MEMORANDUM

Date: January 31, 2019

To: The Honorable Chairman and Members
Pima County Board of Supervisors

From: C.H. Huckelberry
County Administrator

Re: **Purchase of Miovision Signalized Intersection Equipment**

The transportation infrastructure discussion of these past years has focused primarily on pavement maintenance. While critically important, the Department of Transportation (DOT) continues to be responsible for preserving and updating other roadway infrastructure to include signage, markings, sidewalks, drainage structures, bridges and signals. Of these elements, signalized intersections are the most significant component for greatly enhancing corridor mobility and safety through the implementation of technology and data analysis tools.

The base signal components for intersection control are the lanterns (signal lights), timing and phasing controllers and traffic detection equipment. Additional functionality for optimizing corridor mobility can be achieved through video and data analytics components. In addition to improved intersection mobility and safety, video camera feeds also support emergency management and law enforcement functions. Approximately sixty percent of the County's 103 existing signalized intersection cameras currently experience significant optical degradation, which limits functionality. Replacement of these cameras is needed with a modern technology system.

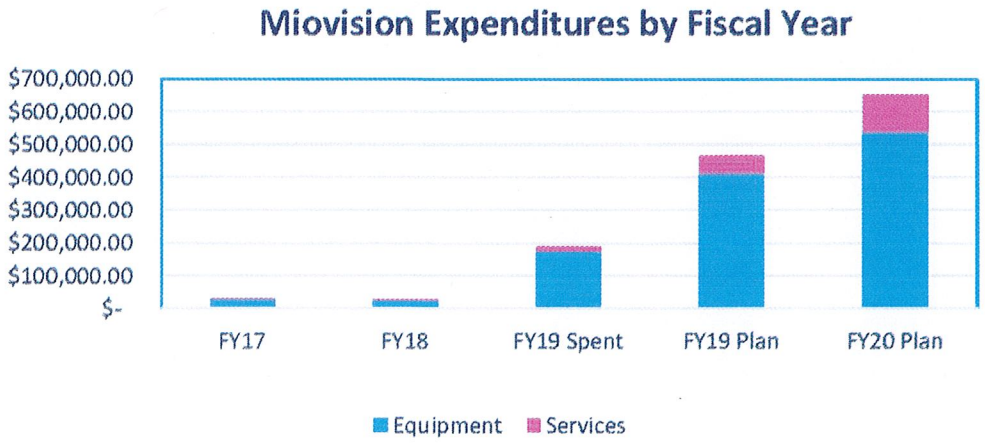
The February 19, 2019 agenda will include an amendment with Miovision Technologies Incorporated for intersection equipment. Miovision was an early implementer of signalized intersection video detection using artificial intelligence algorithms and analytics to optimize corridor mobility and safety. The Miovision system consists of a single traffic signal pole-mounted, high-resolution fish-eye camera, which splits views for each intersection approach. Other Miovision hardware consists of a Wi-Fi sniffer installed on the top of the signal cabinet, which enables remote data collection, and a traffic link processor inside the signal cabinet. The Wi-Fi sniffer serves to count smart phones and connected vehicles by assigning an ID solely for the purpose of tracking corridor travel time and origin/destination information across Miovision-equipped signalized intersections. The assigned ID and collected data is not identifiable as to specific individuals.

The equipment transmits mode of transportation, turning movements, Wi-Fi counts and progression data from each intersection to the Miovision cloud. The County can access this data as raw counts and as various corridor performance reports such as vehicle arrivals on

red lights, split trends and overall corridor travel time. Data can also be exported to a Synchro readable format, which can be utilized, by the County and consultants for signal design and optimization in other intersection design platforms. Miovision includes the ability for tracking near-miss collisions and a wide range of other traffic activities and patterns to further assist with enhancing the safe design and operation of intersections. Miovision video, controller timing and traveler analytics information is available through the web-based Miovision control platform. Attached are examples of the various types of information available through the Miovision equipped intersections at the data analytics components.

Pima County originally procured Miovision intersections in Fiscal Year (FY) 2016/17 through a job order contract for the purpose of remotely maximizing signal-timing performance. Traditional methods for collection of timing data and analysis to optimize corridor progression is very labor intensive requiring multiple staff performing observations and making adjustments over weeks or months. By using Miovision, this analysis can be done remotely by a single individual for a fraction of the cost. The Miovision detection infrastructure costs $11,400 per intersection. Comparable detection-capable intersection camera systems of this category typically range from $11,000 to $30,000 per intersection. The Miovision system is very competitive, primarily due to the use of a single camera in lieu of four, with dual cameras only being used on intersections of eight-lane or larger cross-sections.

