANCED ENFORCEMENT PROGRAM FOR SMOKING VEHICLES

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The Harris County Sheriff's Department, the Precinct 4 Constable's Office, and the Precinct 5 Constable's Office have implemented an emissions enforcement program to ensure that all vehicles on our roads are



in compliance with air quality standards. This enforcement program is conducted in collaboration with the Harris County District Attorney's office, the Harris County Judge's office, the Harris County Attorney's office, the Texas Department of Public Safety, and the Houston-Galveston Area Council. Law enforcement personnel target high emitting vehicles, smoking vehicles, and suspicious vehicles to verify that the state inspection certificates attached to these vehicles are legitimate.

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## METROPOLITAN TRANSIT AUTHORITY OF HARRIS COUNTY

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### LIGHT RAIL EXPANSION

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The Metropolitan Transit Authority of Harris County (METRO) has expanded its light-rail infrastructure within the City of Houston, recently opening two new light rail lines in May of 2015. With this addition, Houston's passenger rail operations have expanded from 7.5 miles to 23 miles.

### HYBRID BUS FLEET

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METRO currently operates a fleet of more than 1,230 buses that carry more than 105 million passengers annually. Over one-third of the METRO bus fleet, 438 buses, is powered by clean-running, diesel-electric hybrid technology, resulting in significant PM reductions for the HGB region.

### METRO BIKES ON BUSES

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There are a growing number of bicycle and pedestrian paths and walkways and a concentrated effort to connect these walkways with activity centers and transit centers. All METRO buses are equipped with bike racks, with the exception of park and ride buses (which have cargo areas for bike storage). METRO's annual bike boardings continue to increase from 2011 through 2014. In METRO's FY2013, there were 167,421 bike boardings that were recorded and in FY 2014 that number increased to 251,072 bike boardings<sup>13</sup>.

## PORT OF HOUSTON AUTHORITY (PHA)

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### BAYPORT EXPANSION AND INCREASED EFFICIENCY

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The Port of Houston Authority was awarded a \$10 million Transportation Investment Generating Economic Recovery (TIGER) grant to be used toward the expansion of the berth at its Bayport Container Terminal. The grant helped fund the extension of Bayport's wharf and purchase three new electric, rail-mounted gantry cranes to handle the increase in container throughput. The project will allow Bayport to handle more than 2 million 20-foot-equivalent units (TEUs), doubling its present capacity, and will help support international trade with more than 1,000 ports in more than 200 countries. Increased productivity as a result of the expansion is projected to reduce truck waiting and idling times by an estimated 7.6 minutes on average.

### CLEANER OPERATING EFFICIENT CRANES

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<sup>13</sup> Metro Bike Boarding Running Count FY 2011 – FY 2014 by month

The Port of Houston recently replaced 10 rubber tired gantry cranes (RTGs) at Barbours Cut with 8 newer Tier 3 665hp RTGs (replaced 10 Tier 2 755 hp RTGs). These RTGs will operate about 2,500 hours a year. This is possible because the older cranes average about 4 moves an hour while the new cranes average about 12 to 15 moves per hour. The increased efficiency associated with these cleaner, faster cranes reduces the truck idling and associated emissions at the Port.

## CONTAINER TRACKING MOBILE APP

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The Port has developed a mobile app that allows drivers to check on the status of a container and its pick up availability. This app reduces the amount of waiting and idling at the Port. It is available for download at: [www.portofhouston.com/container-terminals/bayport/container-tracking-mobile-app/](http://www.portofhouston.com/container-terminals/bayport/container-tracking-mobile-app/)

## BAYPORT TERMINAL OPERATIONAL IMPROVEMENTS

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The stop sign at the truck exit at the Bayport Container Terminal has been removed and Port Road has been restriped to allow two lanes of truck traffic to exit without stopping. This eliminates idling for all trucks exiting Bayport plus eliminates a source of congestion during peak times.

## GATE AUTOMATION

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PHA implemented an automated gate system with optical character recognition (OCR) portal to automate equipment identification, traffic processing and damage inspection imaging at the entry gate of the Barbours Cut and Bayport container terminals. The system automatically identifies containers, chassis, and license plates associated with the equipment. Since implementation, gate OCR installation enabled PHA to process trucks twice as fast and reduced idling time by 48%, dramatically reducing emissions.

