NE 94th Avenue

NE Padden Parkway – NE 99th Street

Clark County

Project Goals:

- Decrease congestion at a network bottleneck
- Improved east/west cross county travel
- Signal integration, upgrade and communication
- Data collection and traffic surveillance
- Improve safety
- Improve both NE 94th Avenue and the NE 94th Avenue / Padden Parkway intersection

Project Outcomes:

- Congestion at the network bottleneck NE 94th Avenue Padden Parkway has been decreased
- East/west travel times have been reduced, improving cross county travel
- The signal has been upgraded with LED signal heads and signal system interconnection
- Data collection and traffic surveillance equipment has been installed, are active 24/7 and capture real time data
- Multi-modal safety has been improved for system users
- NE 94th Avenue and the NE 94th Avenue / Padden Parkway intersection have improved pedestrian and vehicular geometrics

Project Information

Federal Funding Program: STP

RTC Awarded Funding: $3,600,000

Total Project Cost: $8,997,000

Project Type: Road Improvement

Project Length: Approximately 1.48 miles

Function Classification: Minor Arterial

Daily Traffic Volume: 12,000 ADT

Project Description

Improve:

NE 94th Avenue to a 3-lane urban facility with: center-turn lane, bike lanes and sidewalks.

Install upgrades at the intersection of NE 94th Avenue / Padden Parkway: additional left turn lanes, new right turn lanes, acceleration lanes, pedestrian islands, added and improved bicycle lanes, lighting upgrades, a new LED traffic signal with data collection and traffic surveillance equipment.

Project Funding

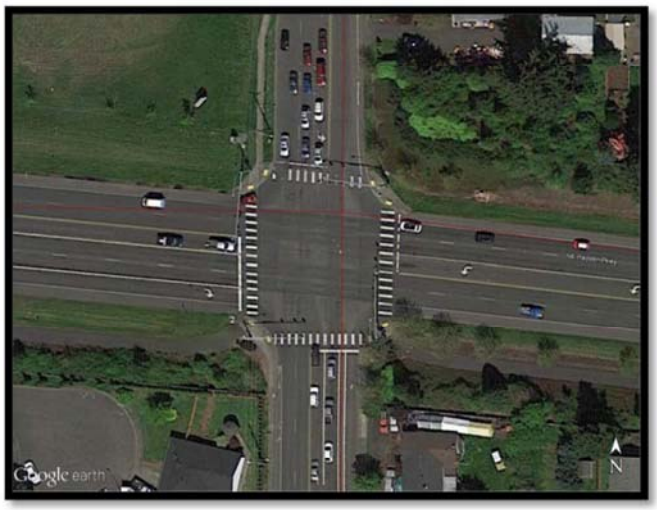
Phase	Year	Federal Funds	Other Funds	Total
PE	2013	$ 200,000	$ 709,000	$ 909,000
ROW	2014	$ 0	$ 1,478,000	$ 1,478,000
CN	2015	$ 3,400,000	$ 3,210,000	$ 6,659,000
Total		$ 3,600,000	$ 5,397,000	$ 9,047,000

Project Outcome Details

- Replaced an obsolete 2-lane rural roadway with a modern, 3-lane facility, including bicycle lanes and sidewalks.
- Improved safety and reduced congestion at an intersection which had reached maximum capacity.
- Addressed the NE 94th Avenue / Padden Parkway intersection in RTC's Congestion Management Plan and identified as a "high collision" intersection in RTC's Safety Management Assessment.
- Added roadside bio-retention cells ("rain gardens") for natural treatment of stormwater runoff.
- Have the ability to capture 24/7 real time traffic data.

Project Vicinity Map

NE 94th Avenue / Padden Intersection – Before



NE 94th Avenue / Padden Intersection – After

NE 94th Avenue north of Padden / NB – Before

NE 94th Avenue north of Padden / NB – After

Safety and Crash Analysis

The crash analysis looked at three distinct time periods for the analysis, including the following:

- Before: from January 2009 through April 2013
- Interim: from May 2013 to June 2016 (after the Safety Improvement project CRP#312822 was completed, which made improvements to the traffic signal)
- After: from July 2016 to June 2018 (after the NE 94th Avenue capital project CRP#350822 was constructed)

Goal: Reduce reported crashes per year

Outcome: There was a reduction in reported crashes at both the intersection of NE 94th Avenue/NE Padden Parkway as well as on the corridor of NE 94th Avenue between NE Padden Parkway and NE 99th Street. As shown in Figure 1, before the project there were 17 reported crashes per year, and after the project there were only 9 reported crashes per year at the intersection of NE 94th Avenue/NE Padden Parkway. As shown in Figure 2, before the project there were 20 reported crashes per year, and after there were only 12 reported crashes per year on the NE 94th Avenue corridor between NE Padden Parkway and NE 99th Street.