There is an annual data maintenance cost of $998 per intersection to utilize the full analytics capability. The cost to install Miovision at the 103 County intersections is approximately $1.17 million (103 intersections x $11,400) of which, $226,150 has been expended to date. An additional $410,400 equipment expenditure is planned for FY 2019 and $537,650 in FY 2020, plus annual service costs of $102,794 (103 intersections x $998). The following chart shows the prior and planned Miovision expenditures to date based on fiscal year.



This investment is a fraction of the cost for widening a mile of roadway from two-lanes to four-lanes, which currently is estimated to cost up to $10 million per mile for a fully amenitized road section. In addition, a recent University of Arizona study in the City of Tucson found that a minor change in the signal timing cycle at a single intersection could lead to more than $300,000 annual savings to road users (*Yao-Jan Wu, 2017: Optimizing Traffic Signals Using Multi-Source Data*). This calculated amount was based on average Tucson driver salary and did not account for employer overhead or vehicle, social and environmental costs.

The initial FY 2017 procurement of Miovision consisted of a pilot project to validate published research and provide the County with tools to optimize signal timing along the Ina Road corridor impacted by the closing of the Ina/I-10 interchange. Signal timing was coordinated with the Arizona Department of Transportation (ADOT) and the Town of Marana. Miovision infrastructure was deployed at Camino de la Tierra, Shannon, La Cholla, and La Canada intersections for analysis and adjustment to mitigate traffic affected by the construction. The Miovision pilot infrastructure was installed and operational within one week.

Miovision analytics were able to demonstrate that north-south progression along La Cholla and La Canada was more critical than east-west, thereby allowing rapid retiming and coordination of intersection signals to direct traffic around the closed interchange. The Miovision pilot was additionally useful in adjusting phasing and associated timing to maximize turning movements while accommodating pedestrian crossings. The County experience has resulted in the Town of Marana and ADOT procuring Miovision to complete the western segment of the Ina corridor. Additionally, the County procured installation of Miovision at 25 more intersections and is planning procurement of an additional 36 intersections this fiscal year.

The initial Miovision procurement was for testing and validation of analytics performance which at the time of the Department of Transportation's research, was unrivaled by other companies. The success, ease of use and system reliability, has led to the initial master agreement and planned additional purchases under this contract. The Miovision infrastructure and data analytics capabilities has provided significant return at a competitive price and is not available from any other vendor with commensurate functionality. Based on the significant value returned and the investment made to date, it is recommended to continue no-substitute deployment to other signalized intersections, to create a uniform platform, to standardize operations and reduce maintenance costs. Full deployment of Miovision to County intersections is expected to be completed in FY 2020 with an additional deployment to 37 intersections. Also in FY 2020, Miovision video detection capabilities will be installed at additional intersections, which already have Miovision analytics equipment to add video detection to intersections, which do not currently have video detection, or to replace obsolete video detection systems that are no longer sustainable.

With full implementation, the Miovision video feeds are sufficient to meet the needs of the Department of Transportation, Office of Emergency Management and the Sheriff's Department and are compatible to be viewed by the same platform with camera systems across the region.

Adopting a Miovision signalized intersection standard allows the County to optimize regional signalized corridor mobility and safety; enhance economic, environmental and social impacts; inform potential public safety needs; and provide SMART-ready intersection infrastructure in a cost effective manner. The strategies associated with complete deployment of Miovision will reduce County operating costs and has the potential to significantly slow the need and cost for future capacity construction projects.

CHH/lab

Attachments

c: Carmine DeBonis, Jr., Deputy County Administrator for Public Works
Ana Olivares, Director, Transportation Department
Yves Khawam, Chief Deputy, Transportation Department

