

Using Cloud Based Big Data for Signal Timing

Presented to 2023 ITS Heartland Annual Meeting

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May 2, 2023

Topics

1. Big Data Platforms
2. Corridor Prioritization
3. Before vs. After Analysis
4. Troubleshooting & Monitoring
5. Big Data vs. Floating Car



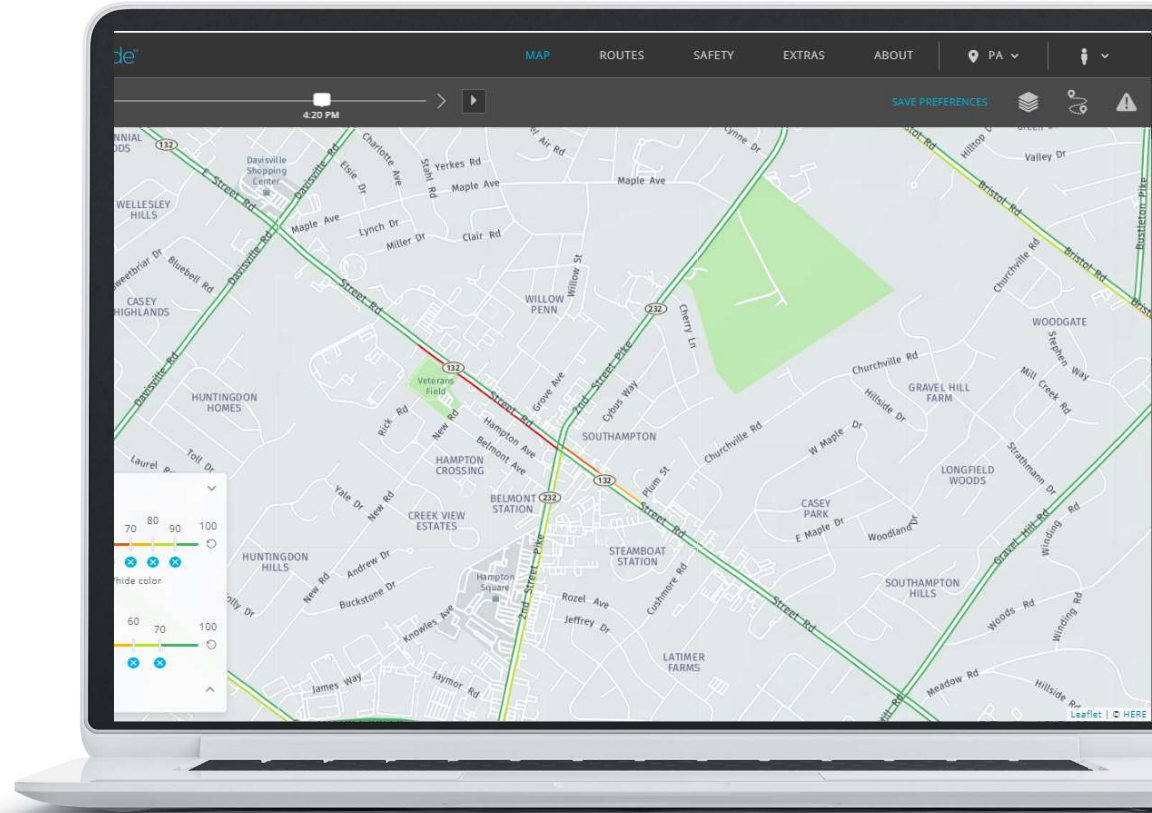
Big Data Platforms

- Third party data
- Near Real Time
- Used for data-driven decisions
 - Travel Time
 - Delay
 - Reliability
- 24/7/365 availability including in the past
- Multi platforms available



Big Data Uses For Signal Timing

- Real-time operations
- Corridor Prioritization
- Before vs. After Analysis
- Troubleshooting
- Visualize Queues and hotspots



PennDOT District 6 Corridor Prioritization

- Districtwide Signal Timing Initiative
 - District 6 Five County Region
 - Super Critical Corridors
- RITIS Platform
 - Travel Time Speed Limit
 - Median Travel Time
 - Interquartile Range
- External Inputs
 - ADT
 - Signal Density

ADT	TTSL (minutes)	Median Before (%)	Median After (%)	Delta Median	IQR Before (%)	IQR After (%)	Delta IQR	Incidents	No. Signals	Length	Score
31,043	2	52.6	180.4	127.8	29.1	74.4	45.3	0	3	0.6	64.2
61,374	16.5	122.5	148.6	26.1	39.6	50.1	10.5	0	23	5.6	94.3
48,662	13.5	117.2	148.2	31	39.5	51.4	11.9	0	12	3.2	80.5
18,355	3.9	134.1	152.3	18.2	51.2	76.3	25.1	0	2	0.2	66.4
37,518	12.5	136.8	146.4	9.6	34.9	39.9	5	0	14	4.1	74.6
46,860	7.2	86	115.5	29.5	25.8	33.7	7.9	0	6	1.3	69.4
44,366	14.3	115.9	132.1	16.2	36	38.3	2.3	0	17	3.9	75.2
43,608	12.7	128.4	145.6	17.2	39.1	42.2	3.1	0	14	3.9	74.7
43,400	11.5	136.1	145	8.9	39.1	36.7	-2.4	0	11	2.1	79.2
46,305	7.6	148.4	157	8.6	45.5	36.8	-8.7	0	8	1.3	85.2
19,826	4.1	5.8	154.5	158.8	4.3	36	34.9	-1.1	0	1.0	37.3
46,619	7.9	129.3	137.9	8.6	26.7	26	-0.7	0	6	2.4	73.1
31,225	16.7	109.1	142.4	33.3	24.1	34.5	10.4	0	12	2.4	61.3
48,004	7.2	121.2	128.3	7.1	32.5	28.3	-4.2	0	6	2.0	74.9
21,346	6.6	84.4	117.2	32.8	19	28.1	9.1	0	3	0.2	58.5
37,338	8.1	102	128	26	23	28.2	5.2	0	9	2.5	62.2
37,338	3.3	115.5	116.9	1.4	23.2	25.3	2.1	0	3	0.6	63.6
42,981	15.8	140.7	137	-3.7	53.6	46.3	-7.3	0	12	3.7	76.6
23,075	8.1	146.2	154	7.8	46.2	48.5	2.3	0	9	2.2	64.2

E 31st St – Kansas City Before vs. After | Data Reliability



Route: E 31st St (EB) Grand to Van Brunt

MON 06/22/2020 TO FRI 12/11/2020

Implementation Week

35

DATE RANGE: 11/17/2020 - 11/19/2020, DATE RANGE 2: 12/08/2020 - 12/10/2020, METRIC 1: Average Speed

TIME OF DAY: 7:00 AM-7:00 PM, INCLUDE DAYS: Tue, Wed, Thu

Route Name	ID	11/17/20-11/19/20	12/8/20-12/10/20	Diff	% Diff	Length (mi)
E 31st St (EB) Grand to Van Brunt	29	22.1	20.9	-1.2	-5.43%	3.5
E 31st St (WB) Van Brunt to Grand	30	21.7	20.6	-1.1	-5.07%	3.53



E 31st St – Kansas City

Before vs. After | Data Reliability

Route: E 31st St (EB) Grand to Van Brunt

MON 06/22/2020 TO FRI 12/11/2020

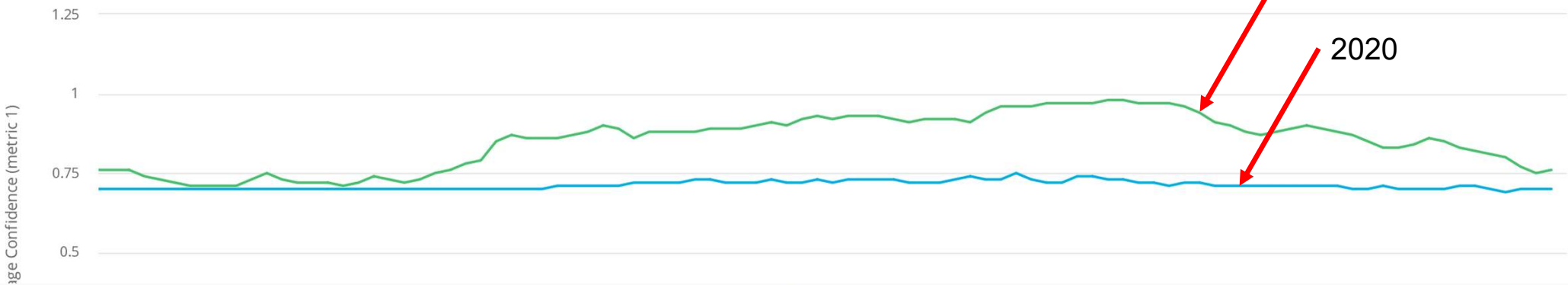


E 31st St – Kansas City

Before vs. After | Data Reliability | Today vs. 2020

Route: E 31st St (EB) Grand to Van Brunt

MON 11/16/2020 TO FRI 12/11/2020 | MON, TUE, WED, THU, FRI AND MON 04/10/2023 TO FRI 04/21/2023 | MON, TUE, WED, THU, FRI