## PARTNERSHIPS

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PHA has established a proven track-record in securing state and federal grants for emission reduction benefits for PHA and PHA tenant and stakeholder engines and equipment.

Through the American Recovery and Reinvestment Act (ARRA)/Diesel Emission Reduction Act (DERA), PHA and six tenant/stakeholder partners were awarded \$3.4 million in grant funds in 2009 that were used for the replacement, repower and retrofit of 115 diesel engines used in port activity which will result in lifetime reduction 6 tons of PM<sub>2.5</sub>.

In 2010 PHA was also awarded a DERA grant of \$1.5 million to cover the incremental costs associated with fuel switching activities for all Maersk vessels calling at PHA prior to the EPA's mandated North America Emission Control Area implementation in 2012. The fleet of 26 vessels performed 163 vessel calls and fuel switches which resulted in a decrease in emissions of 32 tons of PM<sub>2.5</sub>.

In early 2015, PHA was awarded almost \$1.8 million dollars for two different DERA grants that will be used to replace older drayage trucks. The funds from one grant will be passed through to HGAC to fund an expansion to its Houston-Galveston Drayage Truck Program. This grant is expected to replace 14 older on-road drayage trucks with newer 2010 model year compliant drayage trucks and is expected to reduce 2.5 tons of PM<sub>2.5</sub> over the lifetime of the trucks. The funds from the second grant will be passed through to 2 of PHA's tenants and will replace 25 older drayage trucks (13 on-road trucks used only on PHA



turning basin terminal and 12 on-road terminal tractors used to pickup containers at the Bayport and Barbours Cut terminals) with newer on-road terminal tractors with 2010 model year compliant on-road engines. This grant is expected to reduce 5.03 tons of PM<sub>2.5</sub> over the life of the trucks.

## TRUCK REGISTRY AND DRAYAGE EXCHANGE (TRADE)

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As part of PHA's efforts to exchange older engines with cleaner burning technologies, PHA created public/private partnerships with tenants and stakeholders to implement emission reduction strategies and policies. PHA also provided \$2.2 million in grant funds (pass-thru) to tenants and stakeholders for the replacement, repower, and retrofitting engines and equipment. PHA provided matching dollars as leverage for a \$9 million EPA SmartWay grant to fund the revolving Drayage Loan Program.

## TEXAS DEPARTMENT OF TRANSPORTATION

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The Texas Department of Transportation (TxDOT) has been working to reduce both NO<sub>x</sub> and PM<sub>2.5</sub> through a variety of different strategies. TxDOT has encouraged contractors in both construction and maintenance to limit work hours to times which would have the least impact on air quality. For construction contractors in high-volume corridors, this includes limiting construction to night time and other off-peak periods. For maintenance contractors this focuses on curtailing work during ozone action days. In addition, for TxDOT staff is encouraged to limit idling of agency vehicles when possible. TxDOT has also implemented a program to replace and upgrade inefficient off-road vehicles to newer, more efficient models.

## RAILROAD PROJECTS

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### ANTI-IDLING ENGINE CONTROLS

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Approximately 60% of Union Pacific (UP) switcher engines operating in the HGB area have anti-idling controls, which reduce PM emissions.

### REFURBISHED SWITCHER AND LOW EMISSION ENGINES

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The Port Terminal Railroad Association (PTRA) and UP are operating newly refurbished switcher engines on the Clinton line. UP currently has 52 new low-emission genset<sup>14</sup> engines in the Houston area. In addition, UP has 13 Tier 2 locomotives funded by Texas Emissions Reduction Plan (TERP).

## REGULATORY PROJECTS

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A number of regulatory projects have reduced fine particulate matter emissions in the HGB region. Some of these initiatives are outlined below.

## EPA'S CONTROL OF EMISSIONS FROM SHIPS

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<sup>14</sup> Genset locomotives are powered by ultra-low-emission diesel engines that are connected to electric generators, thus the name "Generator-Set," or "Genset" switcher. [http://www.tceq.texas.gov/assets/public/implementation/air/sip/hgb/hgb\\_mveb\\_2012/12002SIP\\_ado\\_complete.pdf](http://www.tceq.texas.gov/assets/public/implementation/air/sip/hgb/hgb_mveb_2012/12002SIP_ado_complete.pdf)

In March 2010, the International Marine Organization (IMO) officially designated waters off North American coasts as an Emission Control Area (ECA) with stringent international emission standards for ships. The first-phase fuel sulfur standard began in 2012, which required that all marine diesel fuels used by ships in the North American ECA be limited to a maximum fuel sulfur content of 10,000 ppm (1 %). In January 2015, a more stringent maximum of 1,000 ppm (0.1 percent) came into force for all ships in the North American ECA. It is anticipated that the implementation of the ECA will reduce PM<sub>2.5</sub> shipping emissions in the Gulf Coast region by 86%.