North Camino de la Tierra and West Ina Road

Camera View

Detection zone and vehicle classifications

North Camino de la Tierra and West Ina Road

51°F
Clear

+Tags

SIGNAL VIEW | APPROACH VIEW | TIMING DIAGRAM

Traffic Signals

WB LT | EB TH | SB | EB LT | WB TH | NB

Pedestrian Signals

PH2 Ped | PH4 Ped | PH6 Ped | PH8 Ped

Preempts

PH2 SB | PH4 WB | PH6 NB | PH8 EB

Detectors

PH2 EB TH | PH6 WB TH | PH1 WBLT | PH2 EB TH | PH4 SB TH | PH5 EBLT | PH6 WB TH

PH8 NB TH

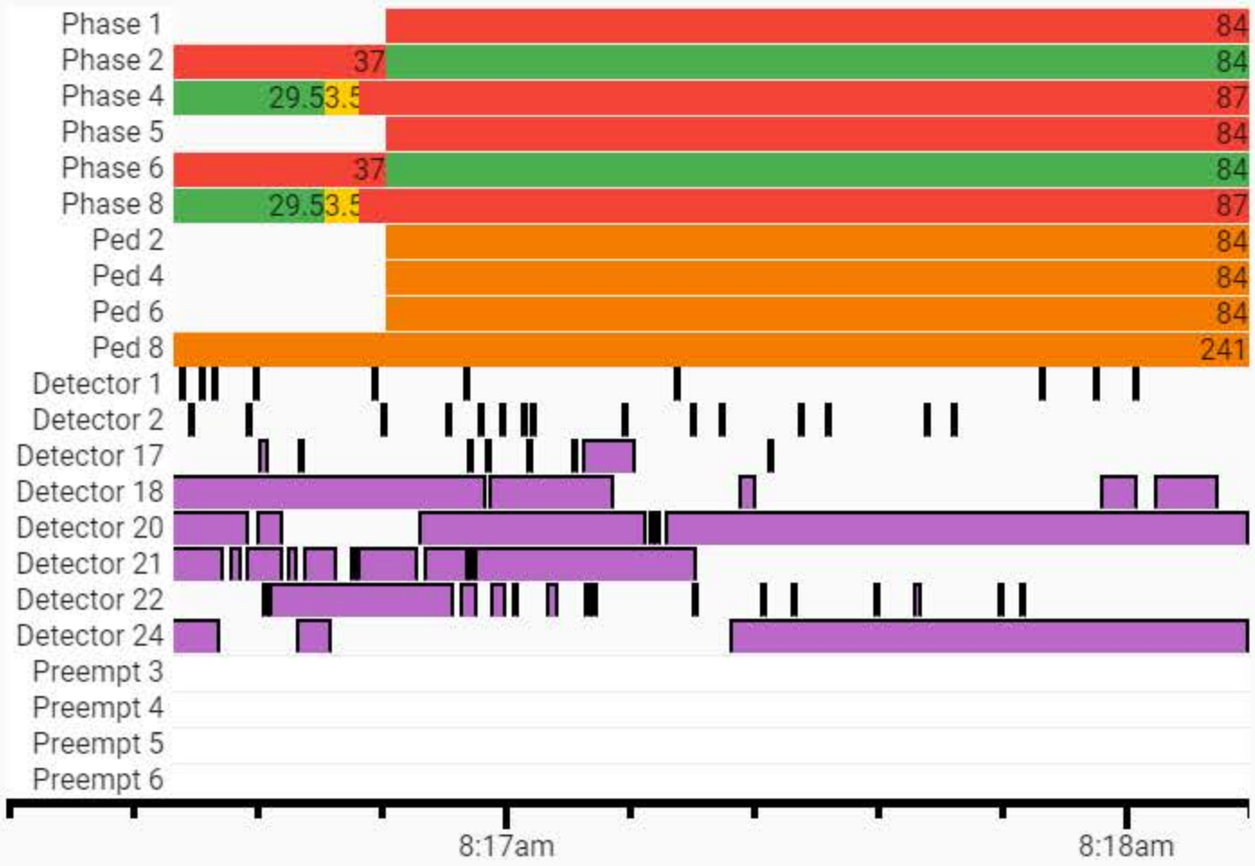
PREVIOUS DAY | 08:17:34 AM Thu Nov 29 2018 (MST) | TODAY