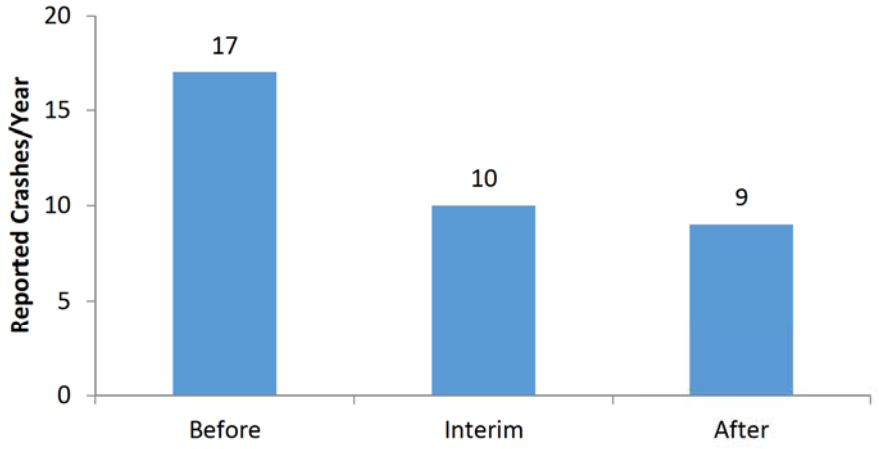


Figure 1. NE 94th Avenue/NE Padden Parkway Intersection Crashes for Before, Interim and After Project

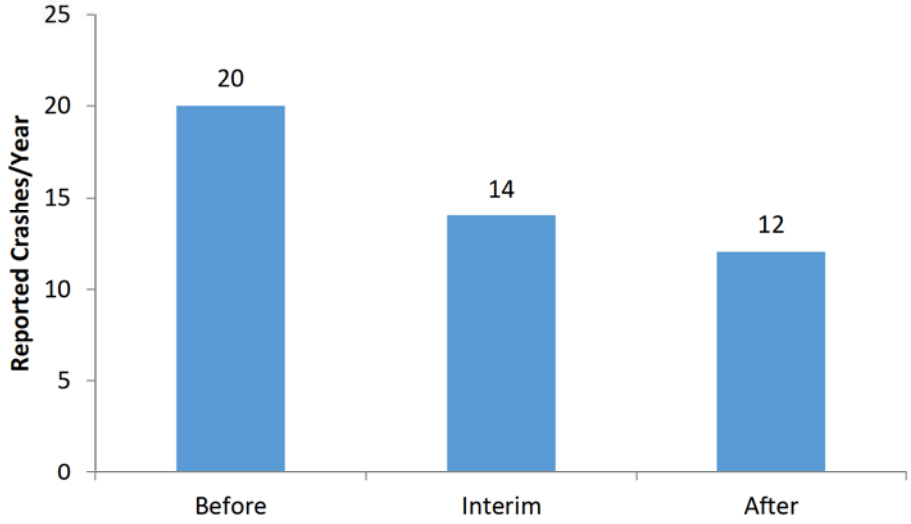


Figure 2. NE 94th Avenue Corridor (NE Padden Parkway to NE 99th Street) Crashes for Before, Interim and After Project

Goal: Reduce both rear-end and turning related reported crashes per year

Outcome: There was a reduction in both rear-end and turning related reported crashes at both the intersection of NE 94th Avenue/NE Padden Parkway as well as on the corridor of NE 94th Avenue between NE Padden Parkway and NE 99th Street. The most significant reduction was in turning related crashes, as shown in both Figure 3 and Figure 4. This reduction is consistent with project improvements that changed signal phasing/timing as well as reconfiguration of turn lanes.