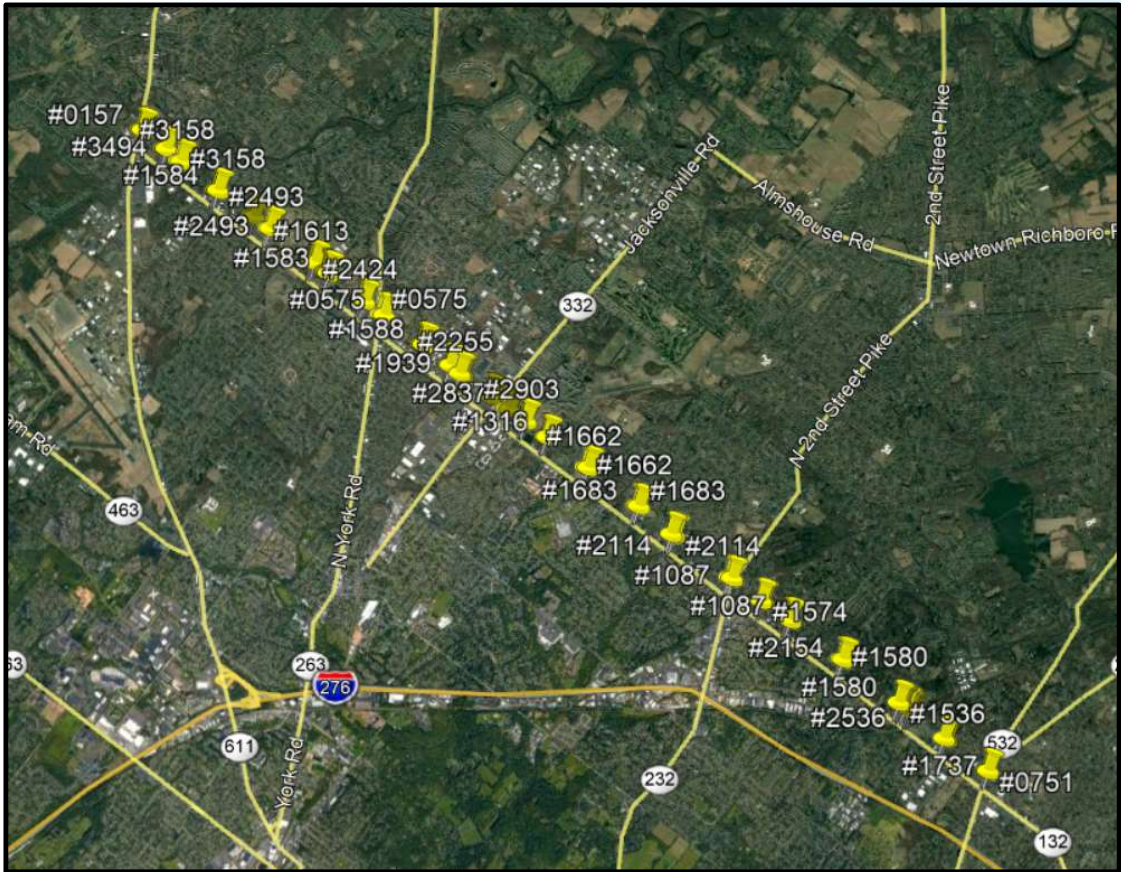
DATE RANGE: 11/16/2020 - 12/11/2020, DATE RANGE 2: 04/10/2023 - 04/21/2023, METRIC 1: Average Confidence

TIME OF DAY: 7:00 AM-7:00 PM, INCLUDE DAYS: Mon, Tue, Wed, Thu, Fri

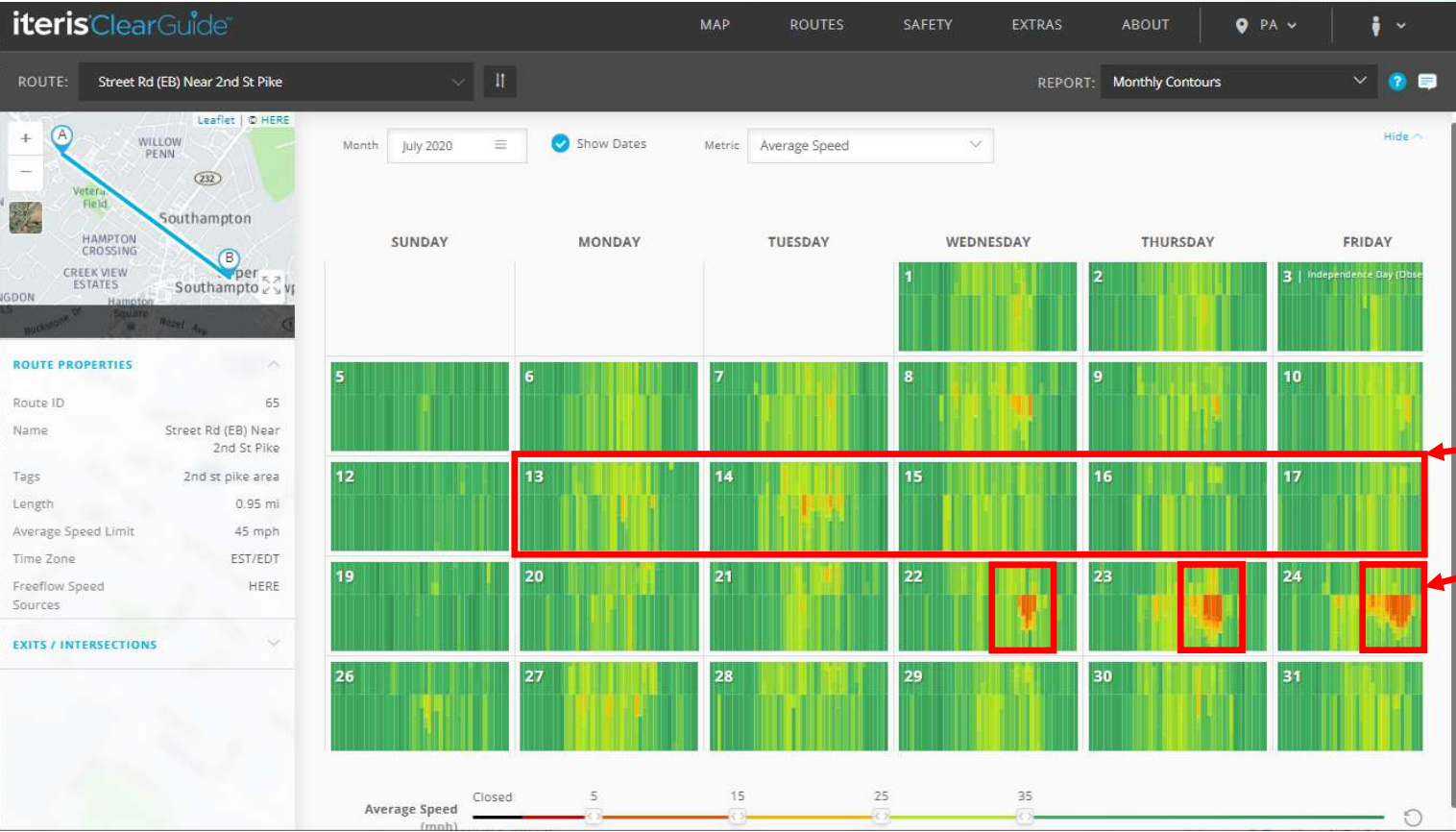
Route Name	ID	11/16/20-12/11/20	4/10/23-4/21/23	Diff	% Diff	Length (mi)
E 31st St (EB) Grand to Van Brunt	29	0.72	0.92	0.2	27.78%	3.5
E 31st St (WB) Van Brunt to Grand	30	0.72	0.92	0.2	27.78%	3.53

Street Rd (SR 0132)

INTID	INTNAME
157	Easton Rd & Street Rd
3494	Valley Sq Blvd & Street Rd
3158	Paul Valley Dr/Neshaminy Ave & Street Rd
1584	Valley Rd & Street Rd
181	St David's Ave/Cooper Dr & Street Rd
2493	Delmont Ave & Street Rd
1613	S. Norristown Rd & Street Rd
1583	N. Norristown Rd & Street Rd
2424	Center Point Plaza/Commercial Driveway & Street Rd
575	York Rd & Street Rd
1588	Mearns Rd & Street Rd
1939	Madison Ave & Street Rd
2255	Lois Dr & Street Rd
1315	Jacksonville Rd & Street Rd
2837	Centennial Village Access & Street Rd
2903	Johnsville Blvd & Street Rd
1316	S. Newtown Rd & Street Rd
1662	Centennial Rd/Reeves Lane & Street Rd
1683	Davisville Rd & Street Rd
2114	Willopenn Drive & Street Rd
1087	Second Street Pike & Street Rd
1574	Churchville Road/Knowles Avenue & Street Rd
2154	Kutcher Rd/Morelyn Plaza Drive & Street Rd
1580	Gravel Hill Rd & Street Rd
1536	Buck Rd/Millcreek/Lakeside & Street Rd
2536	Buck Rd/Millcreek/Lakeside & Street Rd
3536	Buck Rd/Millcreek/Lakeside & Street Rd
1737	Pennsylvania Blvd & Street Rd
751	Bustleton & Street Rd



