Bluetooth vs. INRIX Corridor Evaluation

ITE Houston Chapter Presentation

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Land Use & Transportation

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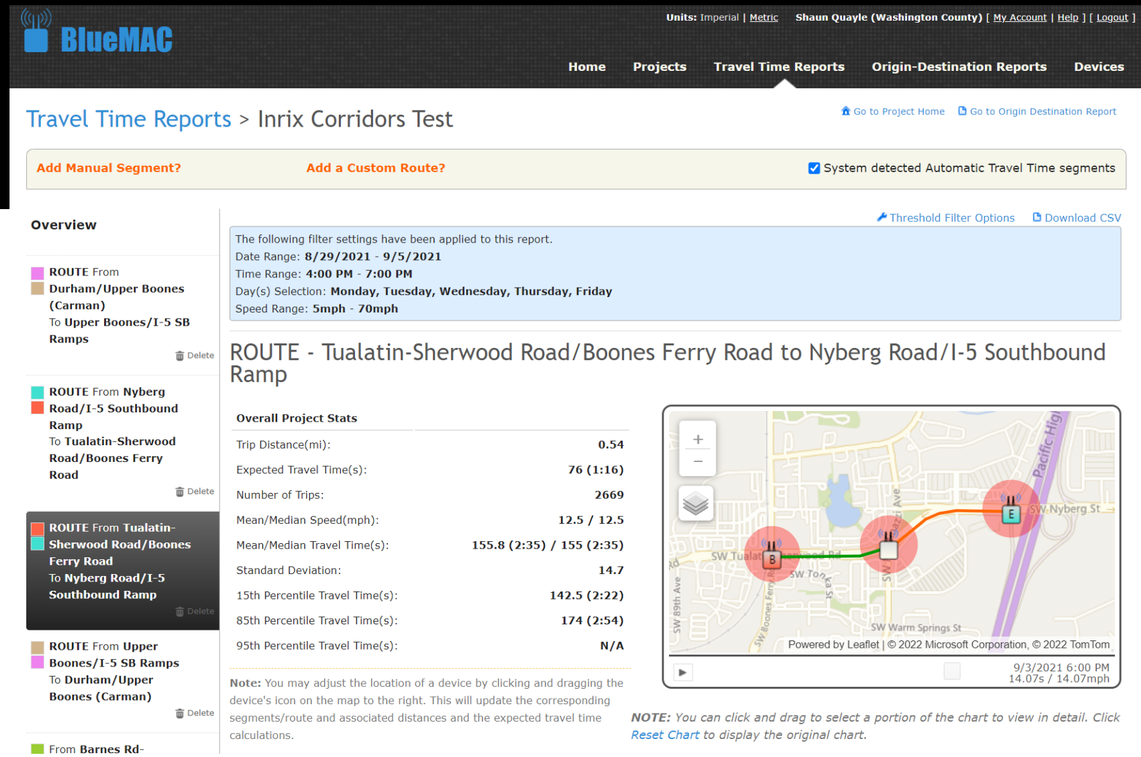
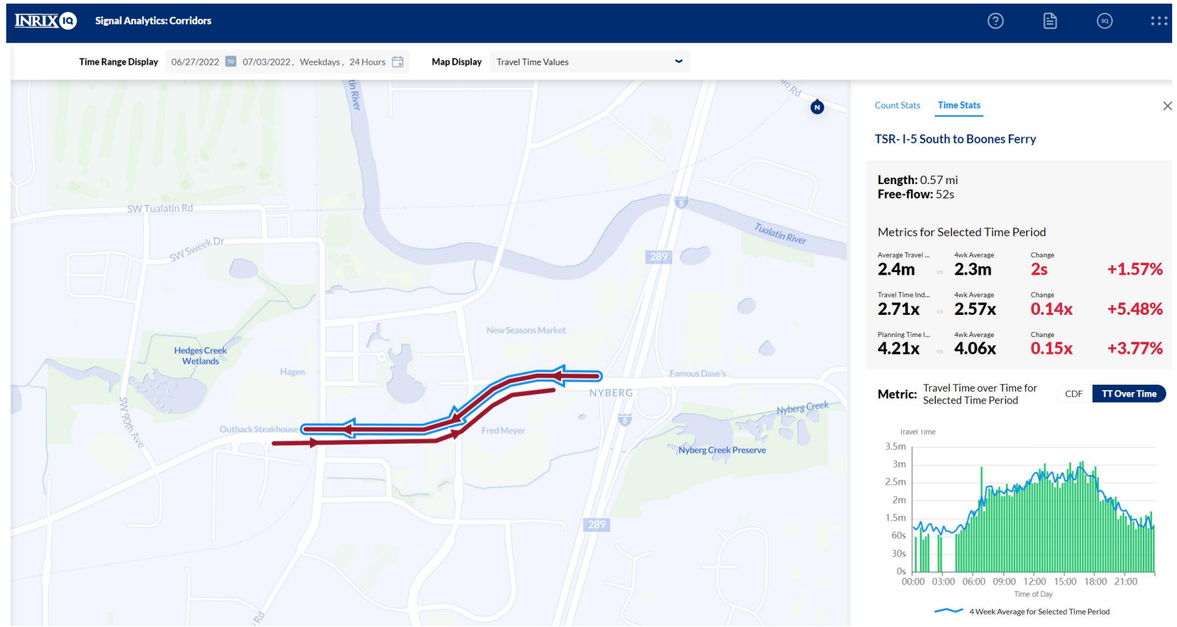
Topics

