

# **Subtask 2.1**

## **TWG Technical Issues – Collection and Analysis of Heavy Duty Drayage Activity Data**

INTERIM MEMORANDUM- DRAFT

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**Subtask 2.1 TWG Technical Issues –  
Collection and Analysis of Heavy Duty Drayage  
Activity Data**

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## COLLECTION AND ANALYSIS OF HEAVY-DUTY DRAYAGE ACTIVITY DATA

This memorandum summarizes the developments in Fiscal Year (FY) 2017 of the collection and analysis of heavy-duty drayage activity data from trucks which are participating in a drayage loan program managed by the Houston Galveston Area Council (H-GAC). The work was conducted as part of Subtask 2.1 (Technical Working Group [TWG] Air Quality [AQ] Planning Technical Issues Analysis) of the Air Quality and Conformity Interagency Contract (IAC).

The task was initiated as part of a larger project sponsored jointly by, TxDOT, H-GAC, and the Port of Houston Authority (PHA) to collect and analyze drayage truck activity data to generate various information items in support of air quality initiatives in the H-GAC area. In addition to the financial support through state and local entities, TTI is utilizing its cooperative agreement with the U.S. EPA, which includes the sharing of both expertise and equipment owned by EPA, to expand the data collection and analysis effort of the project.

The goal of the study is to support TxDOT, H-GAC, PHA and other stakeholders in using vehicle activity data for transportation and air quality planning purposes. The information produced under this study will enhance the inputs to EPA's MOtor Vehicle Emissions Simulator (MOVES) model used for the conformity analyses supported by TxDOT. H-GAC is interested in the overall emissions impact of their drayage loan program as well as potential use of the information for their local transportation conformity and freight planning initiatives. PHA is interested in the use of the data in improving truck operations in and around their port terminals. Both H-GAC and PHA are assisting in the recruitment of vehicles to take part in the project.

The remainder of this memorandum covers the project background and the data collection effort to date.

### BACKGROUND

Since 2009, H-GAC has been managing a drayage truck replacement program as a joint effort between H-GAC, EPA, the Environmental Defense Fund, and PHA. The program supports the replacement of older diesel trucks that operate in and around Houston-Galveston-Brazoria (HGB) area ports. Participants in this program, which are

independent truck owners and trucking companies, receive a grant through the Clean Vehicles or Regional Texas Emission Reduction Plan that partially covers the cost of a new truck replacing an older truck. Program participants are also eligible for a low-interest loan to finance the balance between the cost of the new truck and the grant<sup>1</sup>.

Eligible trucks for the grant and loan program include class 8a/8b diesel trucks (i.e. trucks with Gross Vehicle Weight Ratio (GVWR) equal or greater than 33,001 lbs) that are engaged in port-related drayage activities in the HGB ozone non-attainment area. Program participants agree to destroy the old truck and engine, and replace them with a Class 8a/8b truck equipped with a 2012 or newer engine. Truck operators also agree to the installation of an automatic vehicle locator using a global positioning system [GPS] unit on the replacement truck, and to be subject to five to seven years of monitoring to ensure grant compliance. Truck operators commit to driving at least 25 percent of the trucks' annual mileage within the eight-county HGB ozone nonattainment area.

To date, the H-GAC Drayage Loan Program has led to the voluntary replacement of over 200 drayage trucks. The H-GAC replacement truck program has resulted in a large amount of GPS data detailing the temporal and spatial distribution of participating vehicles. The data is currently being reported in multiple sampling interval levels, from 1-minute to 2-minute intervals.

The data set being collected on the vehicles provides valuable information that is used for many different purposes, including freight planning, regional transportation planning, improving regional emissions inventories, and efforts to improve air quality in the HGB region. TxDOT, may use the data for supporting transportation conformity. EPA could use the data for improving the characterization of vehicle activity parameters in the MOVES emissions model.

This task is supporting the efforts to enhance the application of the vehicle activity data that H-GAC is currently collecting. As part of this effort, Portable Activity Measurement

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<sup>1</sup> Houston Galveston Area Council, Drayage truck program, Accessed at <http://www.mysolutionis.com/fleet-resources/default.aspx>.

Systems (PAMS), shown in Figure 1, are being used to collect detailed engine and vehicle activity data on a subset of participating trucks in the H-GAC loan program. The PAMS data loggers collect both GPS and engine data, such as vehicle speed, engine RPM, engine load, and other data. These PAMS units record data at 1 Hz frequency and upload the data in near real-time<sup>2</sup> to a server via a cellular data connection. This data will then be used to further understand the vehicle activity. The study is focusing on characterizing idling of the vehicles, and vehicle drive cycles by locations (e.g. PHA areas) and time (e.g. time of day, day of week).



**Figure 1: PAMS Data Logger**

## DATA COLLECTION

TTI will eventually collect PAMS data from up to 50 vehicles during the project. The initial data collection effort began in April 2017, with the installation of six PAMS data loggers. During data collection, one of the data loggers was lost when the truck was involved in a traffic accident and another data logger was removed due to malfunctions with the truck. As of the date of this report, over 1600 trips have been recorded for the four remaining data loggers, covering a total of over 52,000 miles of operation. The data from these vehicles is being reported to H-GAC in 1-minute intervals. Additional data being collected from this fleet for analysis includes idling and activity summaries, which will enable TTI to separate the data into different categories such as speed bins.

## DATA QUALITY CONTROL

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<sup>2</sup> Data is uploaded each time that the vehicle is turned off.

TTI has developed a quality assurance/quality control (QA/QC) process that is applied to all the collected data to ensure that there are no major errors in the data being reported. The QA/QC check process includes checking the data for the following errors or omissions:

- Check the timestamps on each data set to ensure that there are no missing gaps in the data sets;
- Check all speeds to make sure no incorrect speeds are being recorded, such as speeds over 90 mph; and
- Check all GPS signals to ensure that the unit is connected to enough number of satellites to be valid.

The data is then flagged for any problems that are found during the QA/QC process so that data with errors are not included in the analysis of the vehicle activity.

## DATA ANALYSIS

The data analysis focuses on comparing the two datasets, GPS and PAMS, to answer several questions, including:

- Identifying the origins and destinations for the short-haul activity in the region;
- Characterizing the daily activity data for the vehicle types, including weekend/weekday, time of day, etc.;
- Determine the activity data inside the Houston port locations, including idling time in and around the port; and
- What are the real emissions impacts of the H-GAC drayage program?

## NEXT STEPS

The next steps of the project include continued data collection, including data collection of new fleets, to enhance the dataset used in the analysis. Further work on the data analysis will continue as more data is collected and other questions are raised about how the data can be used. Tools for data analysis and data visualizations are being developed to make the analysis procedures more efficient as the amount of data collected for analysis increases.