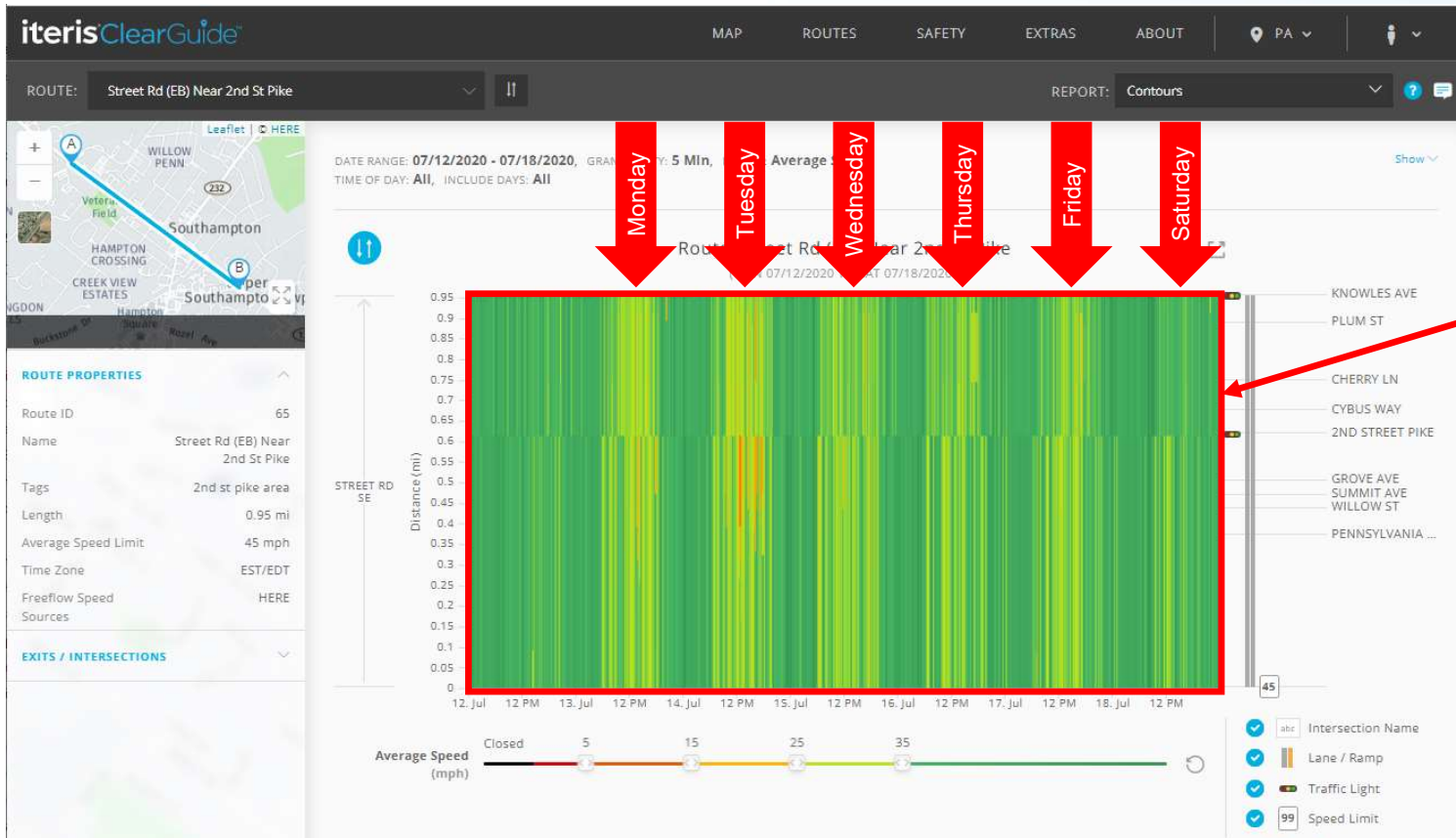
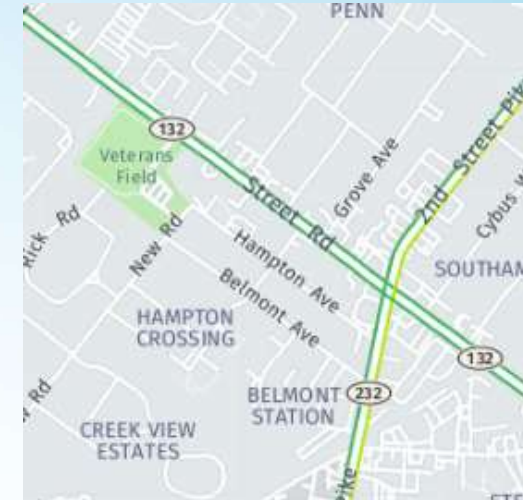
Street Rd – Monthly Contours Troubleshooting



New Timing Implemented

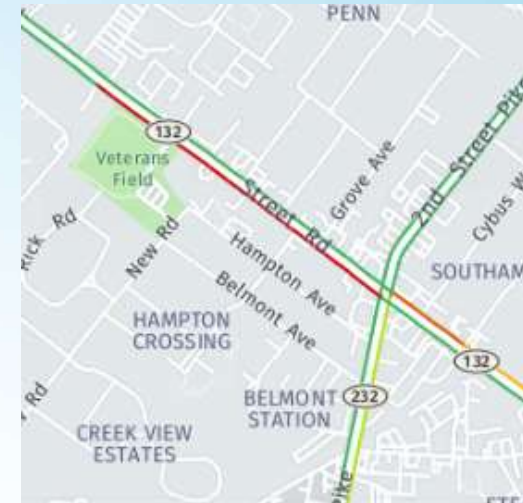
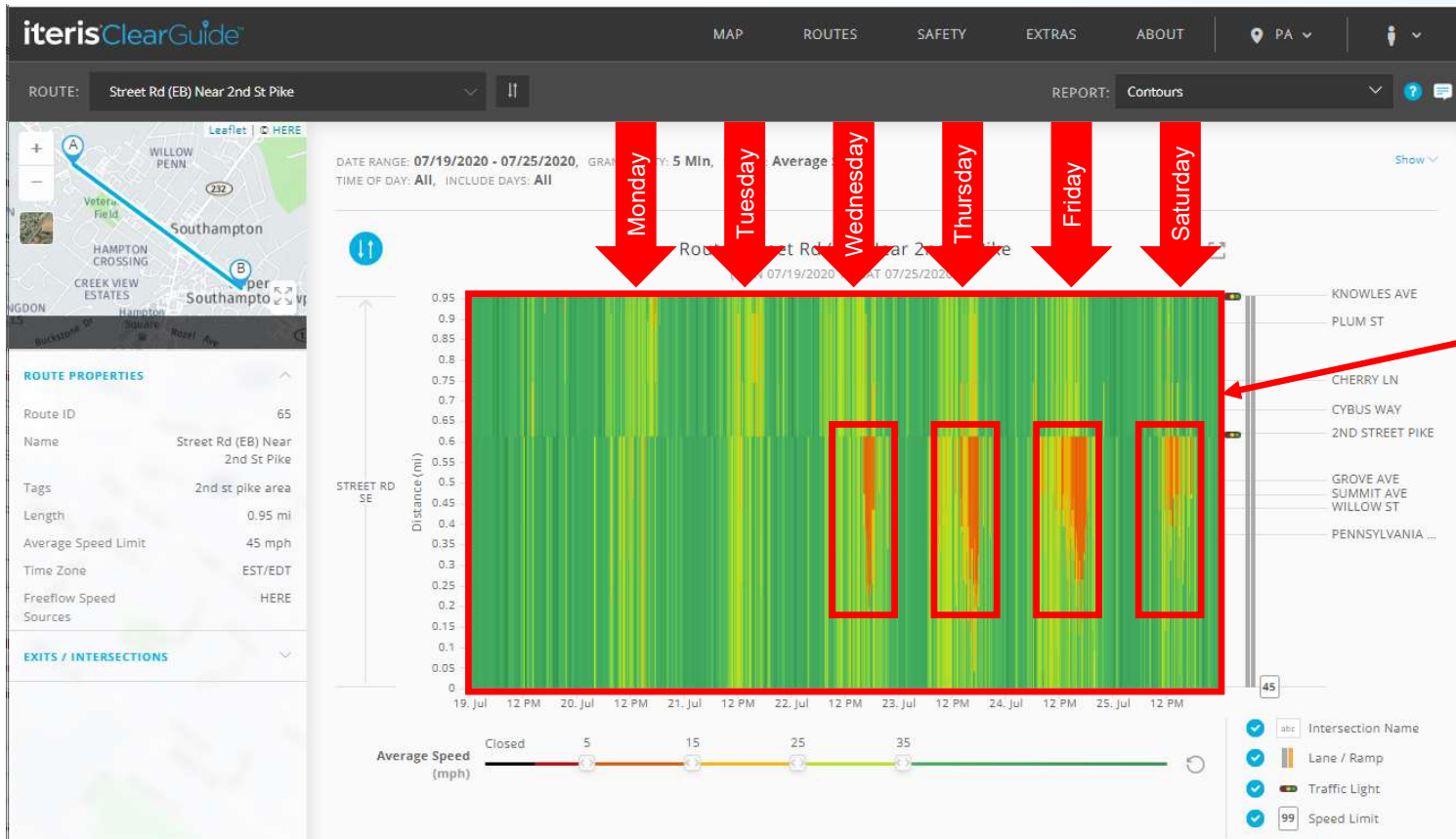
What Happened?

Street Rd – Daily Contour Troubleshooting



Implementation Week

Street Rd – Daily Contour Troubleshooting



The Week After Implementation Week

Street Rd (SR 0132)

Multi-Route Time Comparison

Wednesday to Friday, 24 hours per day												
Range 1		Range 2		Route Name	Range 1		Range 2		Diff	Percent Diff	Route Length	Units
Start	End	Start	End		Delay	Units	Units	Delay				
7/8/20	7/10/20	7/15/20	7/17/20	Street Rd from Valley Sq Blvd to PA Blvd	2.69	mins	2.24	mins	-0.45	-16.7%	8.319	mi
7/8/20	7/10/20	7/15/20	7/17/20	Street Rd from PA Blvd to Valley Sq Blvd	2.91	mins	2.07	mins	-0.84	-28.9%	8.349	mi
Total					5.6	mins	4.31	mins	-1.29	-23.0%	16.667	mi

Wednesday to Friday, AM Peak (6:00 am to 10:00 am)												
Range 1		Range 2		Route Name	Range 1		Range 2		Diff	Percent Diff	Route Length	Units
Start	End	Start	End		Delay	Units	Units	Delay				
7/8/20	7/10/20	7/15/20	7/17/20	Street Rd from Valley Sq Blvd to PA Blvd	2.95	mins	2.37	mins	-0.58	-19.7%	8.319	mi
7/8/20	7/10/20	7/15/20	7/17/20	Street Rd from PA Blvd to Valley Sq Blvd	3.78	mins	2.81	mins	-0.97	-25.7%	8.349	mi
Total					6.73	mins	5.18	mins	-1.55	-23.0%	16.667	mi