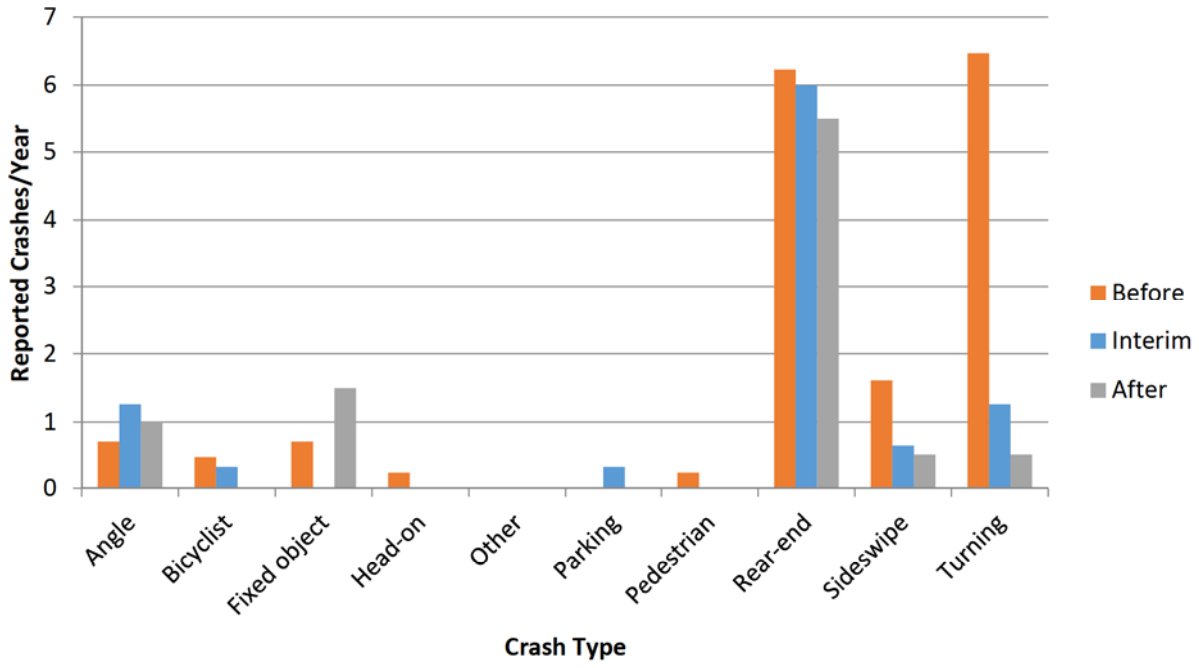


Figure 3. NE 94th Avenue/NE Padden Parkway Intersection Crashes by Type for Before, Interim and After Project

