

Portland Bureau of Transportation

PBOT TRAFFIC SIGNAL PROGRAM OVERVIEW



TRAFFIC SIGNAL SYSTEMS CAPABILITY MATURITY SELF ASSESSMENT



Traffic Signal Systems Capability Maturity Self-Evaluation Tool: <https://ops.fhwa.dot.gov/tsmoframeworktool/tool/tssc/>

ATSPM SYSTEM CAPABILITIES AND MATURITY

The Portland Bureau of Transportation (PBOT) is responsible for the operation and maintenance of 1,200 traffic signals. To explore the benefit, value, and cost associated with implementation of an automated traffic signal performance measures (ATSPM) system, PBOT initiated a pilot project at five intersections spread across the city. In the future, PBOT will expand the ATSPM system with detection at 30 additional signals along three identified corridors. Moving forward, PBOT has developed a prioritized list of intersections for the roll-out of controller upgrades and ATSPM installation in addition to the identified corridors. PBOT has also set the goal of developing a dashboard tool to combine ATSPM data with other data sources to improve operations and assist decision-making. While the ATSPM system in Portland is still in its infancy, there are ambitious plans for growth.

BUDGET

The PBOT annual budget for maintenance of signal systems is roughly \$2.7 million.



Photo Credit: PBOT

"We are getting data that enables us to look at the performance metrics... [but] detection is very critical. With detection you can get the data that you want. We are looking to be able to benefit from pedestrian delay and arrivals on green.

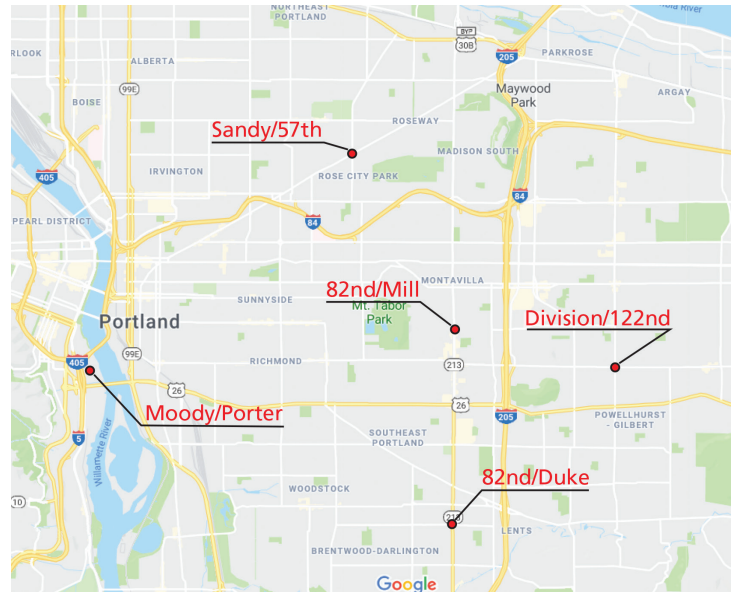
We can look at performance measures from a central system and actually tell what is happening at those locations—1,200 intersections are a lot for eight guys, so we don't have a lot of time to go take a look at things."

Willie Rotich, PE, ITS Engineer
PBOT



RESOURCE CONSTRAINTS

Limited staff and funding have confined PBOT's ATSPM deployment. PBOT has eight full-time staff members tasked with maintaining roughly 1,200 traffic signals and many more lighting fixtures throughout the city. With such limited resources, most of PBOT's energy goes to maintaining existing infrastructure. PBOT has three consultants it uses on an as-needed basis to help with larger projects, as funding allows. Recently, the city has been incrementally upgrading traffic signal controllers to ATC controllers capable of high-resolution data logging required to collect ATSPM data. Future plans call for upgrading all traffic signal controllers throughout the city and installing detection required for the ATSPM system on all signals outside of the central business district. PBOT is not currently pursuing ATSPM in the central business district because those signals use fixed timing, limiting the utility of an ATSPM system.



PBOT pilot projects

ATSPM IMPLEMENTATION

The first ATSPM deployment in Oregon was in Lincoln City, where seven signals along one corridor were equipped with ATSPM capability. The Portland deployment leverages the groundwork laid by the Lincoln City deployment, since the Portland signals could be displayed on the same performance dashboard software. The open source ATSPM software developed by the Utah Department of Transportation (UDOT) was deployed by the Oregon DOT to collect data from all of the state's ATSPM-equipped signals. However, the Oregon DOT ATSPM site is behind a firewall and is not available to the public. Oregon's ATSPM systems use advanced detection including cameras and Bluetooth® readers. As PBOT incrementally upgrades signal controllers throughout the city, detection hardware will need to be installed to enable ATSPM collection. PBOT has a strong multimodal focus and is very interested in using ATSPM data to measure pedestrian and bicyclist delay in addition to vehicle performance measures.

A joint study between Iowa State University, Northern Arizona University, and Portland State University, with cooperation from PBOT, explored the potential to deploy machine learning to refine the raw output data from ATSPM systems. The study used raw data from two of Portland's five ATSPM-equipped signals. Machine learning was used to filter out bad data, develop graphic representations of data, and intelligently learn patterns in demand over time. New performance metrics enabled by machine learning capabilities were dubbed Intelligent Traffic Signal Performance Measures (ITSPM). An example of ITSPMs enabled by machine learning is the Aggregate Platoon Coordination Diagram, which shows vehicle distributions in relation to signal timing using data collected over a day or week.

ADDITIONAL RESOURCES

- To learn more, visit <https://www.portlandoregon.gov/transportation/>
- More information on Automated Traffic Signal Performance Measures is available on the Every Day Counts website at https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/atspm.cfm

For additional information please contact:

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Every Day Counts (EDC), a State-based initiative of FHWA's Center for Accelerating Innovation, works with State, local, and private sector partners to encourage the adoption of proven technologies and innovations aimed at shortening and enhancing project delivery.



U.S. Department of Transportation
Federal Highway Administration