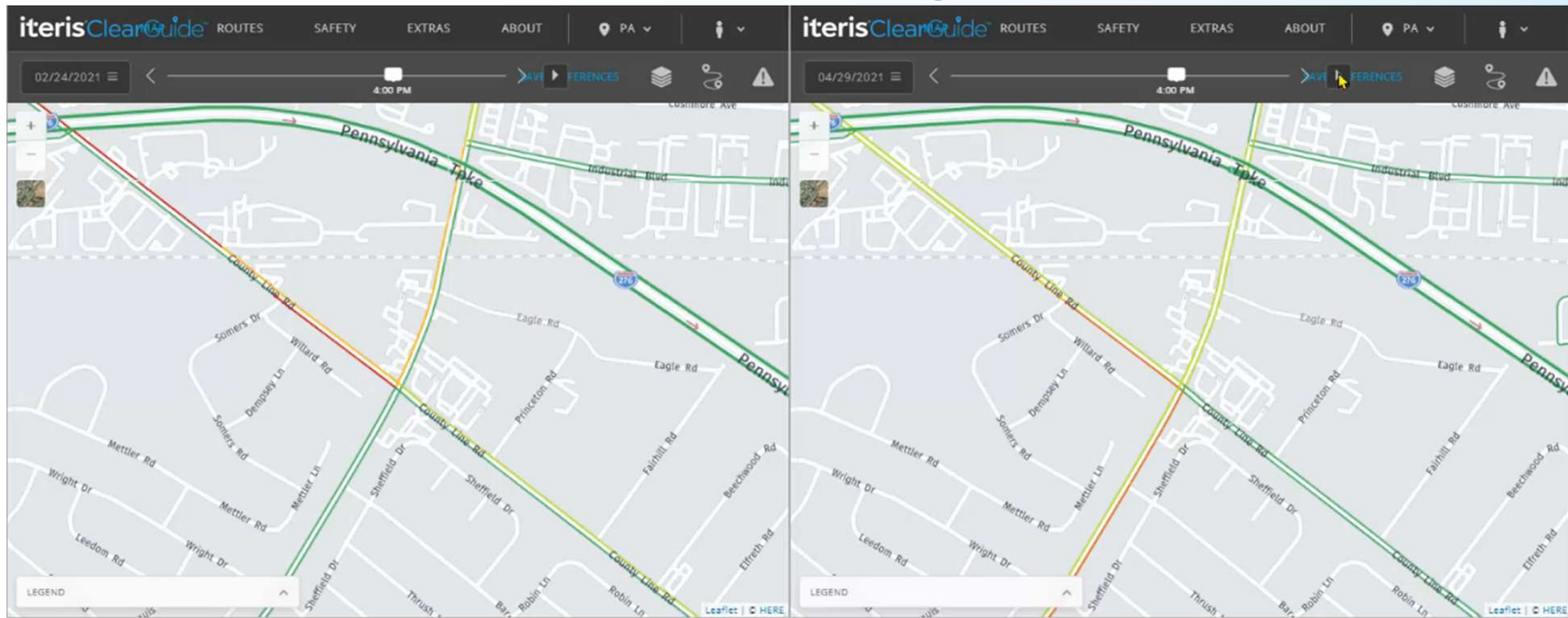
Wednesday to Friday, MD Peak (10:00 am to 3:00 pm)												
Range 1		Range 2		Route Name	Range 1		Range 2		Diff	Percent Diff	Route Length	Units
Start	End	Start	End		Delay	Units	Units	Delay				
7/8/20	7/10/20	7/15/20	7/17/20	Street Rd from Valley Sq Blvd to PA Blvd	5.1	mins	4.26	mins	-0.84	-16.5%	8.319	mi
7/8/20	7/10/20	7/15/20	7/17/20	Street Rd from PA Blvd to Valley Sq Blvd	5.43	mins	4.25	mins	-1.18	-21.7%	8.349	mi
Total					10.53	mins	8.51	mins	-2.02	-19.2%	16.667	mi

Wednesday to Friday, PM Peak (3:00 pm to 7:00 pm)												
Range 1		Range 2		Route Name	Range 1		Range 2		Diff	Percent Diff	Route Length	Units
Start	End	Start	End		Delay	Units	Units	Delay				
7/8/20	7/10/20	7/15/20	7/17/20	Street Rd from Valley Sq Blvd to PA Blvd	4.8	mins	4.05	mins	-0.75	-15.6%	8.319	mi
7/8/20	7/10/20	7/15/20	7/17/20	Street Rd from PA Blvd to Valley Sq Blvd	4.73	mins	2.78	mins	-1.95	-41.2%	8.349	mi
Total					9.53	mins	6.83	mins	-2.7	-28.3%	16.667	mi

County Line Road Monitoring

4:30 PM to 6:00 PM (Apr 21 2021 vs Apr 29 2021) - Thur														
Range 1		Range 2		Range 1		Range 2		Diff	Percent Diff	Route Length	Units			
Start	End	Start	End	Delay	Units	Delay	Units							
2/24/21	2/25/21	4/29/21	4/29/21	County Line Rd from Delmont to Pine	6.76	mins	5.24	mins	-1.52	-22.5%	7.047	mi		
2/24/21	2/25/21	4/29/21	4/29/21	County Line Rd from Pine to Delmont	4.93	mins	4.07	mins	-0.86	-17.4%	7.060	mi		
2/24/21	2/25/21	4/29/21	4/29/21	Meeting House Rd NB near County Line Rd	0.26	mins	0.27	mins	0.01	3.8%	0.827	mi		
2/24/21	2/25/21	4/29/21	4/29/21	Blair Mill Rd NB Near County Line Rd	0.38	mins	0.65	mins	0.27	71.1%	0.710	mi		
2/24/21	2/25/21	4/29/21	4/29/21	York Rd NB Near County Line Rd	0.73	mins	0.62	mins	-0.11	-15.1%	1.078	mi		
2/24/21	2/25/21	4/29/21	4/29/21	York Rd SB Near County Line Rd	0.59	mins	0.53	mins	-0.06	-10.2%	1.078	mi		
2/24/21	2/25/21	4/29/21	4/29/21	Jacksonville Rd NB Near County Line Rd	0.65	mins	0.68	mins	0.03	4.6%	0.787	mi		
2/24/21	2/25/21	4/29/21	4/29/21	Jacksonville Rd SB Near County Line Rd	0.82	mins	1.04	mins	0.22	26.8%	0.787	mi		
2/24/21	2/25/21	4/29/21	4/29/21	Warminster Rd NB Near County Line Rd	0.15	mins	0.12	mins	-0.03	-20.0%	0.451	mi		
2/24/21	2/25/21	4/29/21	4/29/21	Newtown Rd SB Near County Line Rd	0.02	mins	0.01	mins	-0.01	-50.0%	0.634	mi		
2/24/21	2/25/21	4/29/21	4/29/21	S Davisville Rd NB Near County Line Rd	0.37	mins	0.34	mins	-0.03	-8.1%	0.702	mi		
2/24/21	2/25/21	4/29/21	4/29/21	N Davisville Rd SB Near County Line Rd	0.06	mins	0.06	mins	0	0.0%	0.340	mi		
2/24/21	2/25/21	4/29/21	4/29/21	2nd St Pike NB Near County Line Rd	0.68	mins	1.06	mins	0.38	55.9%	0.664	mi		
2/24/21	2/25/21	4/29/21	4/29/21	2nd St Pike SB Near County Line Rd	0.74	mins	0.68	mins	-0.06	-8.1%	0.664	mi		
2/24/21	2/25/21	4/29/21	4/29/21	Buck Rd SB Near County Line Rd	0.13	mins	0.06	mins	-0.07	-53.8%	0.505	mi		
2/24/21	2/25/21	4/29/21	4/29/21	Pine Rd NB Near County Line Rd	0.18	mins	0.23	mins	0.05	27.8%	0.535	mi		
Total					17.45	mins	15.66	mins	-1.79	-10.3%	23.871	mi		