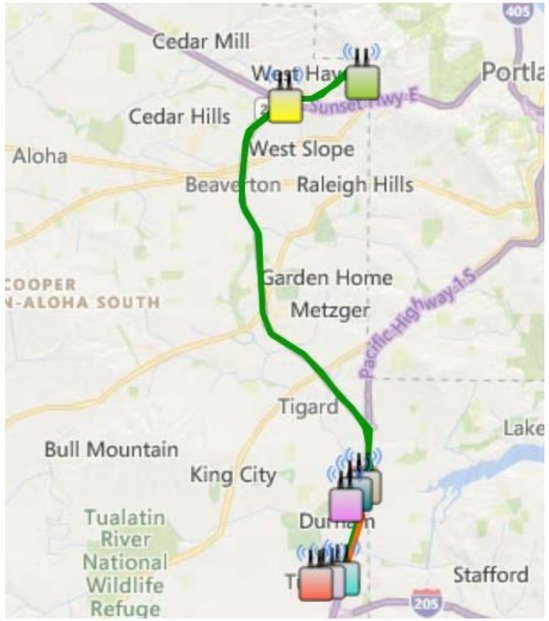
- County Backstory
- Comparison & Preliminary Results
- INRIX Software Use Case Examples
- Discussion



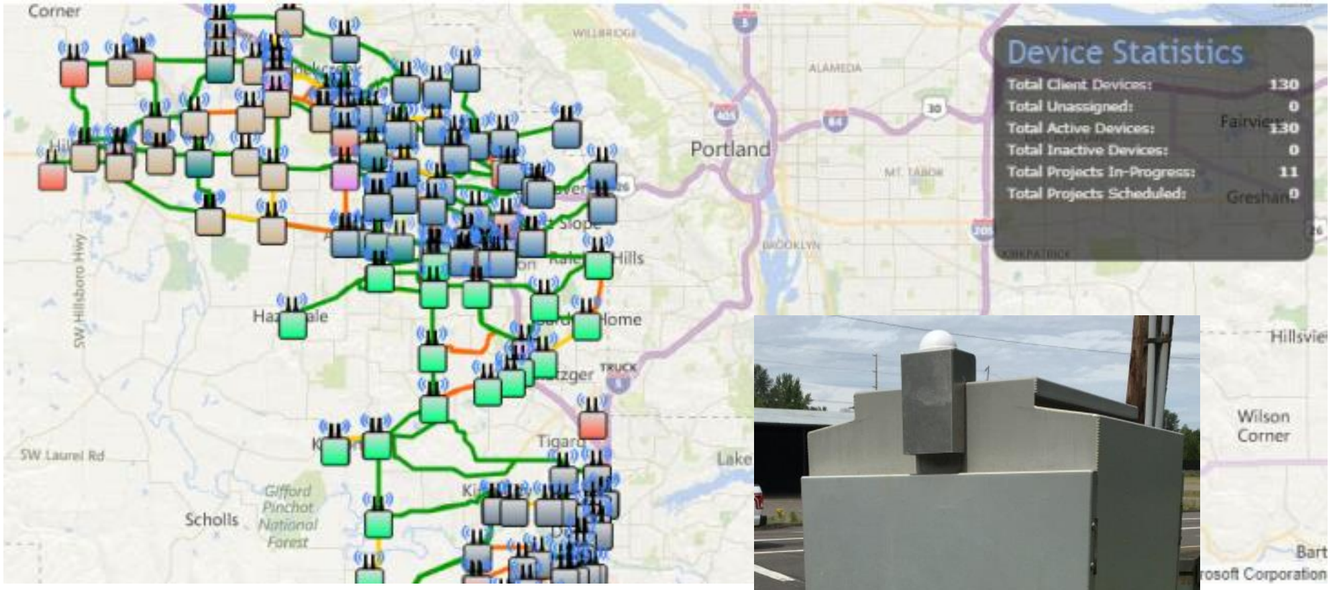


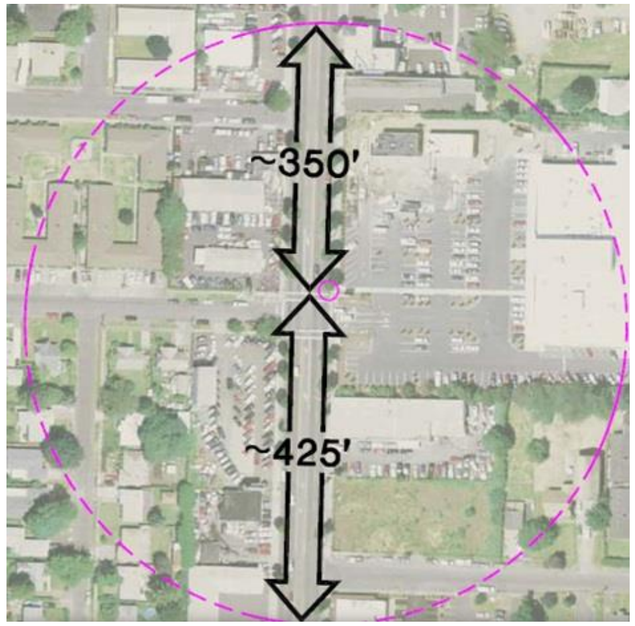
Comparison Summary

- INRIX & BlueMAC produce **similar travel time results**
  - Average < 3% when adjusting for length differences
- **INRIX reflects higher congestion values** (TTI, PTI)
  - Assumes a faster free flow value (5th %ile midnight to 6am)
- INRIX data set is **more complete**
- INRIX has **lower corridor sample size**
  - BlueMAC avg. 7%, INRIX avg. 2.5%



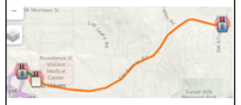
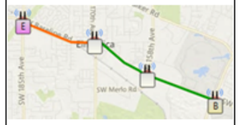
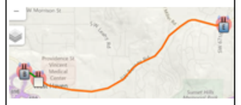
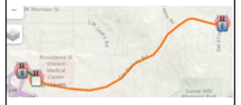
Wash Co BlueMAC Program





MAC Reader Station	Time Period		Tube Counts	MAC Address Matches between On-Ramp and Pairing Station	Vehicle Capture Rate
Brookwood Parkway Eastbound On-Ramp	AM	7 am - 9 am	727	113	16%
	Midday	12 noon - 2 pm	1,108	96	9%
	PM	4 pm - 6 pm	806	153	19%
	All Day		8,697	969	11%
185th Avenue Northbound to Eastbound On-Ramp	AM	7 am - 9 am	895	79	9%
	Midday	12 noon - 2 pm	1,775	163	9%
	PM	4 pm - 6 pm	1,508	114	8%
	All Day		12,299	1,036	8%
185th Avenue Southbound to Eastbound On-Ramp	AM	7 am - 9 am	956	103	11%
	Midday	12 noon - 2 pm	578	80	14%
	PM	4 pm - 6 pm	339	66	19%
	All Day		4,796	595	12%

