Fueling Freight Movement:
Emerging Technologies Help Clarify South Florida's Regional Petroleum Supply Chain

BACKGROUND AND CHALLENGE

Florida Department of Transportation's (FDOT) District 4 wanted a better understanding of the supply and logistics chain for petroleum-based products from the point at which they are processed at Port Everglades to their distribution across the 12 counties of South Florida. Using emerging technologies for automated vehicle recognition as well as conventional data sources, an FDOT District 4 team developed a project to document petroleum shipments in the region. A literature review and evaluation led the project team to select two technologies able to identify and classify fuel tanker truck and tanker rail cars for testing in real-world conditions: license plate recognition and video image processing. The team also collected and approximated petroleum shipments through the region using Florida Department of Revenue tax records, Global Positioning System (GPS) truck probe data, driver surveys, and other sources.

Project Type:	**Innovations in Local Freight Data**
Grant Recipient Agency:	**Florida Department of Transportation (FDOT), District 4**
Location:	**Florida**
Duration of Activity:	**2014 to 2015**
Budget:	**$300,000 ($150,000 from SHRP2 C20 and $150,000 in FDOT matching funds)**

The methodology developed in this project will allow transportation planners to use conventional transportation data to better inform tanker truck route choice behaviors and forecast freight demand, both critical components in developing a behavior-based freight model. Data collected during this project can also support infrastructure investment and assist emergency management and transportation agencies in managing the transportation system in significant weather events. Ultimately, findings from this project showed that at the current time, large scale use of license plate recognition and video image technology for automated data collection on fuel tanker trucks and tanker rail cars is limited; though, it is possible to successfully capture and process the required data through those two technologies in smaller-scale applications.

APPROACH

This project's goals include:

- Describing the petroleum supply and demand chain in South Florida using a combination of conventional and innovative data sources.
- Identifying technologies that can distinguish tanker trucks and tanker rail cars from other vehicles in the traffic stream and testing those technologies for large-scale deployment.

| Objective	Work Approach	Outcome
Quantify and document petroleum commodity flows from Port Everglades.	Develop data fusion methodology to combine multiple sources of data.	Better understanding of petroleum shipments in Southeast Florida.
Engage the private sector.	Plan and conduct a robust outreach and coordination effort.	Insight into and feedback from private industry associated with Florida's petroleum products.
Identify applicable automated vehicle recognition technology for future deployment.	Literature review and evaluation of applicable technologies followed by use of these technologies to collect and process field data at strategic locations in Southeast Florida.	Identified issues and needs and developed an understanding of technology deployment readiness.

BENEFITS AND IMPACTS

Key elements that contributed to project outcomes and subsequent impacts include:

- Project steering committee that engaged both public and private sector participants.
- Robust outreach and coordination plan that included proactive engagement of the private sector.
- In-depth research of 15 technologies documenting their applicability, benefits, and drawbacks for the purpose of identifying and classifying fuel tanker trucks and rail cars.
- Adaptation of existing methodologies to process the available data and address data gaps.

Key accomplishments by the project include:

- Collection or approximation of the volumes of all sea and land transportation modes (including roads, rail and pipelines) used to transport petroleum goods, along with their final shipping destinations.
- Research, evaluation, and deployment in a pilot study of the vehicle detection and classification technologies capable of distinguishing truck and rail fuel tankers from regular semi-trailers and rail cars.

PEV Fuel Commodity Flow Snapshot
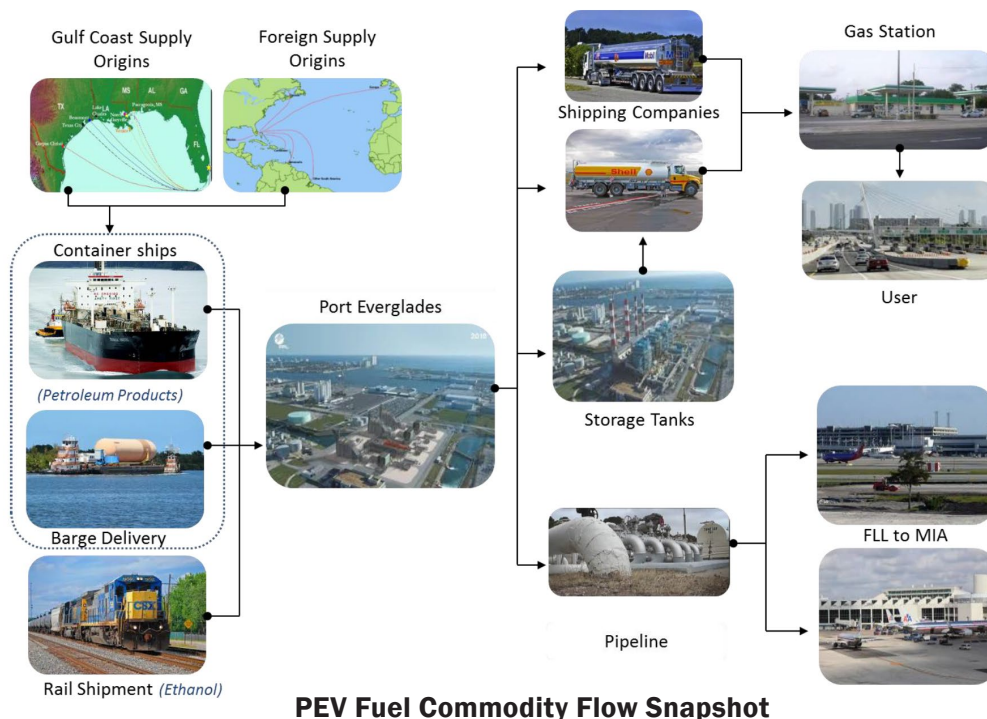
Source: Florida Department of Transportation, District 4 (2016). Freight Demand Modeling and Data Improvement Port Everglades Petroleum Commodity Flow Pilot Study, Fort Lauderdale, FL. Retrieved from http://fdotd4-shrp2c20.com/blog/wp-content/uploads/2014/07/Final_report_SHRP2_C20_PEV_PetroleumComm_2016-02-01.pdf, last accessed June 1, 2016.