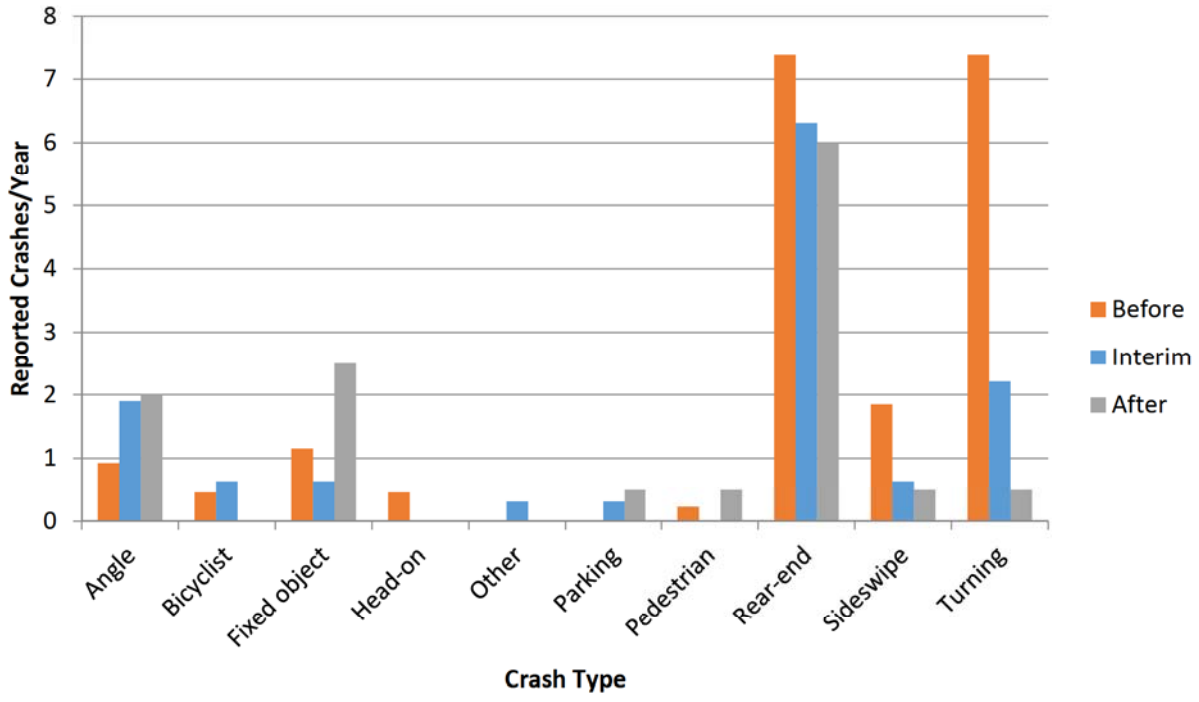
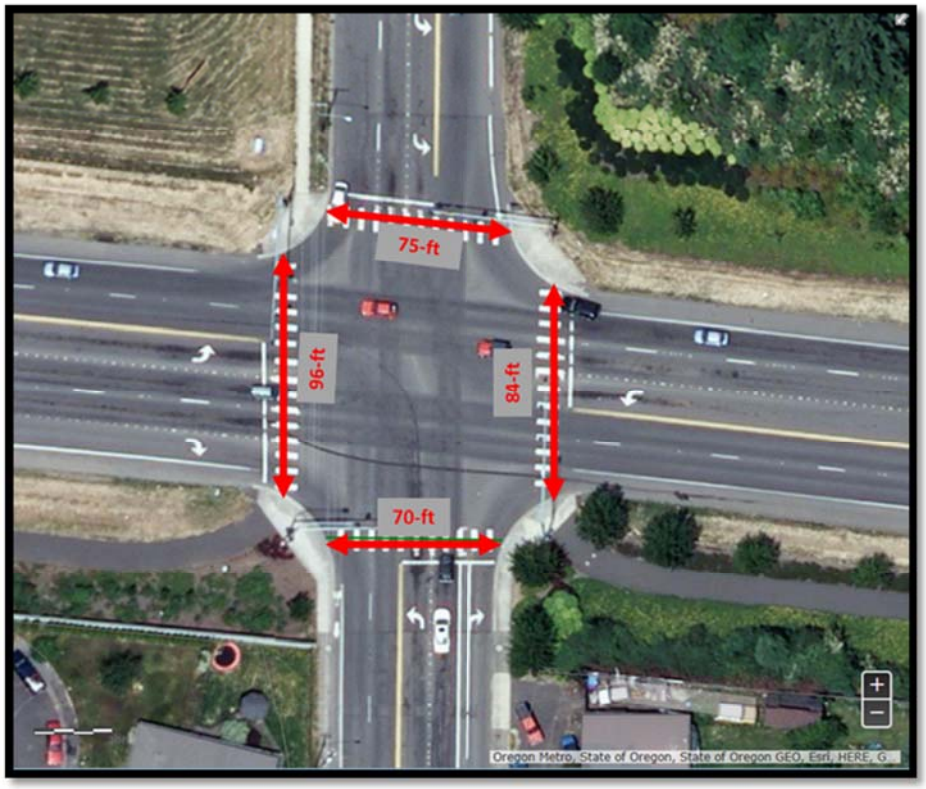