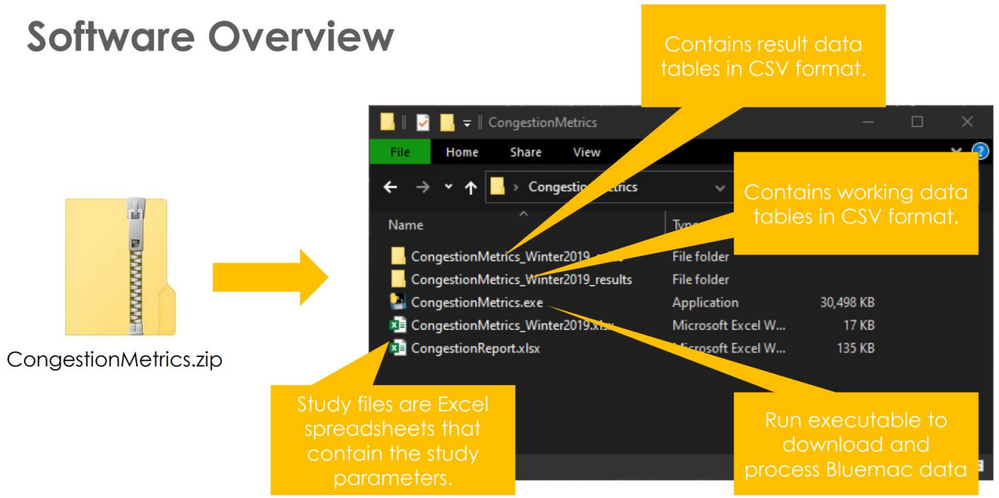
Countywide Congestion

Fall 2017 - Oct 16 to Nov 17, 2017						
Rank (1=most congested)	Corridor	Time	Congestion Score	BlueMac Estimated Data Excluded	Route Length (Miles)	Route Maps
1	EB Barnes (OR 217-Burnside)	8:00 AM	2.48	-	1.79	
2	WB Baseline-Jenkins (Murray-185th)	5:00 PM	2.46	-	2.21	
3	EB Barnes (OR 217-Burnside)	7:00 AM	2.36	-	1.79	
4	EB Barnes (OR 217-Burnside)	5:00 PM	2.33	-	1.79	
5	SB Boones Ferry (Carmen to Martinazzi)	5:00 PM	2.32	-	1.29	

	RouteID	RouteName	Time	Samples	Outliers	OutlierPercentage
2	1	EB Scholls Ferry (Tile Flat-OR 217)	1:00:00 AM	1	0	0
3	1	EB Scholls Ferry (Tile Flat-OR 217)	3:00:00 AM	1	0	0
4	1	EB Scholls Ferry (Tile Flat-OR 217)	4:00:00 AM	3	0	0
5	1	EB Scholls Ferry (Tile Flat-OR 217)	5:00:00 AM	29	2	6.9
6	1	EB Scholls Ferry (Tile Flat-OR 217)	6:00:00 AM	218	21	9.63
7	1	EB Scholls Ferry (Tile Flat-OR 217)	7:00:00 AM	344	33	9.59
8	1	EB Scholls Ferry (Tile Flat-OR 217)	8:00:00 AM	220	19	8.64
9	1	EB Scholls Ferry (Tile Flat-OR 217)	9:00:00 AM	115	10	8.7
10	1	EB Scholls Ferry (Tile Flat-OR 217)	10:00:00 AM	86	6	6.98
11	1	EB Scholls Ferry (Tile Flat-OR 217)	11:00:00 AM	116	14	12.07
12	1	EB Scholls Ferry (Tile Flat-OR 217)	12:00:00 PM	110	10	9.09
13	1	EB Scholls Ferry (Tile Flat-OR 217)	1:00:00 PM	110	12	10.91
14	1	EB Scholls Ferry (Tile Flat-OR 217)	2:00:00 PM	119	11	9.24
15	1	EB Scholls Ferry (Tile Flat-OR 217)	3:00:00 PM	162	16	9.88
16	1	EB Scholls Ferry (Tile Flat-OR 217)	4:00:00 PM	257	24	9.34
17	1	EB Scholls Ferry (Tile Flat-OR 217)	5:00:00 PM	226	17	7.52
18	1	EB Scholls Ferry (Tile Flat-OR 217)	6:00:00 PM	100	12	12
19	1	EB Scholls Ferry (Tile Flat-OR 217)	7:00:00 PM	16	1	6.25
20	1	EB Scholls Ferry (Tile Flat-OR 217)	8:00:00 PM	9	1	11.11
21	1	EB Scholls Ferry (Tile Flat-OR 217)	9:00:00 PM	4	0	0
22	1	EB Scholls Ferry (Tile Flat-OR 217)	10:00:00 PM	1	0	0
23	2	EB Farmington (209th-Murray)	12:00:00 AM	7	1	14.29
24	2	EB Farmington (209th-Murray)	1:00:00 AM	3	0	0
25	2	EB Farmington (209th-Murray)	2:00:00 AM	6	0	0
26	2	EB Farmington (209th-Murray)	3:00:00 AM	4	0	0
27	2	EB Farmington (209th-Murray)	4:00:00 AM	13	2	15.38