North Camino de la Tierra and West Ina Road

51°F
Clear

+Tags

SIGNAL VIEW | APPROACH VIEW | TIMING DIAGRAM



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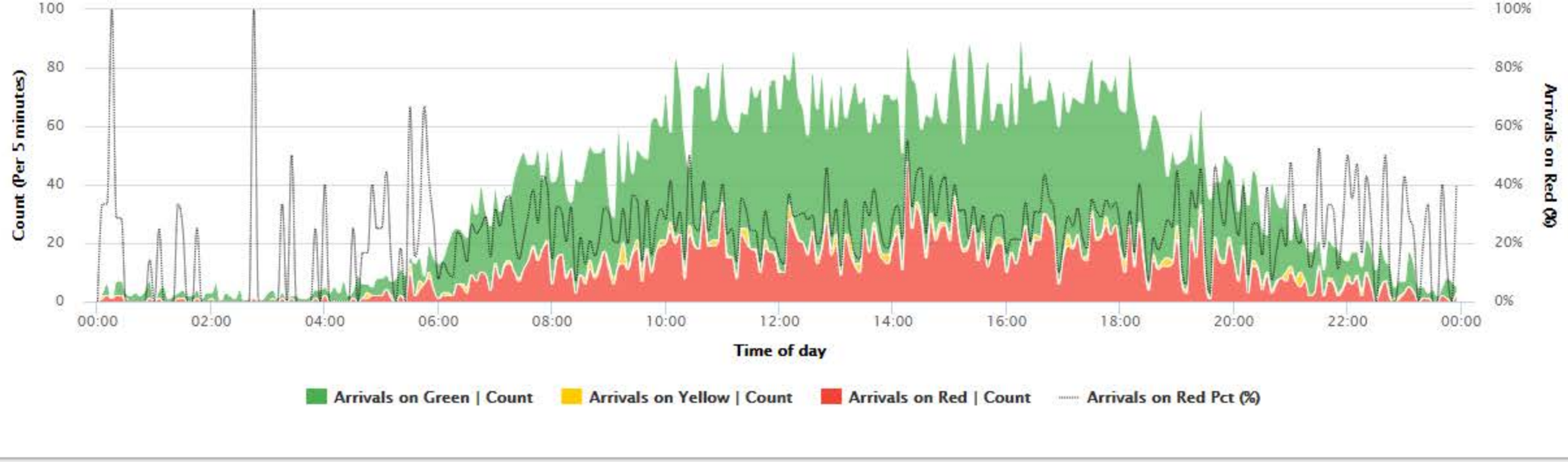

Arrivals on Red

Arrivals on red characterize vehicle arrivals by the interval (color) of the corresponding traffic signal.

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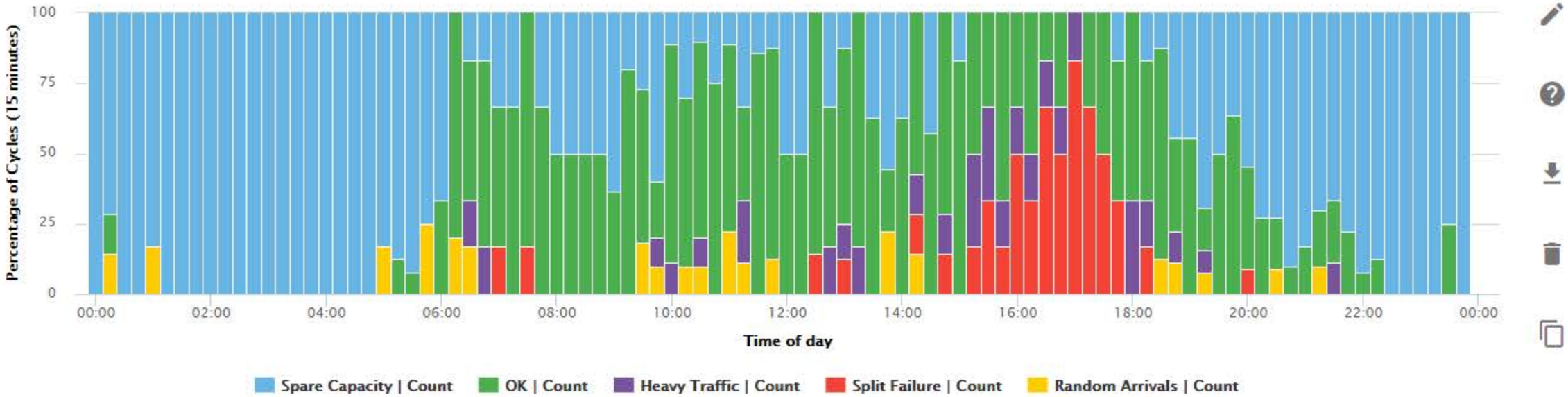

Split Trends

The split trend chart categorizes values from the split failure chart into five groups over days, weeks or months