## FEDERAL MOTOR VEHICLE CONTROL PROGRAM

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The Federal Motor Vehicle Control Program has significantly reduced exhaust emissions from both light duty and heavy duty vehicles in the HGB area.

## INDUSTRY PROJECTS

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As of January 2011, approximately 90% of the nation's refinery capacity is under lodged or entered 'global' settlements to reduce SO<sub>2</sub> emissions at both refineries and sulfuric acid plants<sup>15</sup>.

An East Harris County company reduced particulate emissions by an estimated 24 tons per year during 2005 to 2007 with several projects including boiler shutdown, process changes, and cooling tower equipment upgrade. Another company upgraded cooling tower equipment and decreased particulate emissions (quantity not estimated).

Shell Deer Park made several equipment upgrades that reduced particulate and/or sulfur dioxide emissions, including the 2003 installation of a wet gas scrubber on refinery's cat cracker, resulting in the reduction of 61 tpy of PM and 4674 tpy of SO<sub>2</sub><sup>16</sup>. Shell also installed a flare gas recovery compressor system on the Deer Park Refinery's East Property Flare at end of 2012—resulting in the reduction of 2475 tpy of SO<sub>2</sub><sup>17</sup>.

Valero Refining has implemented control measures to reduce SO<sub>2</sub> emissions by 3,500 tpy. The Rhodia sulfuric acid plant was projected to decrease its SO<sub>2</sub> emissions by 8,984 tpy from 2005 to 2012.

The Dow Chemical Company completed several shutdowns and upgrades to facilities at Freeport and Deer Park that reduced PM emissions by 192.97 tpy. These projects include: an Acetylene plant shutdown (Deer Park), 2008; Latex plant shutdown (Freeport), 2009; Upgrades to the Dow Pyridine derivatives facility and cooling tower (Freeport), 2009; Power 3, Power 6 and Poly 2 facilities shutdown (Freeport), 2010; EDC VCM facility shutdown (Freeport), 2011; Styrene 1, 2, EBA and distribution facilities shutdown (Freeport), 2012; and improvements to HT cooling Tower in Deer Park, including drift eliminators, 2013.

## ENERGY EFFICIENCY IN HGB

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<sup>15</sup> <http://www2.epa.gov/sites/production/files/documents/refineryinitiative-powerpoint021111.pdf>

<sup>16</sup> Based on comparison of 2002/2003 emissions to 2004/2005 emissions

<sup>17</sup> Based on comparison of 2011 emissions versus 2013 preliminary-AEI emissions

In 1999, the Public Utility Commission of Texas (PUCT) adopted rules for the state's Renewable Energy Mandate, establishing a renewable portfolio standard (RPS), a renewable-energy credit (REC) trading program, and renewable-energy purchase requirements for competitive retailers in Texas<sup>18</sup>.

The State has established the Texas Energy Efficiency resource goal of 20% incremental load growth in 2011, which is equivalent to approximately 0.10% annual savings, with 25% in 2012, 30% in 2013 and onward<sup>19</sup>.

In Fort Bend County, NRG Energy added a 75-megawatt natural gas generating unit to its W.A. Parish power plant. This natural gas unit has higher energy efficiency and less PM<sub>2.5</sub> emissions than a conventional power plant. PHA has also adopted an electrical contract which requires 25% renewable energy.

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## POTENTIAL AND FUTURE PROJECTS

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*These ideas are NOT commitments of future action. They are merely ideas, and their implementation would be contingent on funding availability, and an affirmative commitment from the proposing agency. All ideas are voluntary and would result in PM benefits.*

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## AIR QUALITY PROGRAMS & PARTNER PROJECTS

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### CLEAN VEHICLES & CLEAN SCHOOL BUS PROGRAMS

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The Clean Vehicles Program will continue to provide significant emission reductions within our region. This program has funded replacements of school buses, private fleets, drayage trucks, transit vehicles and more. Since its start, the program has provided over \$78 million in financial aid, replaced over 2,700 engines and developed several alternative fueling stations. In the future, the Clean Vehicles Program will target heavy-duty fleet replacements and will continue to result in both PM and NO<sub>x</sub> emission reductions for our region.