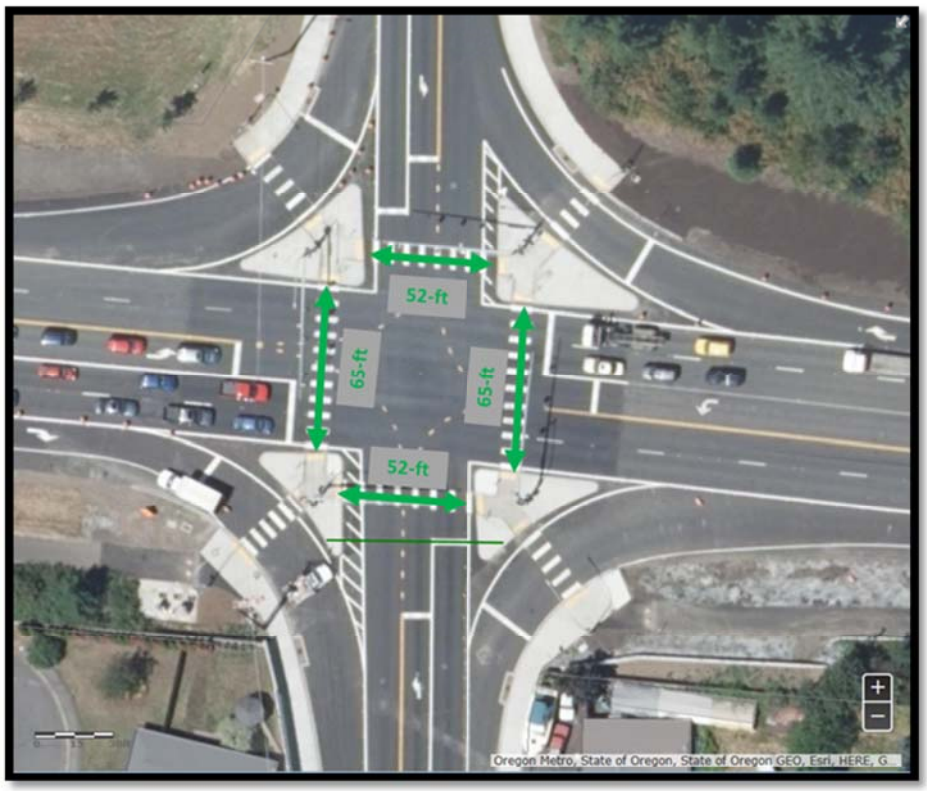
Figure 4. NE 94th Avenue Corridor (NE Padden Parkway to NE 99th Street) Corridor Crashes by Type for Before, Interim and After Project

Pedestrian Safety and Crash Analysis

The old intersection had a large intersection area, with long pedestrian crosswalks.



The new intersection configuration changed the geometry to provide pedestrian islands, which were designed to reduce the pedestrian crossing distances.



Compare the crossing distances in the first picture with the second one. The pedestrian crossing the west leg was in traffic for approximately 96-feet of crossing distance. The new configuration provides slip lanes with signalized crossings. The new crossing distance across the west leg is approximately 65-feet, as opposed to the old 96-foot distance. This means that a pedestrian crossing the road is in potential conflict with vehicles for 10-seconds less time on a 50 mph posted road.

The reduced crossing distances not only help improve pedestrian safety, but they also provide improved traffic signal flow.

Every time a pedestrian pushes a button to cross the road, the signal must process the WALK + Flashing Don't Walk + Yellow + All-red time. The extra crossing distance equates directly to more time that the signal is not providing green time to one of the vehicle movements. In the old design, each corner had one traffic signal pole. Each pole had two pedestrian pushbuttons on the same pole. Pedestrians regularly push both buttons to cross one direction. The new signal poles are separated, which reduces the tendency for a pedestrian to push both buttons and increases signal efficiency.

The reduced pedestrian crossing distance for the new configuration decreases the amount of time that a pedestrian is in the mainline of traffic, and reduces the amount of time that the signal must hold the green while processing the associated pedestrian phases of: WALK, Flashing Don't Walk, Yellow and All-red.