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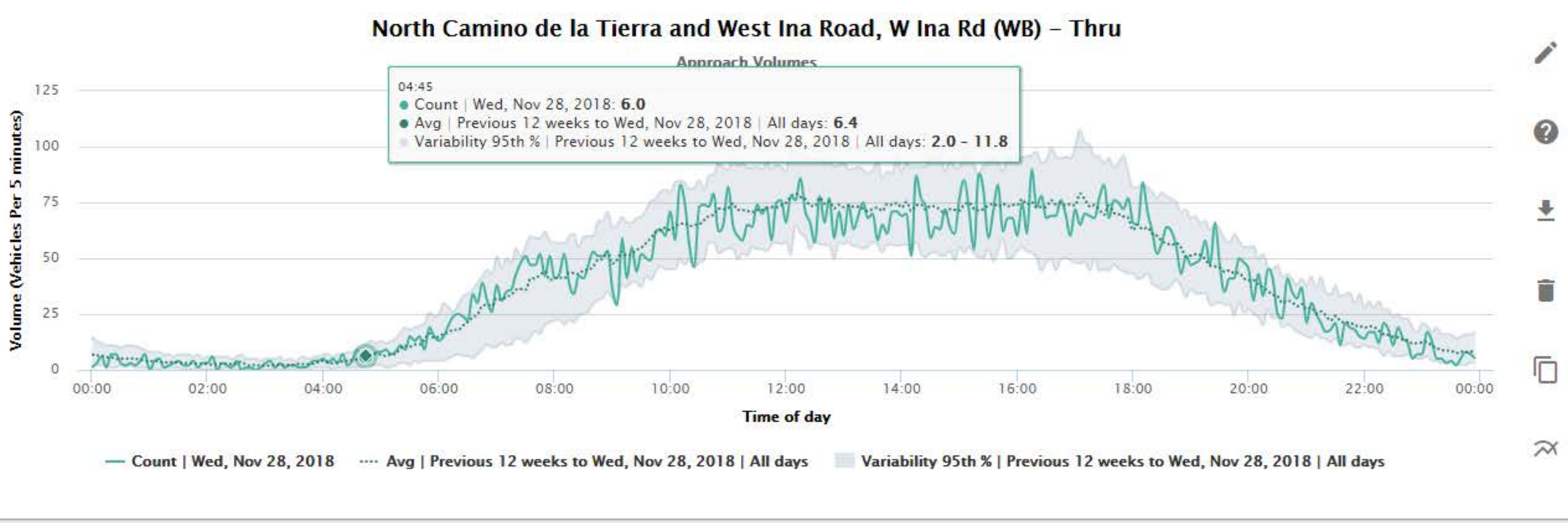

Approach Volume

Approach volumes use upstream detectors to count vehicles arriving at an intersection for each approach.

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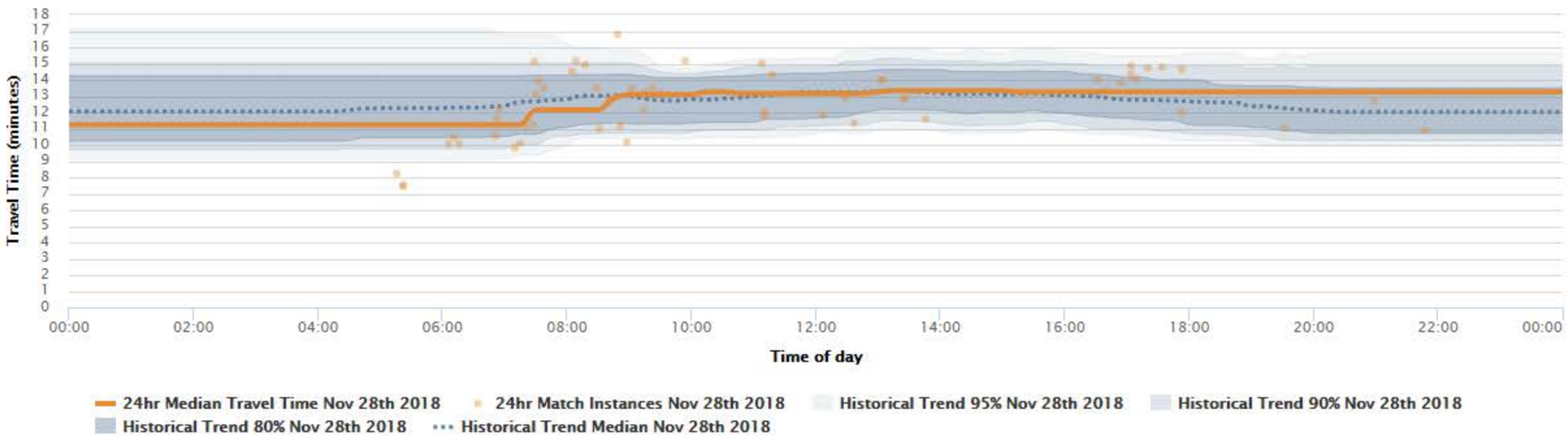