In 2015, EPA awarded a total of \$240,000 to three school districts in Texas to replace older diesel school buses with new buses that emit 90 percent cleaner emissions<sup>20</sup>. The Aldine Independent, Lone Star Public School and Spring Branch Independent school districts will receive rebates through EPA's Diesel Emissions Reduction Act to replace 12 of their existing diesel school buses. Since 2008, the DERA program has funded over 600 clean diesel projects across the country. These projects have reduced emissions for more than 60,000 engines. Over 500 school bus fleets applied to EPA's Rebate Program, requesting over \$32 million in funding.

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## DOE HYDROGEN FUEL-CELL ELECTRIC HYBRID TRUCK DEMONSTRATION PROJECT

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<sup>18</sup> [www.dsireusa.org/incentives/incentive.cfm?Incentive\\_Code=TX03R&re=1&ee=1](http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX03R&re=1&ee=1)

<sup>19</sup> [www.aceee.org/sector/state-policy/texas](http://www.aceee.org/sector/state-policy/texas)

<sup>20</sup> <http://www.epa.gov/cleandiesel/dera-rebate-schoolbus.htm>

The U.S. Department of Energy (DOE) provided a grant of \$3.4 million for a three-year demonstration project supporting the deployment of three zero emission Class-8 Hydrogen fuel cell-electric hybrid trucks at the Port of Houston Authority (PHA). The purpose of the project is to deploy heavy-duty trucks fueled by hydrogen and to demonstrate cost-effectiveness, emissions reduction, and commercial viability.

## DOE ZERO-EMISSION DELIVERY VEHICLE DEMONSTRATION PROJECT

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The goal of H-GAC's Zero Emission Truck project is to demonstrate the effectiveness of all-electric delivery vehicles in the Houston region. H-GAC received more than \$2 million from the U.S. Department of Energy for this project. Project partners will assemble and deploy all-electric delivery vehicles and provide vehicles to partner fleets operating in HGB. Each truck will be delivered with an electric vehicle charging station (EVSE). The vehicles will be deployed and tested over two years to measure emission reductions and evaluate vehicle performance. By deploying zero emission trucks, the project will reduce petroleum consumption and emissions of harmful air pollutants, including PM.

## REGIONAL TERP

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H-GAC received \$3 million from TCEQ to establish the second Regional Texas Emission Reduction Program (TERP). The Regional TERP provided grants to local governments for the replacement of non-road equipment and on-road vehicles powered by heavy duty diesel engines, and aids in the replacement of drayage trucks associated with the Drayage Loan Program. Regional TERP grant amounts are based upon the NO<sub>x</sub> reduction created by the equipment and vehicle replacement. These replacements will also result in PM<sub>2.5</sub> reductions in the HGB area.

## CLEAN AIR EDUCATION

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### PM FILTER OUTREACH CAMPAIGN

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H-GAC is considering the potential application and impact of a PM filter outreach and education campaign for truck drivers. Diesel particulate filters are ceramic devices that collect PM in exhaust steam. The high temperature of the exhaust heats the ceramic structure and allows the particles inside to break down (or oxidize) into less harmful components. When maintained correctly, PM filters reduce emissions of PM, hydrocarbons and carbon monoxide by 60 to 90 percent<sup>21</sup>. To function appropriately, manufacturers recommend that filters be cleaned every 100,000 miles to prevent clogged filters. The educational component of this campaign would focus on appropriate use and maintenance of PM filters and associated emission reduction technology.

### AIR QUALITY FLAG PROGRAM

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The Air Quality Flag Program alerts organizations to the local air quality forecast and helps them to take actions to protect people's health. Each day, participating organizations raise a flag that corresponds to how clean or polluted the air is. This color matches EPA's Air Quality Index (AQI) (green, yellow, orange, red, or purple). This better helps organizations adjust physical activities on unhealthy days to help reduce exposure to air pollution, while still keeping people active.