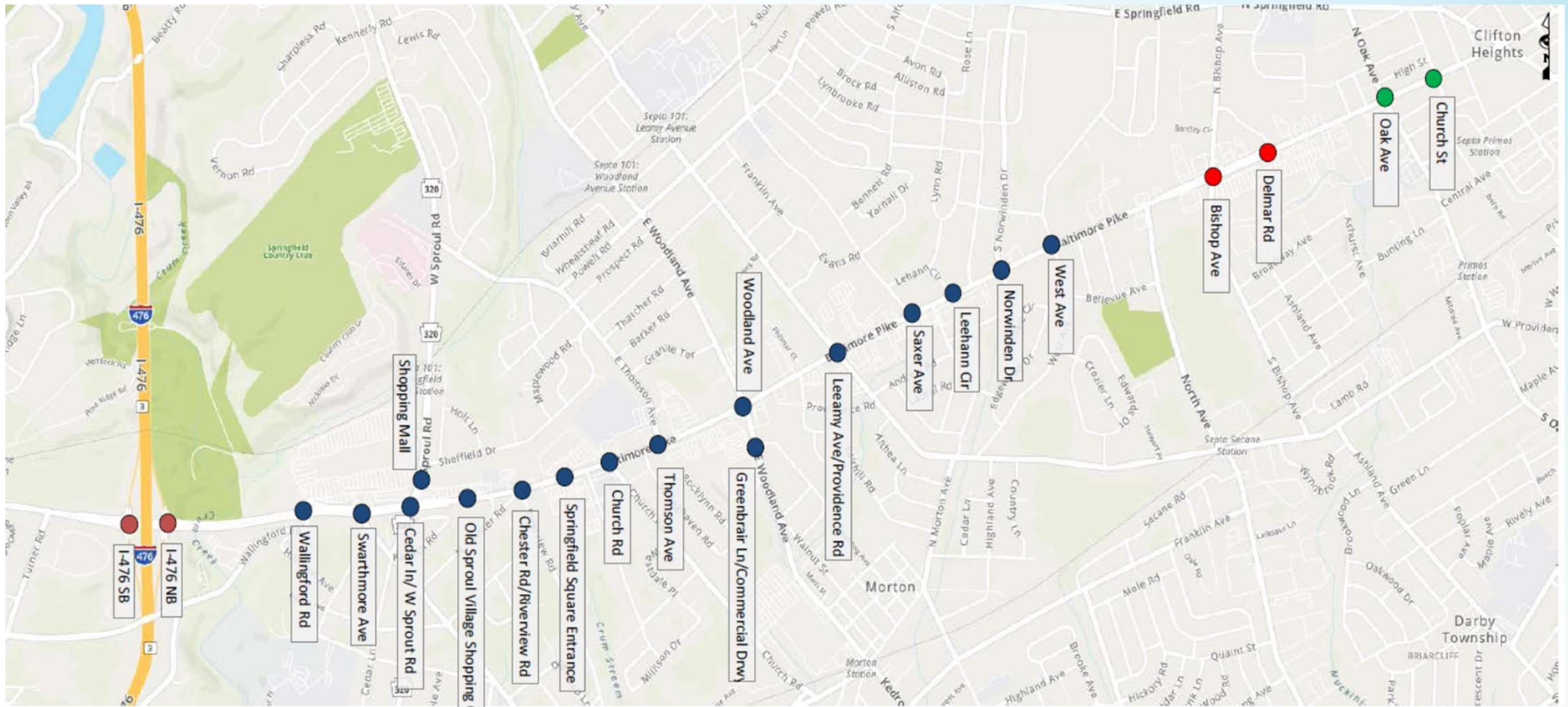
County Line Road Monitoring



Before
February 24, 2021

During Imp
April 29, 2021

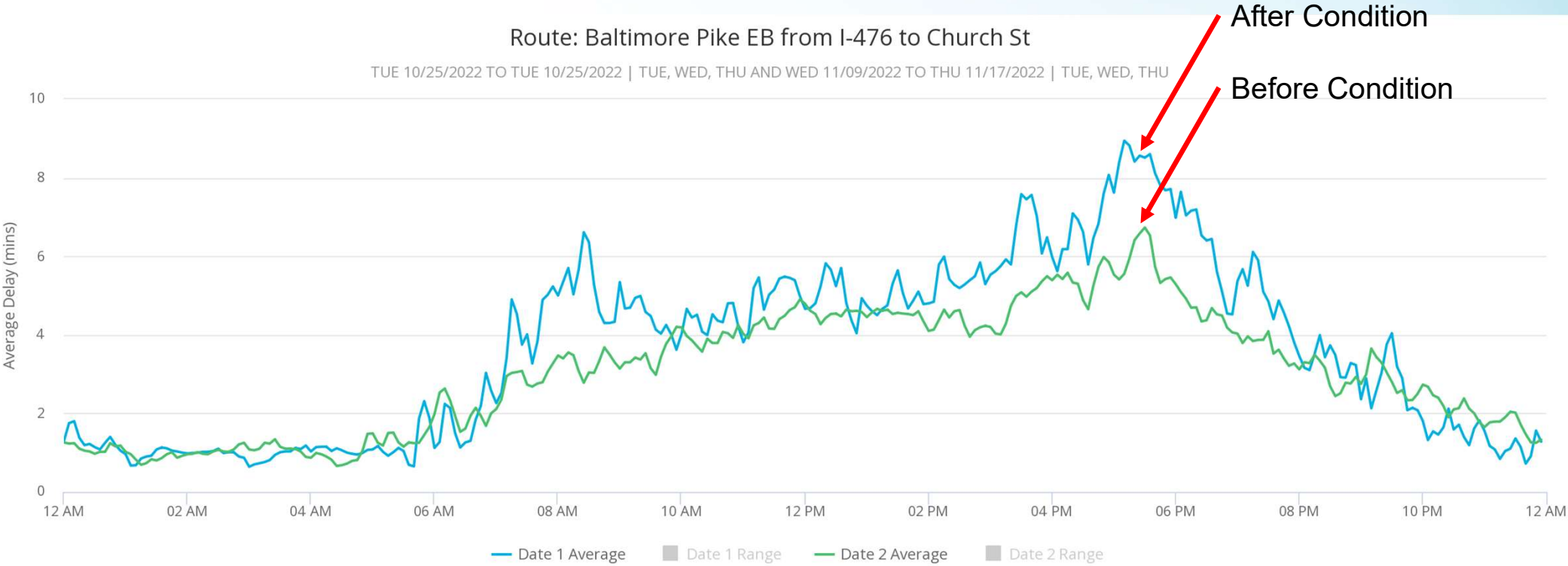
Baltimore Pike (SR 0132)



Baltimore Pike – Time of Day Before vs. After

Route: Baltimore Pike EB from I-476 to Church St

TUE 10/25/2022 TO TUE 10/25/2022 | TUE, WED, THU AND WED 11/09/2022 TO THU 11/17/2022 | TUE, WED, THU



Baltimore Pike – Route Comparison Before vs. After

Route: Baltimore Pike EB from I-476 to Church St

TUE 10/25/2022 TO TUE 10/25/2022 | TUE, WED, THU AND WED 11/09/2022 TO THU 11/17/2022 | TUE, WED, THU

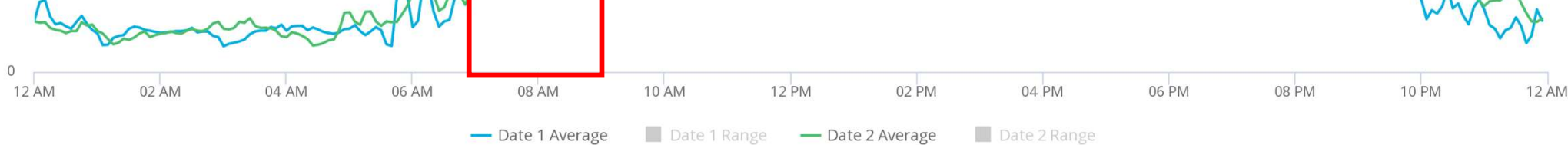
10



DATE RANGE: 10/25/2022 - 11/03/2022, DATE RANGE 2: 11/09/2022 - 11/17/2022, METRIC 1: Delay In Minutes (SL)
 TIME OF DAY: 7:00 AM-9:00 AM, INCLUDE DAYS: Tue, Wed, Thu

Route Name	ID	10/25/22-11/3/22	11/9/22-11/17/22	Diff	% Diff	Length (mi)
Baltimore Pike EB from I-476 to Church St	158	4	3.06	-0.94	-23.5%	3.71
Baltimore Pike WB from Church St to I-476	159	5.77	3.97	-1.8	-31.2%	3.61

2



Baltimore Pike – Route Comparison Before vs. After

Route: Baltimore Pike EB from I-476 to Church St

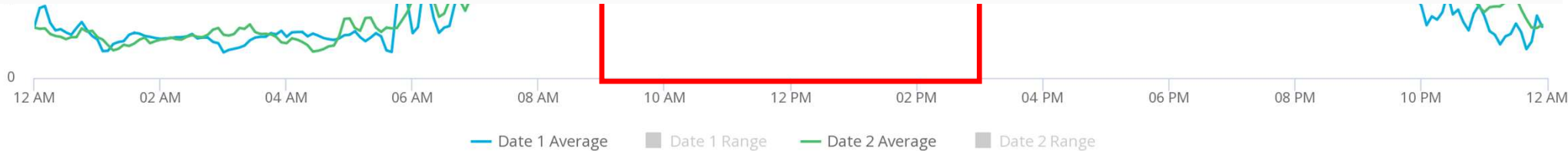
TUE 10/25/2022 TO TUE 10/25/2022 | TUE, WED, THU AND WED 11/09/2022 TO THU 11/17/2022 | TUE, WED, THU



DATE RANGE: 10/25/2022 - 11/03/2022, DATE RANGE 2: 11/09/2022 - 11/17/2022, METRIC 1: Delay In Minutes (SL)

TIME OF DAY: 9:00 AM-3:00 PM, INCLUDE DAYS: Tue, Wed, Thu

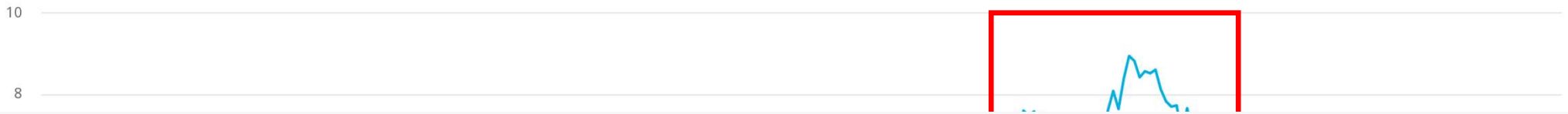
Route Name	ID	10/25/22-11/3/22	11/9/22-11/17/22	Diff	% Diff	Length (mi)
Baltimore Pike EB from I-476 to Church St	158	5	4.19	-0.81	-16.2%	3.71
Baltimore Pike WB from Church St to I-476	159	5.07	4.59	-0.48	-9.47%	3.61



Baltimore Pike – Route Comparison Before vs. After

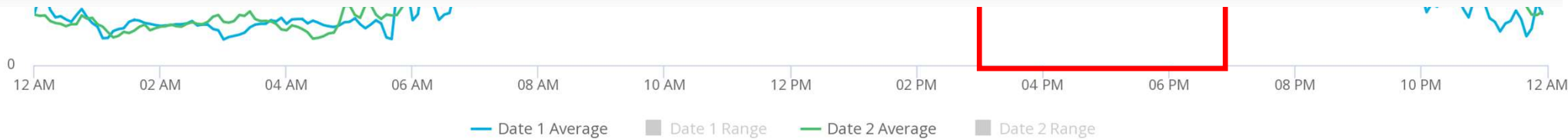
Route: Baltimore Pike EB from I-476 to Church St