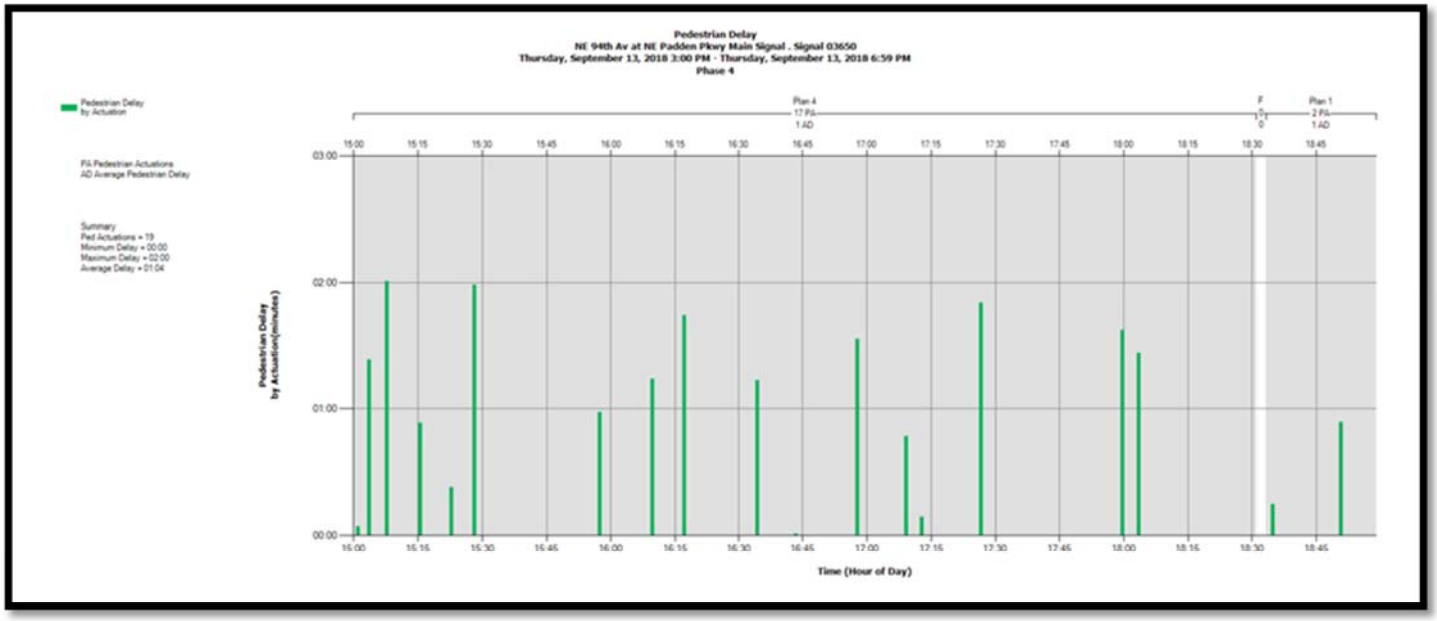
For a pedestrian usage frame of reference, the south side of Padden has a regional trail. The north leg of the intersection also has the beginning of a regional trail and sidewalk / walkway access to a large community of homes. The traffic signal system counts the number of times per 5-mniute interval that the signal serves a pedestrian movement. The signal does not count the number of pedestrians crossing, just the number of times that a pushbutton is pushed and the WALK is served.

A random week in September 2018 was selected to look at the number of times the signal served a pedestrian crossing one of the four major crossings (across mainline Padden, or across mainline NE 94th Avenue) between the hours of 3:00 PM and 7:00 PM (4 hours around and including the PM Peak hour). The number of pedestrian crossings served total across the four legs of the NE 94th Avenue / Padden Parkway intersection for those four hours included:

Observation Date – Number of Pedestrian Crossings			
9/10/18 – 25	9/11/18 – 42	9/12/18 – 37	9/13/18 – 57
9/14/18 – 47	9/15/18 – 49	9/16/18 – 41	Average – 37.3

On average, during that week, between the hours of 3:00 PM and 7:00 PM, the signal served approximately 10 pedestrian crossings per hour, or more. It is also more efficient than the old signal configurations capability

The High Resolution "Purdue" traffic signal data also allows us to know how long the pedestrian waits from when they push the button until they cross. The graphic below shows the time between when the pedestrian pushed the button to cross and when they were served, along with some statistics about the wait. This particular graph shows for the delay time for crossing the west leg (formerly the longest crossing distance) on September 13 between 3:00 PM and 7:00 PM.