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<sup>21</sup> EPA [http://www.epa.gov/region1/eco/diesel/pdfs/particulate\\_matter\\_filter\\_fact%20sheet.pdf](http://www.epa.gov/region1/eco/diesel/pdfs/particulate_matter_filter_fact%20sheet.pdf)

## HOUSTON INDEPENDENT SCHOOL DISTRICT (HISD)

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### HISD ELECTRIC VEHICLE SCHOOL BUS DEMONSTRATION PROJECT

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This potential future project is being led by National Strategies LLC as part of a commitment made under the Clinton Global Initiative (CGI), with the support of Houston Independent School District (HISD), TransPower and NRG and others. The demonstration project being considered includes the repower of 4 conventional type-C HISD school buses to all-electric, battery powered vehicles (EV) with vehicle-to-grid (V2G) technology and vehicle-to-building (V2B) capability. The project duration is anticipated to be 2.5 to 3 years, including a 9-month bus operation cycle in summer and winter seasons with a total cost of approximately \$2 million. The overall objectives of the project are to demonstrate the economic viability and air quality benefits of EV V2G school buses in order to speed the adoption of zero-emission school buses and associated emission reductions across the U.S.

## CITY OF HOUSTON

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### ONE BIN FOR ALL

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The City of Houston recently won a Bloomberg Philanthropies Mayors Challenge grant award to implement One Bin for All, a program which allows residents to discard all materials in one bin, treating trash as valuable assets where up to 75% of the total Municipal Solid Waste may be separated and recycled. It is estimated that the 75% waste stream generates approximately 7 TPY of PM<sub>2.5</sub> and 13 TPY of PM<sub>10</sub> emissions. Diverting 75% of the city's waste stream would substantially reduce the city's current PM emissions footprint and benefit Houston in its ongoing efforts to improve air quality. The City has conducted two procurement processes for this project: Request for Qualifications (RFQ) and Request for Proposals (RFP). The City is continuing its review of proposals, analyzing bids based on the One Bin objectives, including PM<sub>2.5</sub> and other emissions reductions.

## RENEWABLE ENERGY

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In 2014, EPA recognized the City of Houston for its use of green power practices and technologies<sup>22</sup>. Houston signed a two-year agreement to purchase more than 620 million kilowatt-hours of certified renewable energy certificates from wind projects. This purchase accounts for half of the city's municipal power needs and make Houston the largest municipal purchaser of renewable power in the Green Power Partnership. The City is planning to continue to expand this renewable energy portfolio through the construction of 30 MW of solar power which will be used to power City facilities.

## FUTURE DUST SUPPRESSION PROJECTS

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Fugitive road dust entrainment rates, whether from parking lots or on the transit network, depend upon the dust loading, vehicle speed and number of vehicles. Dust loading has been controlled by paving unpaved surfaces and regular pavement cleaning or watering or other treatment of unpaved surfaces. The benefits of these programs are proportional to the activity on those surfaces. Analysis of these projects is relatively straightforward given the level of activity and understanding of the dust loading of those areas.

The Port of Houston Authority is planning dust suppression projects in future years. Approximately 30 acres will continue to have emulsified asphalt sprayed following this initial effort.

## BROADWAY SECOND MAIN TRACK PROJECT

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Access to the entire rail network serving the south side of the Houston Ship Channel (HSC) is constrained by a short, but critical bottleneck segment of single track. Port of Houston Authority owns the track segment, which is operated by Port Terminal Railroad Association (PTRA). All trains serving the industrial and port facilities on the south side of the HSC must operate over this 0.28-mile segment of single track, which includes a single-track bridge over Broadway Street

PHA is seeking funding to construct a second main track through this bottleneck segment. Having two main tracks on this segment would reduce delays to trains awaiting clearance to enter onto the single track, improving the flow of cargoes to and from industrial and port facilities and reducing emissions. The single track segment already is operating above its original design capacity which is causing 2 1/2 hours of train delay per day, and will become totally constrained in 2018. The additional capacity provided by a second main track would be sufficient to handle anticipated volume growth for the next thirty years.