TUE 10/25/2022 TO TUE 10/25/2022 | TUE, WED, THU AND WED 11/09/2022 TO THU 11/17/2022 | TUE, WED, THU

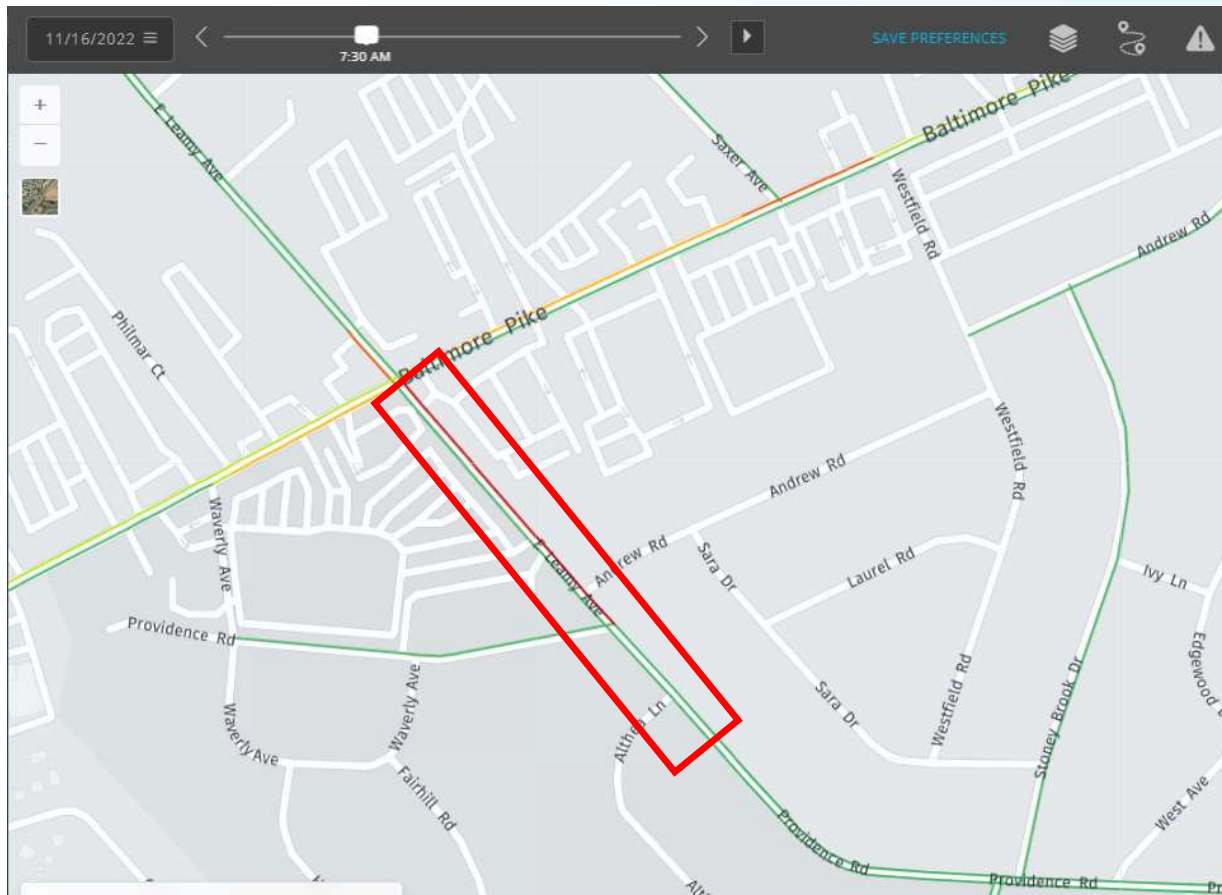


DATE RANGE: 10/25/2022 - 11/03/2022, DATE RANGE 2: 11/09/2022 - 11/17/2022, METRIC 1: Delay In Minutes (SL)
 TIME OF DAY: 3:00 PM-7:00 PM, INCLUDE DAYS: Tue, Wed, Thu

Route Name	ID	10/25/22-11/3/22	11/9/22-11/17/22	Diff	% Diff	Length (mi)
Baltimore Pike EB from I-476 to Church St	158	7.27	5.15	-2.12	-29.16%	3.71
Baltimore Pike WB from Church St to I-476	159	6.51	5.23	-1.28	-19.66%	3.61



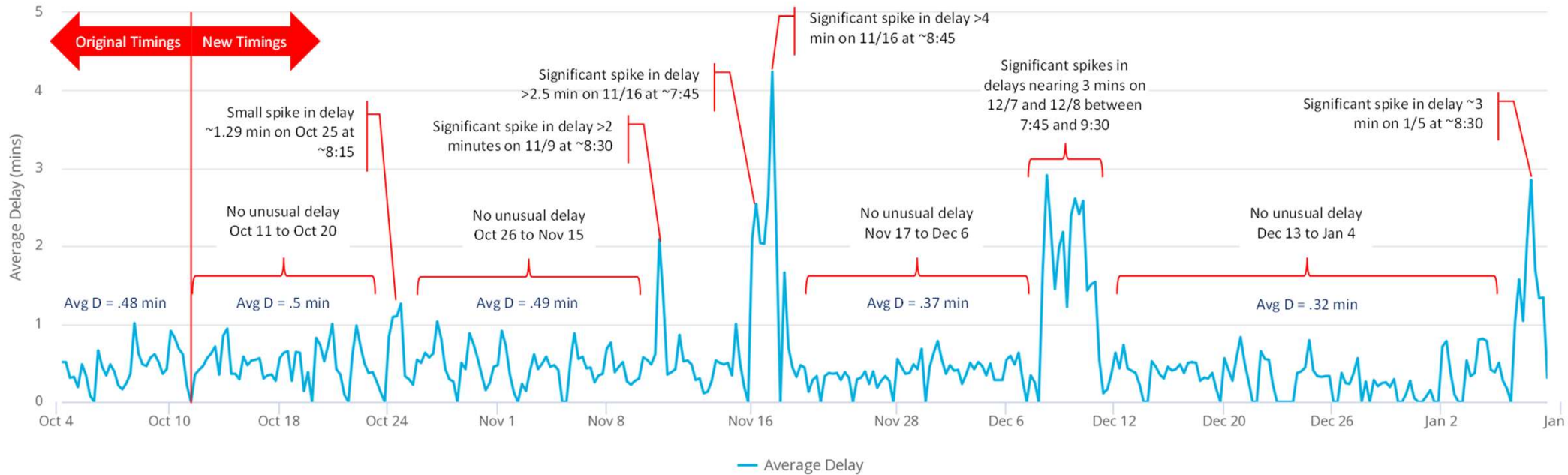
Baltimore Pike Troubleshooting



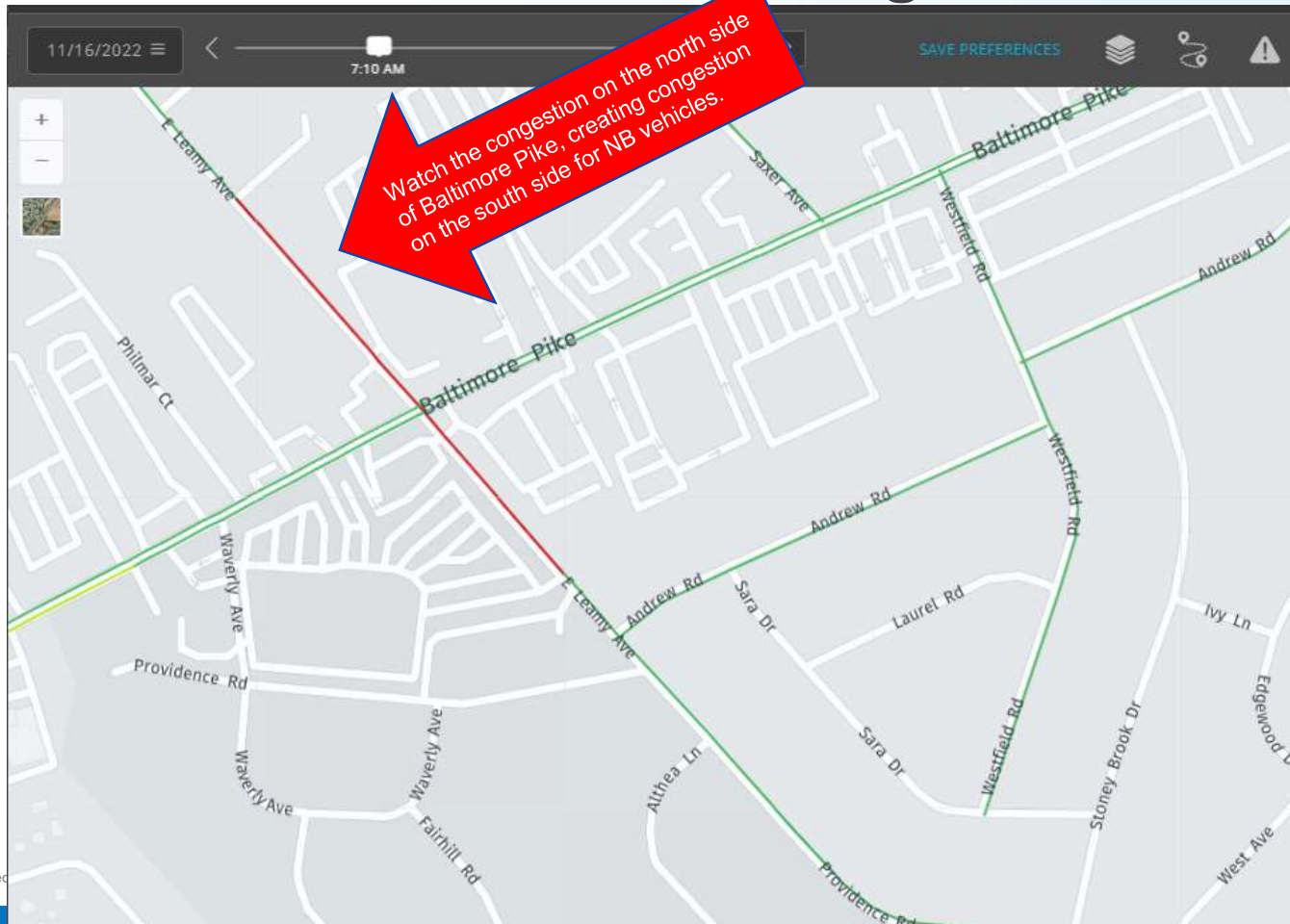
Baltimore Pike - Timeseries Troubleshooting

Route: Providence/leamy NB

TUE 10/04/2022 TO THU 01/05/2023 | 7:30 AM-9:30 AM | TUE, WED, THU



Baltimore Pike - Timeseries Troubleshooting



Columbus OH Downtown Timing Troubleshooting

The screenshot displays the Iteris ClearGuide web application interface. The browser address bar shows the URL: `ohio.iteris-clearguide.com/map?type=route-my#39.9626,-82.9921,15,0,eyJmaWx0ZXJ0cmFmZmljip71mluY2lkZW50cyt6e...`. The application header includes the logo, navigation tabs (MAP, ROUTES, EXTRAS, ABOUT), and a location dropdown set to 'OH'. A search bar is located in the top right of the interface.