Automated Tool (Kittelson)

Software Overview



KITTELSON & ASSOCIATES

CENTRAL

TRAVEL TIME DATA	EB Scholls Ferry (Tile Flat-OR 217)	EB Farmington (209th-Murray)	EB Allen-Garden Home (Murray-Oleson)	WB Scholls Ferry (OR 217-Tile Flat)	WB Farmington (Murray-209th)	WB Allen-Garden Home (Oleson-Murray)	NB Murray (Scholls Ferry/TV Hwy)	NB Hall Blvd (Oleson-Allen)	NB Scholls Ferry (Hall-BH Hwy)	NB Oleson (Hall-BH
Start Location	Scholls Ferry/Tile F	Farmington/209th-	Murray Blvd at Allen	Scholls Ferry Rd at	Farmington Rd/Mu	Oleson Rd/Garden	Murray Blvd at Sch	Oleson Rd/Hall Blv	Scholls Ferry at Ha	Oleson Rd/H
End Location	Scholls Ferry Rd at	Farmington Rd/Mu	Oleson Rd/Garden	Scholls Ferry/Tile F	Farmington/209th-	Murray Blvd at Alle	Murray Blvd at TV H	Hall Blvd/Allen	Olsen-Scholls Ferr	Olsen-Schoo
Trip Distance (miles)	4.70	3.55	3.98	4.71	3.55	3.98	3.57	2.47	2.75	2.88
5:00 AM to 6:00 AM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	#N/A	#N/A	1.00
6:00 AM to 7:00 AM	1.24	1.27	1.16	1.06	1.21	1.19	1.20	#N/A	#N/A	1.10
7:00 AM to 8:00 AM	1.43	1.66	1.52	1.33	1.32	1.52	1.56	#N/A	#N/A	1.26
8:00 AM to 9:00 AM	1.38	1.60	1.38	1.35	1.30	1.46	1.45	#N/A	#N/A	1.32
9:00 AM to 10:00 AM	1.18	1.29	1.21	1.14	1.21	1.27	1.26	#N/A	#N/A	1.20
10:00 AM to 11:00 AM	1.23	1.26	1.13	1.15	1.15	1.32	1.25	#N/A	#N/A	1.16
11:00 AM to 12:00 PM	1.28	1.23	1.21	1.23	1.14	1.22	1.36	#N/A	#N/A	1.18
12:00 PM to 1:00 PM	1.26	1.31	1.27	1.26	1.21	1.38	1.35	#N/A	#N/A	1.16
1:00 PM to 2:00 PM	1.22	1.28	1.26	1.26	1.19	1.36	1.37	#N/A	#N/A	1.24
2:00 PM to 3:00 PM	1.35	1.35	1.30	1.28	1.28	1.30	1.34	#N/A	#N/A	1.29
3:00 PM to 4:00 PM	1.38	1.50	1.30	1.38	1.34	1.43	1.44	#N/A	#N/A	1.29
4:00 PM to 5:00 PM	1.52	1.47	1.37	1.47	1.37	1.43	1.47	#N/A	#N/A	1.36
5:00 PM to 6:00 PM	1.55	1.40	1.41	1.51	1.44	1.58	1.54	#N/A	#N/A	1.40
6:00 PM to 7:00 PM	1.24	1.34	1.24	1.24	1.28	1.36	1.30	#N/A	#N/A	1.22
7:00 PM to 8:00 PM	1.17	1.18	1.15	1.05	1.11	1.16	1.20	#N/A	#N/A	1.13
8:00 PM to 9:00 PM	0.97	1.14	1.19	1.01	1.08	1.38	1.09	#N/A	#N/A	1.11
AGGREGATE	20.40	21.28	20.10	19.72	19.63	21.36	21.18	0.00	0.00	19.42