Point-to-Point Travel Times

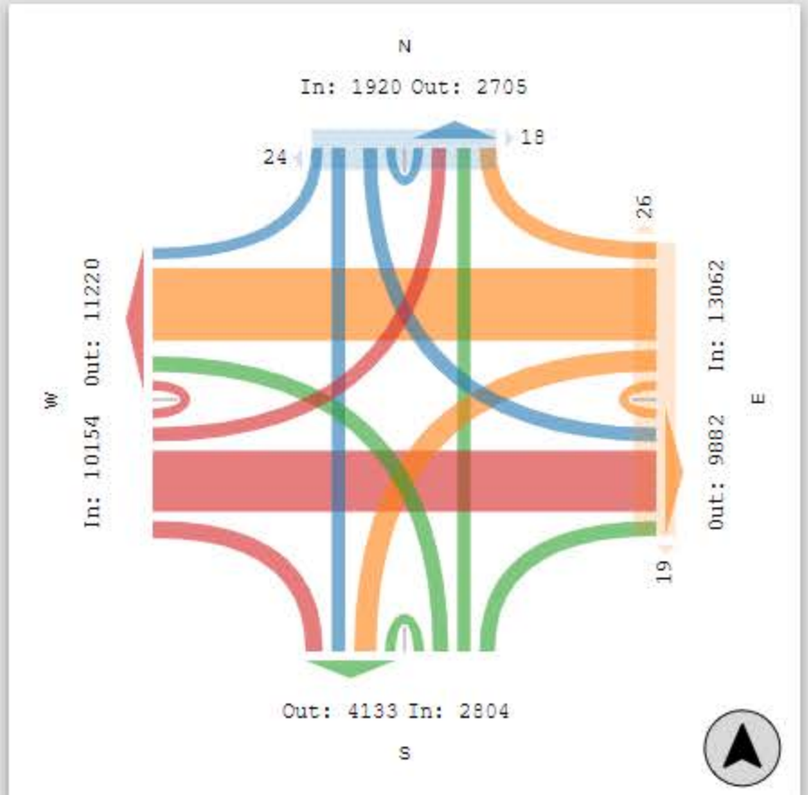
Travel time provides the amount of time it takes to traverse a segment of road between two intersections over days, weeks, or months