The main content area is split into two sections. On the left is a map of downtown Columbus, OH, showing streets, parks, and landmarks. On the right is a search results panel with the following content:

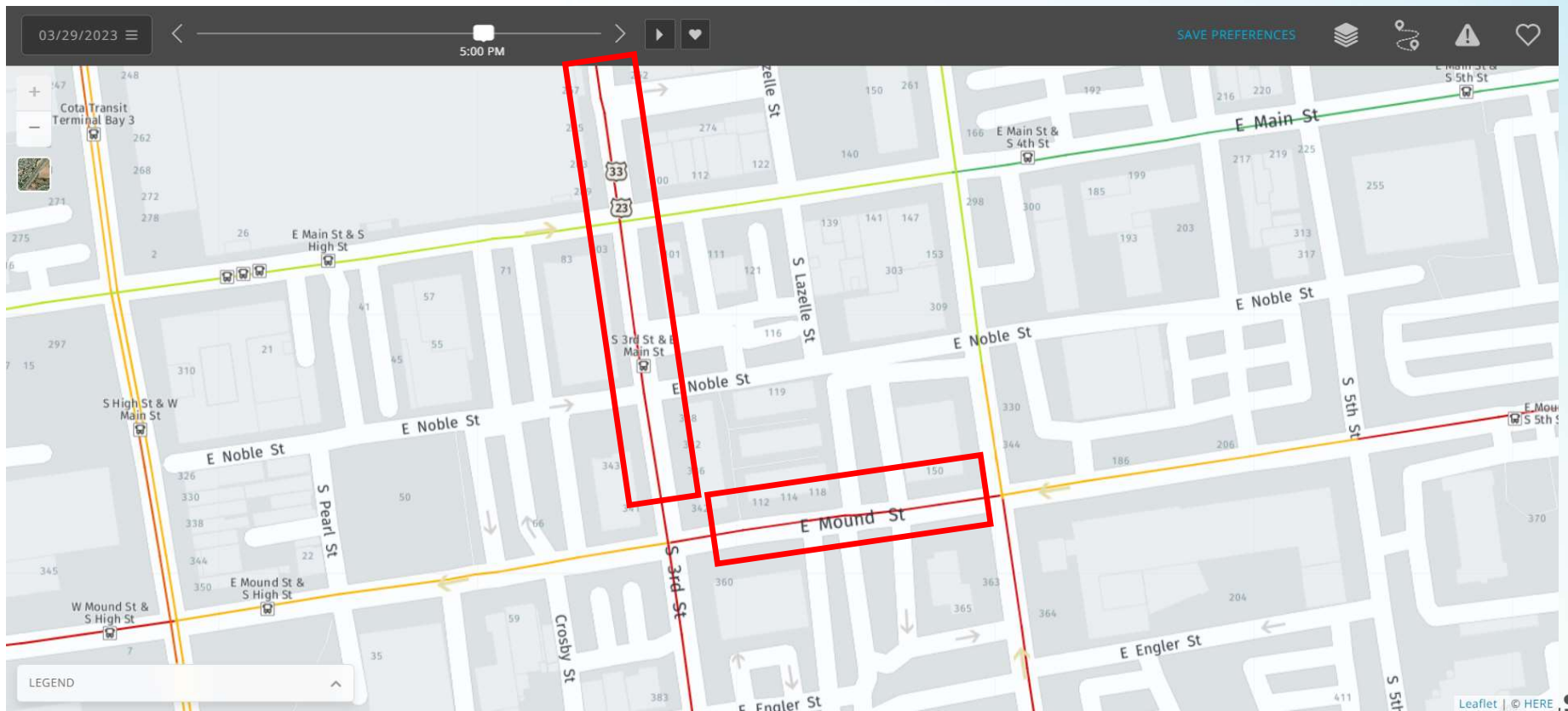
SEARCH **CREATE**

Search Results [MODIFY](#) [NEW](#)

PREVIOUS Showing 1-20 of 60 [NEXT](#)

ID	NAME	CREATED ON
ID: 144	Broad St from Marconi Blvd to Parsons Ave	CREATED: Apr 5, 2023
ID: 143	Broad St from Parsons Ave to Marconi Blvd	CREATED: Apr 5, 2023
ID: 142	Spring St (WB) Elijah Pierce to Neil	CREATED: Apr 1, 2023
ID: 141	Long St (EB) Neil to Hamilton	CREATED: Apr 1, 2023

Columbus OH Downtown Timing Troubleshooting



Big Data vs. Floating Car

S 84th St

S 84th St SB from WCR to Lincoln

ROUTE PROPERTIES

Route ID: 119
Tags: s 84th st study
Length: 5.61 mi
Average Speed Limit: 40.4 mph
Reverse Route: S 84th St NB from Lincoln to WCR

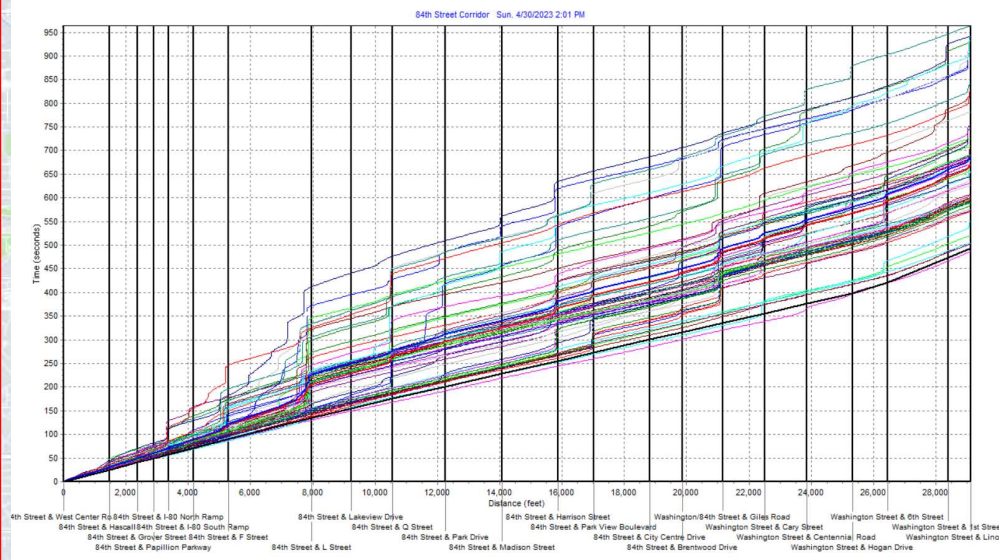
EXITS / INTERSECTIONS

Output: KML

EXPORT

DELETE ROUTE

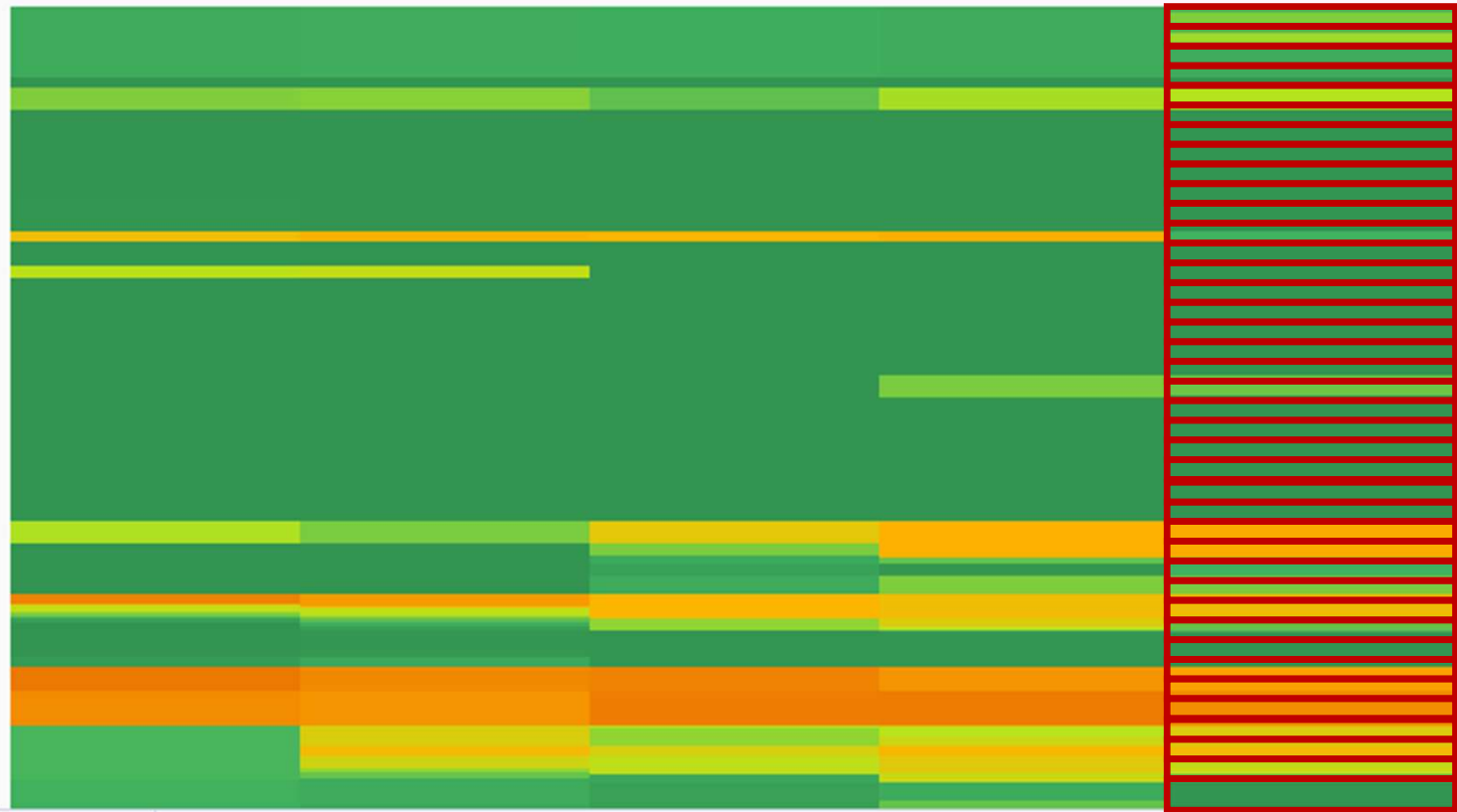
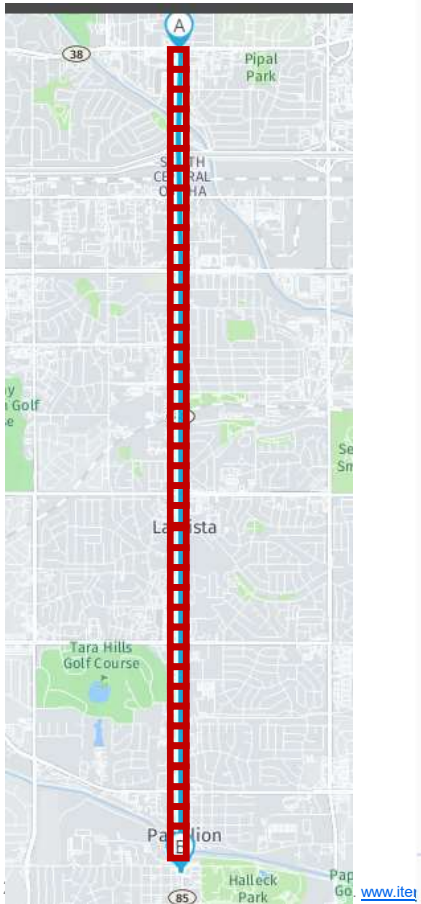
Tru-Traffic Travel Time Runs