Benefits

Benefits realized from this project include the ongoing use of the resources it created as well as the changes it may influence in stakeholder behavior. Specific outcomes are listed below:

Outcome	Evidence
Improved understanding of petroleum flows in the region.	A new methodology was developed to approximate petroleum deliveries in South Florida.
Improved public and private sector collaboration.	More than 50 project meetings conducted in 13 months to ensure information sharing and collaboration among key freight leaders. These included: ■ Federal Highway Administration (FHWA): Headquarters, Resource Center, Florida Division. ■ Florida Department of Transportation: Central Office, District 4, District 6. ■ Regional stakeholders.
Enhanced set of data on petroleum movement in the region.	Data acquired from a variety of sources, including: ■ Florida Department of Transportation. ■ Port Everglades' 14 fuel terminals and pipeline operators. ■ Florida Department of Revenue fuel tax records. ■ Truck transponder Global Positioning Service (GPS) records. ■ Driver surveys. ■ Private sector terminal operators and trucking companies.
Assessment of automated vehicle detection technology readiness for large-scale deployments.	License plate recognition and video image processing technologies were tested and proved promising. This project showed that it is possible to use each technology to accurately collect data on tanker trucks and tanker rail cars, but neither is practical for large-scale deployments with these technologies at this time.

Impacts

Impact measures are the ultimate benefits of using a product. These are longer-term, value-added impacts of the product related to saving time, money, and lives.

Impact	Application
Progress toward a behavior-based freight model.	The development of petroleum-related trip chains during this project represent a critical step in developing a behavior-based freight model.
Identification of data gaps.	The project team identified data gaps in describing the petroleum supply and demand chain as well as during the testing of new technologies. By addressing these data gaps, future activities using methodologies developed in this project will provide more detailed insight into petroleum shipments in the region.
Documentation and assessment of vehicle detection technologies.	This project provided a wealth of documentation on existing and emerging vehicle detection technologies. While the project team researched emerging technologies to identify, classify, and track vehicles with fuel tanker trucks and tanker rail cars as the target vehicle types, findings from this project are applicable to multiple vehicles types and are useful to any State or local transportation agency interested in using automated data collection technologies.

PARTNERSHIPS

Florida Department of Transportation (FDOT), District 4 – Steering committee member.

Broward Metropolitan Planning Organization (MPO) – Steering committee member.

Petroleum Association of Port Everglades and petroleum fuel industry operators – Steering committee members.

Center for Urban Transportation Research at the University of South Florida – Regional partner and stakeholder.

Florida East Coast Railway – Regional partner and stakeholder.

Local commercial airports including Ft. Lauderdale-Hollywood and Miami – Regional partners and stakeholders.

Miami-Dade MPO – Regional partner and stakeholder.

Palm Beach MPO – Regional partner and stakeholder.

Federal Highway Administration (FHWA) – Provided coordination support as well as technical and administrative guidance.

FOR MORE INFORMATION

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Learn more about the SHRP2 program, its Capacity focus area, and Freight Demand Modeling and Data Improvement (C20) products at
www.fhwa.dot.gov/GoSHRP2/

The second Strategic Highway Research Program (SHRP2) is a partnership of the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the Transportation Research Board (TRB). TRB completed the research, and now FHWA and AASHTO are jointly implementing the resulting SHRP2 Solutions that will help the transportation community enhance productivity, boost efficiency, increase safety, and improve the reliability of the Nation's highway system.

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