## OTHER REGIONAL PORT PROJECTS

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### OVERWEIGHT CONTAINER ROUTE BETWEEN HGB REGION PORTS

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An overweight or dedicated truck route can improve emissions by reducing stop and go emissions and reducing the number of truck trips. This potential future measure could create dedicated routes able to allow overweight trucks. Dedicated routes could provide a benefit without an overweight allowance by smoothing the traffic flow. In other transportation measures, such as traffic signal improvements, traffic flow improvements have been shown to reduce emissions rates by 5 to 10 percent for regional fleets. The relative benefit may be higher with heavy-duty trucks than for light-duty vehicles because braking, idling, and acceleration are high emissions modes for trucks.

Overall emission reductions will also depend on the dedicated truck routes and the expected usage of routes. Other considerations include whether infrastructure costs are incurred to allow overweight trucks, create grade separation, or overcome obstacles to allow such trucks routes to be constructed.

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<sup>23</sup> These ideas are NOT commitments of future action. They are merely ideas, and their implementation would be contingent on funding availability, and an affirmative commitment from the proposing agency. These ideas can be considered as factors in the PM Advance discussion, but they themselves are not open for discussion before RAQPAC. All ideas are voluntary and would result in PM benefits. Contingent on funding, and in conjunction with TxDOT, railroads, the City of Houston, H-GAC, and Harris County

## RAILROAD PROJECTS

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### REPLACEMENT OF RAILROAD SWITCHER ENGINES

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In the Houston area, there has been discussion regarding a potential future railroad demonstration project involving the replacement of traditional switcher engines with natural gas powered engines. Powering long haul locomotives with LNG would result in PM reduction benefits for the HGB region.

## REGULATORY PROJECTS

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### TIER 3 MOTOR VEHICLE FUEL AND EMISSION STANDARDS

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The Tier 3 emission standards include a lower PM emission standard for light-duty gasoline vehicles beginning in 2017 and phasing in through 2025. This means that in addition to the 2007 PM standards for heavy-duty diesel that is reducing PM emissions in the near term, as the fleet turns over, on-road vehicle PM emissions will continue to decrease in the future. The table below shows the effect of Tier 3 emission standards in years 2018 and 2030.

Comparison of Emission Reductions from On-Road Inventories <sup>24</sup>				
Pollutant	2018		2030	
	National Inventory Reduction	Air Quality Inventory Reduction	National Inventory Reduction	Air Quality Inventory Reduction
PM <sub>2.5</sub>	-0.1%	-0.4%	-10.0%	-10.4%
NO <sub>x</sub>	-9.6%	-9.9%	-24.6%	-25.5%
VOC	-2.8%	-2.4%	-15.5%	-14.4%
CO	-1.6%	-1.6%	-23.4%	-25.3%
SO <sub>2</sub>	-56.3%	-55.9%	-55.7%	-55.0%

## METROPOLITAN TRANSIT AUTHORITY OF HARRIS COUNTY

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### ALTERNATIVE FUEL BUSES

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METRO is currently investigating the possibility of transitioning their bus fleet to compressed natural gas (CNG), using a phased-in approach.

### METRORAIL

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<sup>24</sup> <http://www.epa.gov/otaq/tier3.htm>



METRO expanded the existing Red Line (North Corridor extension) by 5.3 miles in December 2013. The Southeast corridor and East End corridor Green and Purple lines opened to the public in May 2015. For now, METRO's LRT system is comprised of approximately 23 miles of revenue producing rail. These network expansions are included in the Regional Transportation Plan (RTP) and these extensions have been modeled accordingly for transportation conformity purposes. METRO has also proposed the University LRT and 90A LRT Commuter Rail projects as well as a newly announced bus rapid transit (BRT) system in the Uptown District of the City. These routes would result in reduced congestion and PM emissions in the HGB region. These new and planned additions are an essential element of the City and METRO's plans to meet present and future transportation and environmental challenges.

## CONCLUSION

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H-GAC's participation in PM Advance has been, and continues to be, a successful example of voluntary collaboration between local government, business, industry, citizens, and environmental groups in our region. In the past, the HGB region has faced potential nonattainment designations for PM. Since that time, our region has made significant improvements and successfully avoided nonattainment status in 2015.

This Path Forward document continues a framework for the region to continue to meet air quality standards and achieve the Program mission to encourage voluntary accelerated implementation of current clean air strategies and programs. Our region needs to continue to collectively work together to better understand PM. Future growth will inevitably impact particulate matter emissions in our region—whether due to population, industry or economic growth. Through this program, we will continue to work together to understand regional PM emissions and meet our air quality and attainment goals.