Big Data vs. Floating Car

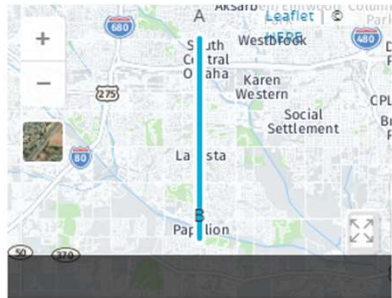
Route: S 84th St SB from WCR to Lincoln

(WED 04/26/2023 TO WED 04/26/2023)



04 PM

Big Data vs. Floating Car S 84th St



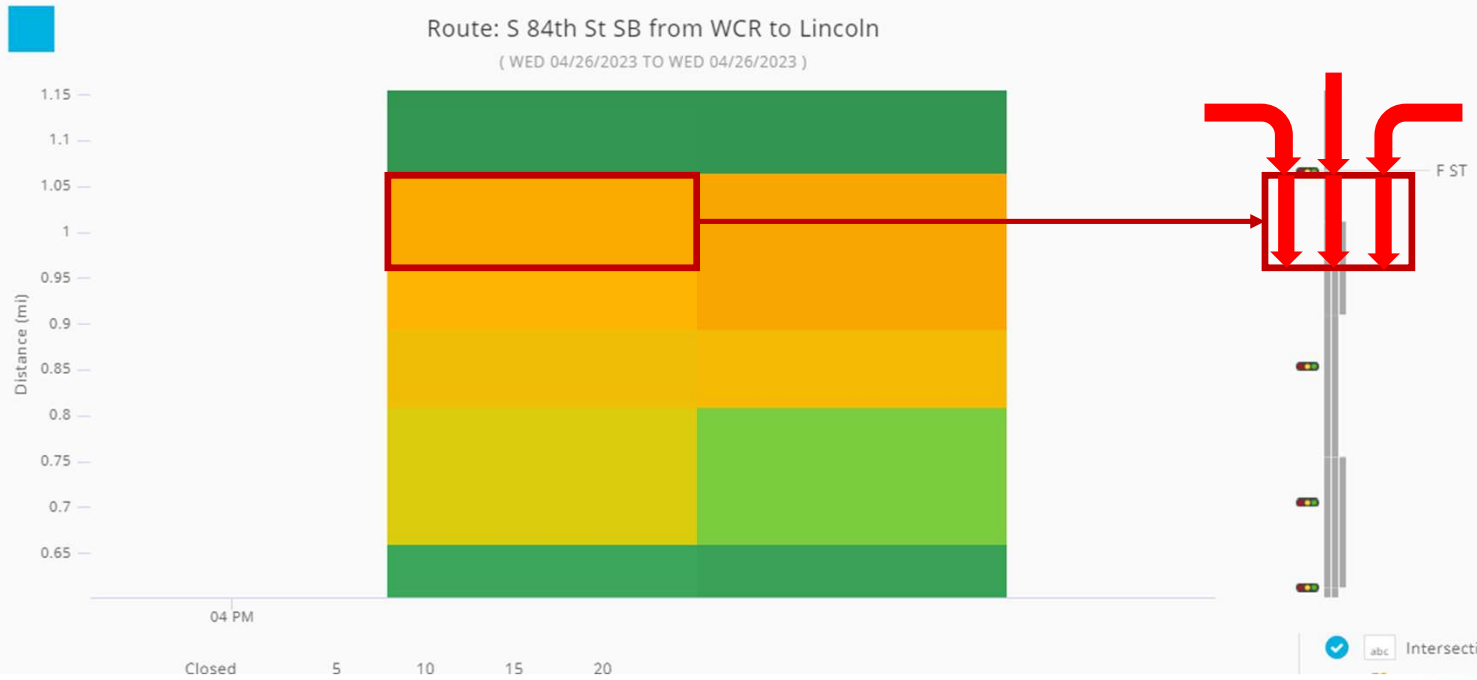
ROUTE PROPERTIES

Route ID	119
Name	S 84th St SB from WCR to Lincoln
Tags	s 84th st study
Length	5.61 mi
Average Speed Limit	40.4 mph
Time Zone	CST/CDT
Freeflow Speed	HERE
Sources	

EXITS / INTERSECTIONS

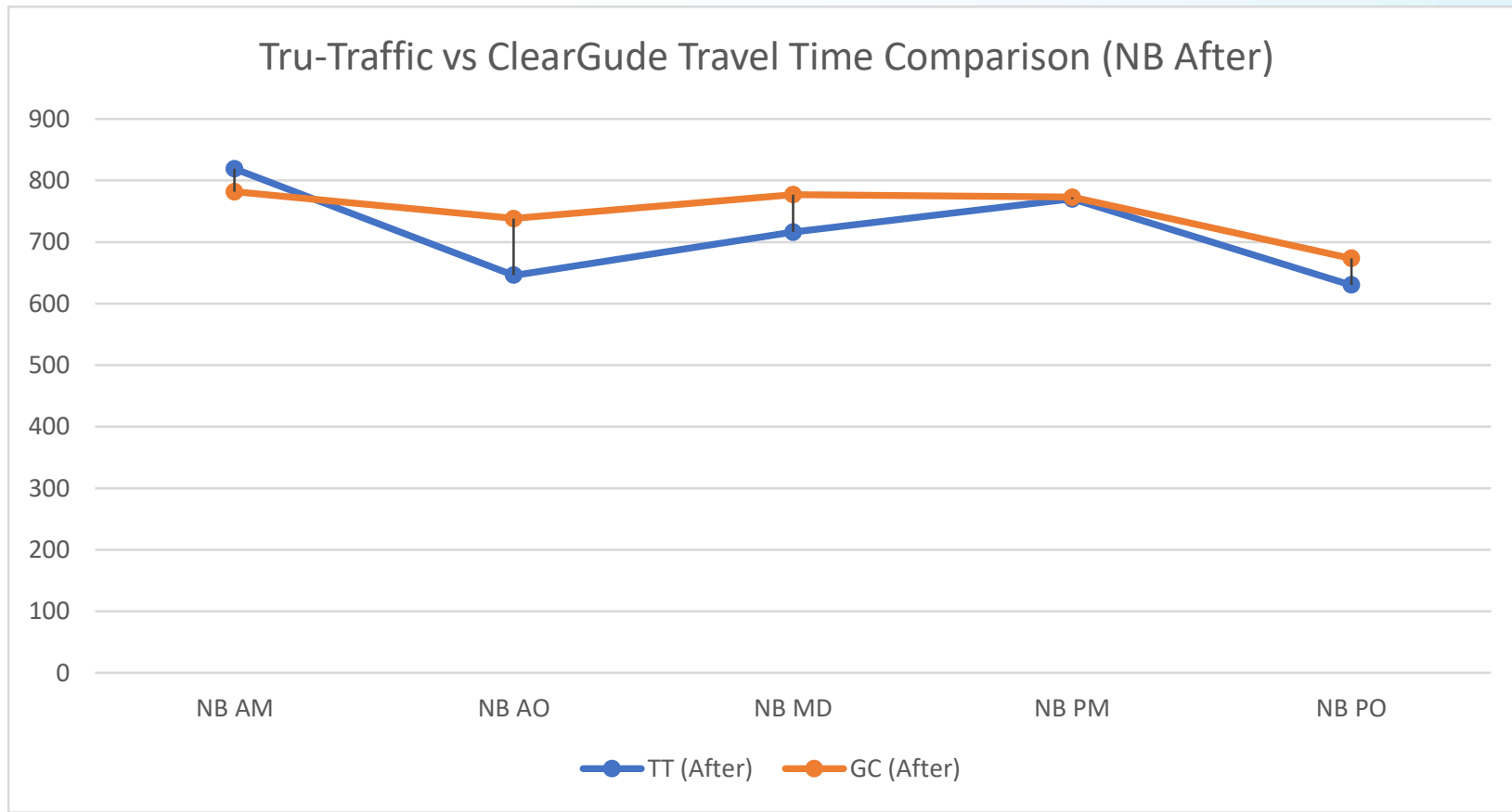
DATE RANGE: 04/26/2023 - 04/26/2023, GRANULARITY: 5 Min, METRIC: Average Speed
TIME OF DAY: All, INCLUDE DAYS: All

Show



Big Data vs. Floating Car

S 84th St





Thank You.

John Albeck, P.E., PTOE

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