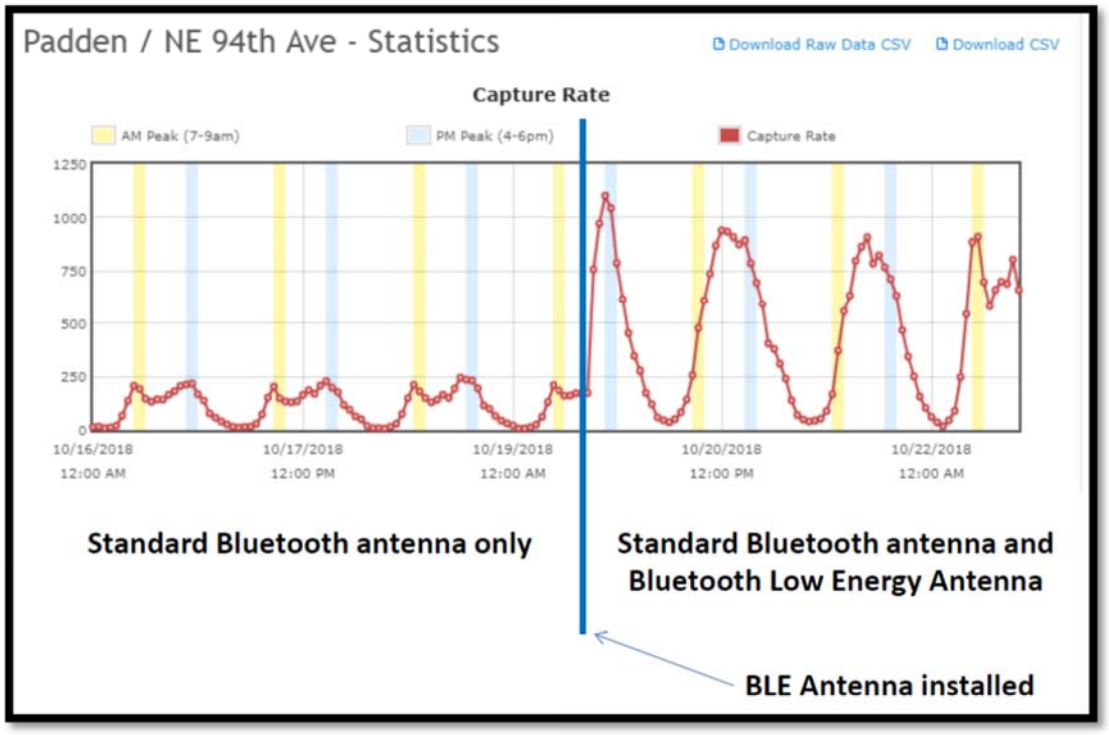
Data Collection and Traffic Surveillance

Across the county 69 Bluetooth sensors with two antennas, one standard Bluetooth, one Bluetooth Low Energy (BLE) have been installed, including NE 94th Avenue/Padden Parkway intersection. Normal Bluetooth sensors pick up Bluetooth devices that are in discoverable mode (phones, wireless Bluetooth headsets, car stereos), the BLE adds people who have items like Apple Watches and Fitbits.