North Camino de la Tierra and West Ina Road

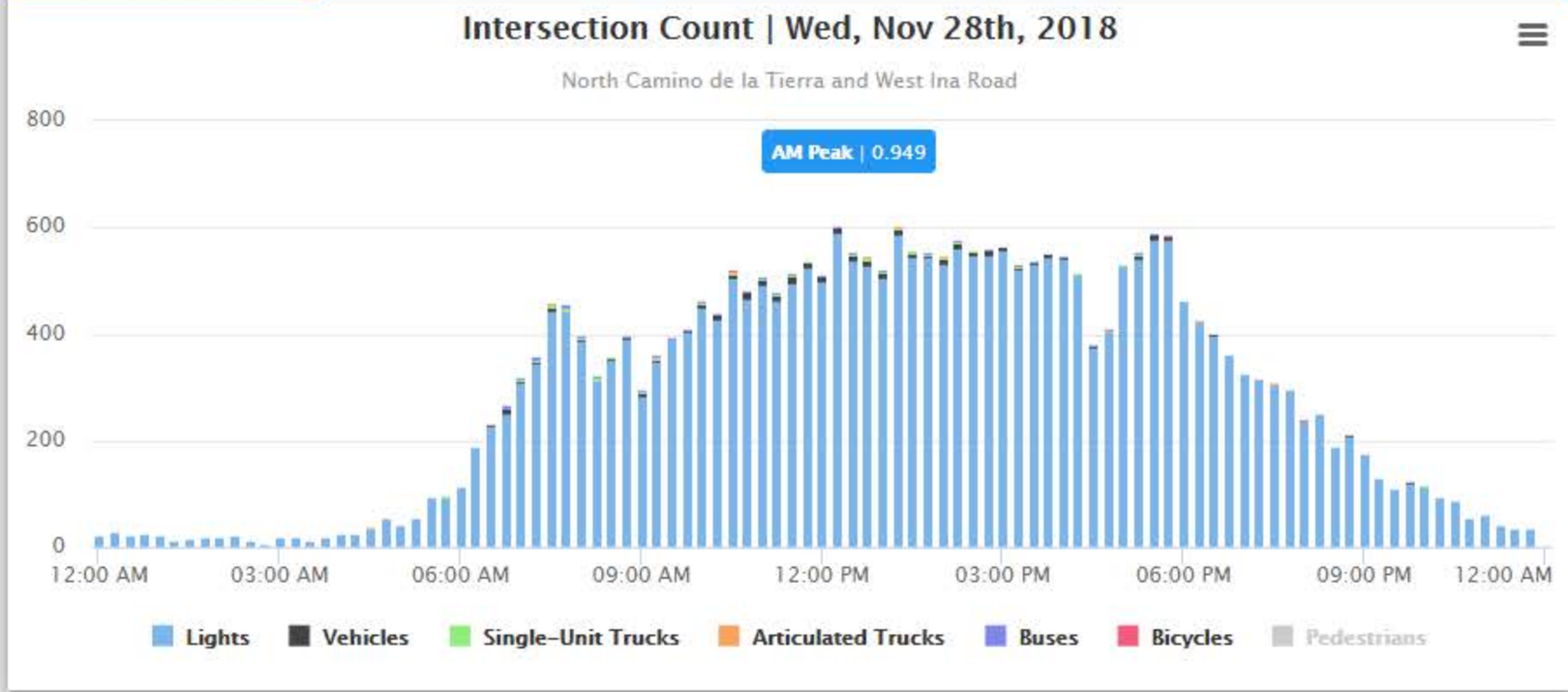
32.33746601, -111.03782057

Date Range 11/28/2018 | Time Of Day 00:00 - 24:00 | Percentile

Total Vehicles	Total Pedestrians	Total Bicycles BETA	Truck Pct (%)	AM Peak	PM Peak
27,927	87	13	1%	2,043	2,268
24 Hour Total	24 Hour Total	24 Hour Total	% of Vehicle Traffic	From 11:00 to 12:00 PM	From 1:15 to 2:15 PM



VOLUMES



Turning Movement Count

Explore turning movement count data with vehicle classification and pedestrian volumes

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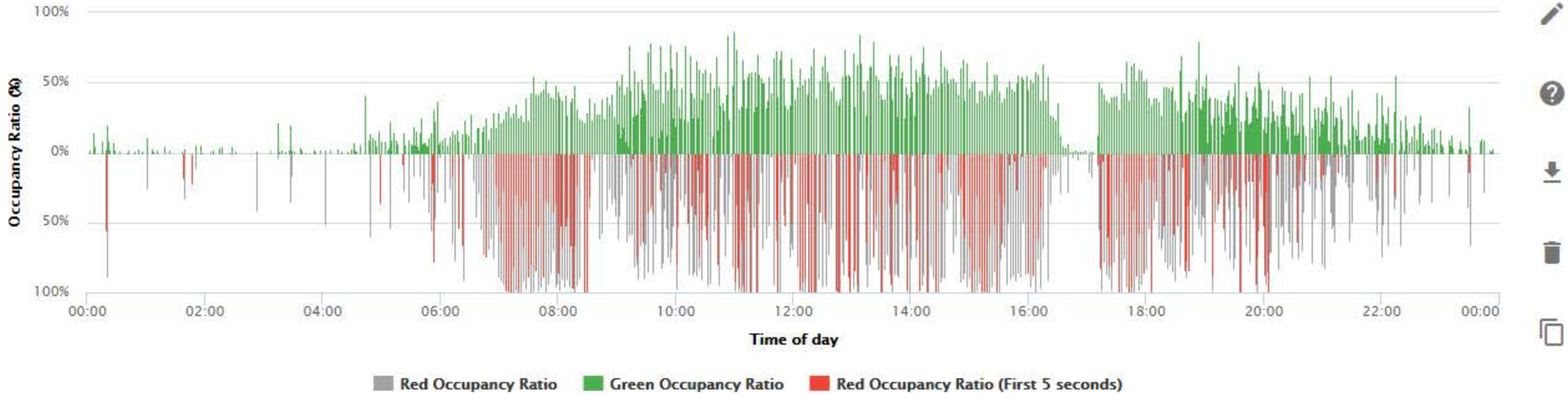

Occupancy Ratio

Using stop-bar detection, occupancy ratios help identify movements that have unserved demand on a cycle-by-cycle basis.