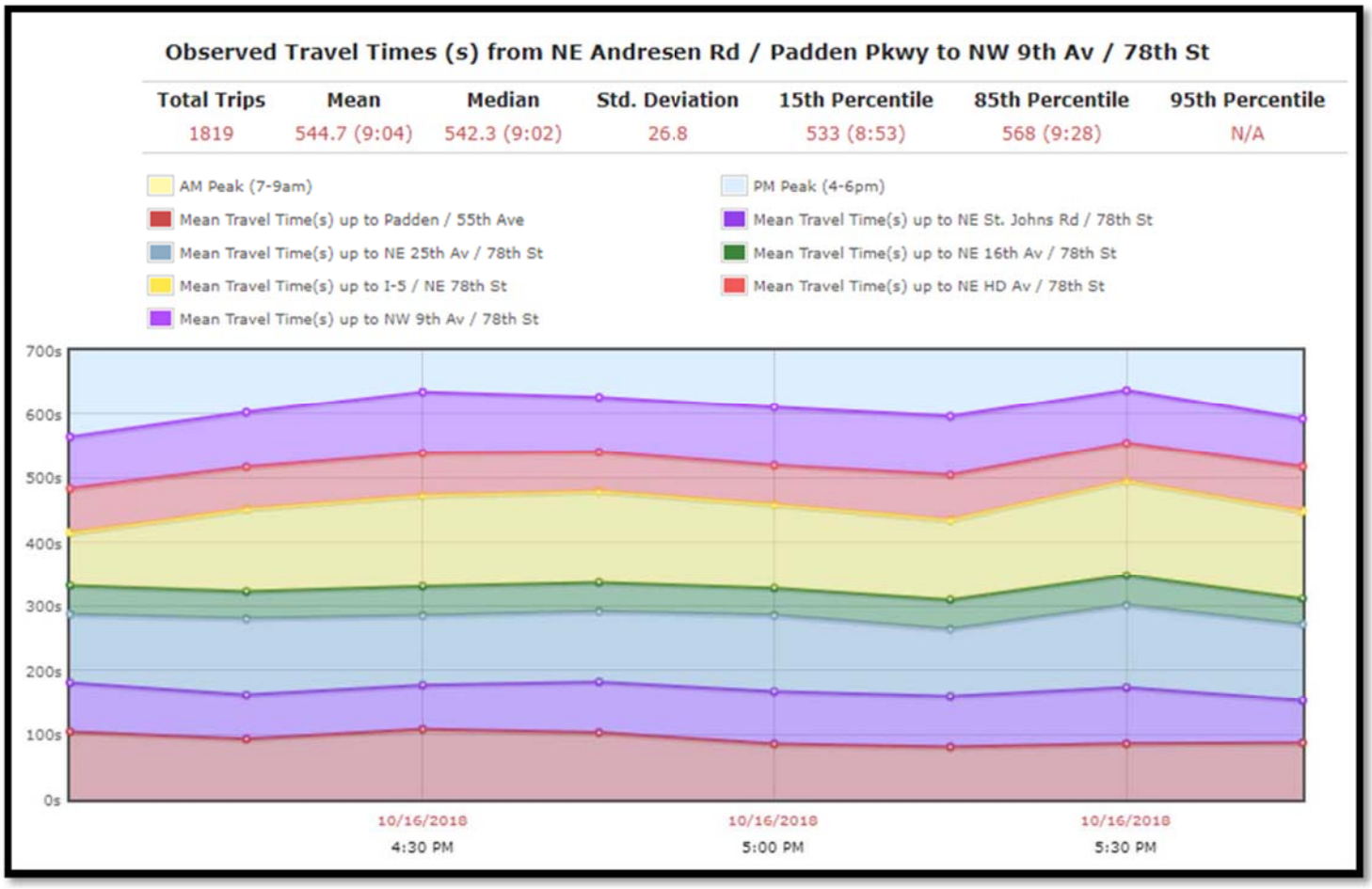
The hit rates are significantly higher for the new BlueMAC sensors that have both antennas.

Older BlueMAC devices have been retrofitted with the BLE antennas. Below is a snapshot of the before and after data capture rate of the Bluetooth antenna alone, and the Bluetooth and BLE antennas both operating for the NE 94th Avenue/Padden Parkway intersection.

More data hits means better reporting. With the old system, Bluetooth antennas were getting about 40 or 50 usable hits per hour during the PM Peak Hour.



The graphic below shows the Bluetooth travel times for the NE 78th Street / Padden Parkway Corridor from Andresen to NW 9th Avenue. There are hundreds of valid data points per hour now with both antennas. Each 15 minute interval has between 180 and 250 data points for the travel time on the corridor.



The data also yields more detail such as:

NOTE: All times are in (UTC-08:00) Pacific Time (US & Canada).
Italicized values are estimates due to missing data.

Start Time	Mean Speed (mph)	Mean Travel Time (s)	Number of Trips
10/16/2018 4:00 PM	24.2	564	207
10/16/2018 4:15 PM	22.7	602.3	219
10/16/2018 4:30 PM	21.5	635.1	227
10/16/2018 4:45 PM	21.8	626.8	229
10/16/2018 5:00 PM	22.4	610.4	239
10/16/2018 5:15 PM	22.9	596	222
10/16/2018 5:30 PM	21.4	637.7	268
10/16/2018 5:45 PM	23.1	592.1	208

There is much more that can be obtained from the system. This is a very quick high-clip presentation overview.