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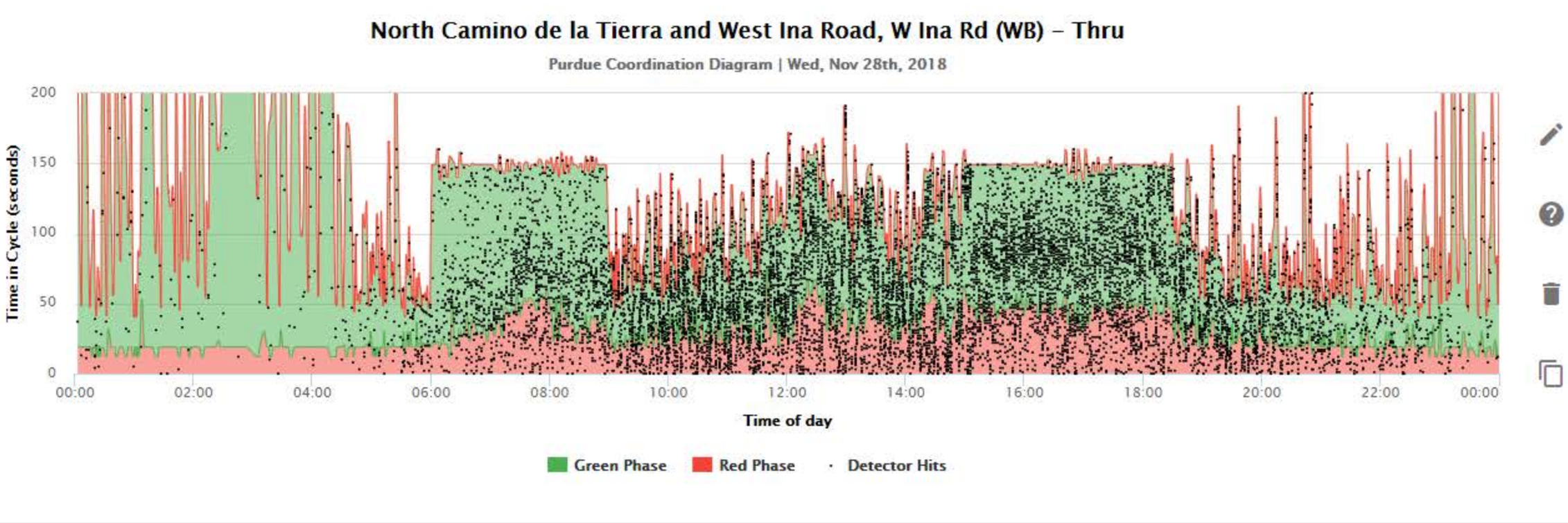

Purdue Coordination Diagram

The PCD visualizes the relationship between individual vehicle arrivals and signal phasing

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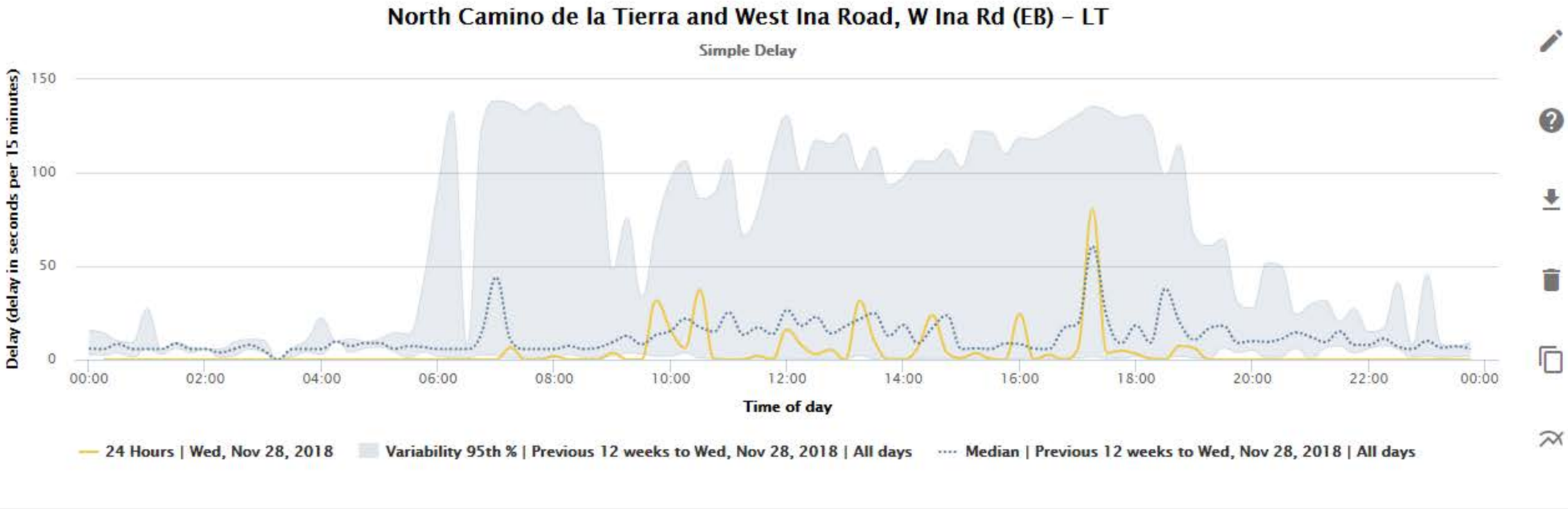

Simple Delay

Simple delay displays the average time between stop-bar detector actuation during red and when the phase turns green