Number of Observations	EB Scholls Ferry (Tile Flat-OR 217)	EB Farmington (209th-Murray)	EB Allen-Garden Home (Murray-Oleson)	WB Scholls Ferry (OR 217-Tile Flat)	WB Farmington (Murray-209th)	WB Allen-Garden Home (Oleson-Murray)	NB Murray (Scholls Ferry/TV Hwy)	NB Hall Blvd (Oleson-Allen)	NB Scholls Ferry (Hall-BH Hwy)	NB Oleson (Hall-BH
Start Location	Scholls Ferry/Tile F	Farmington/209th-	Murray Blvd at Allen	Scholls Ferry Rd at	Farmington Rd/Mu	Oleson Rd/Garden	Murray Blvd at Sch	Oleson Rd/Hall Blv	Scholls Ferry at Ha	Oleson Rd/H
End Location	Scholls Ferry Rd at	Farmington Rd/Mu	Oleson Rd/Garden	Scholls Ferry/Tile F	Farmington/209th-	Murray Blvd at Alle	Murray Blvd at TV H	Hall Blvd/Allen	Olsen-Scholls Ferr	Olsen-Schoo
Trip Distance (miles)	4.70	3.55	3.98	4.71	3.55	3.98	3.57	2.47	2.75	2.88
5:00 AM to 6:00 AM	29	67	158	34	79	51	90	0	0	55
6:00 AM to 7:00 AM	218	236	456	174	244	170	307	0	0	222
7:00 AM to 8:00 AM	344	229	732	307	358	284	553	0	0	338
8:00 AM to 9:00 AM	220	200	582	402	364	259	473	0	0	279
9:00 AM to 10:00 AM	115	139	442	315	351	218	299	0	0	215
10:00 AM to 11:00 AM	86	147	313	296	378	188	239	0	0	171
11:00 AM to 12:00 PM	116	173	380	350	402	151	239	0	0	199
12:00 PM to 1:00 PM	110	154	343	491	469	138	229	0	0	211
1:00 PM to 2:00 PM	110	129	300	404	514	149	237	0	0	221
2:00 PM to 3:00 PM	119	144	334	548	548	177	257	0	0	209
3:00 PM to 4:00 PM	162	120	315	687	698	189	256	0	0	268
4:00 PM to 5:00 PM	257	137	302	759	795	196	294	0	0	262
5:00 PM to 6:00 PM	226	146	328	698	737	244	280	0	0	253
6:00 PM to 7:00 PM	100	95	204	600	591	136	180	0	0	213
7:00 PM to 8:00 PM	16	59	138	268	369	64	134	0	0	114
8:00 PM to 9:00 PM	9	38	56	165	242	43	74	0	0	90
AGGREGATE	2237	2213	5363	6498	7137	2657	4141	0	0	3320

SEGMENT RANKING BY HOUR CONGESTION SCORE

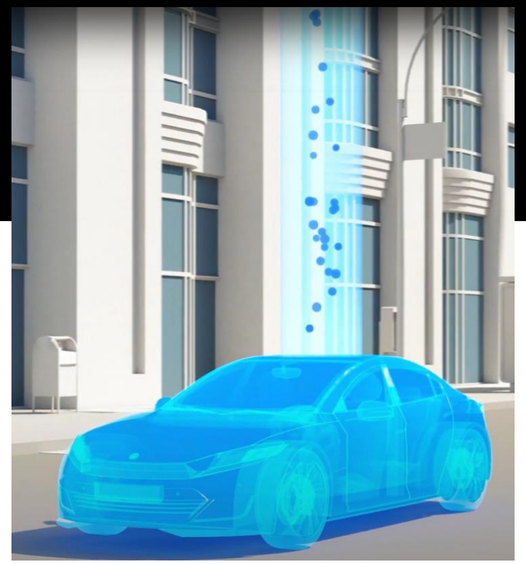
RANK	ROUTE	HOUR	SCORE
1	WB Scholls Ferry (OR 217-Tile Flat)	3:00 PM to 4:00 PM	2.58
2	EB Barnes (OR 217-Burnside)	11:00 PM to 12:00 AM	2.53
2	NB 1st/Glencoe (Main-Evergreen)	11:00 PM to 12:00 AM	2.53
4	WB TV Hwy (185th-Oak)	12:00 AM to 1:00 PM	2.51
5	NB 1st/Glencoe (Main-Evergreen)	12:00 AM to 1:00 PM	2.46
6	WB Canyon (Camelot-OR 217S)	1:00 PM to 2:00 PM	2.26
7	EB Barnes (OR 217-Burnside)	7:00 AM to 8:00 AM	2.17
8	EB Barnes (OR 217-Burnside)	2:00 PM to 3:00 PM	2.15
9	SB 158th-Merlo (Cornell-170th)	12:00 AM to 1:00 PM	2.14
10	SB Oleson Rd (BH Hwy-Hall)	11:00 PM to 12:00 AM	2.08
11	SB Scholls Ferry (BH Hwy-Hall)	5:00 PM to 6:00 PM	2.05
12	EB Barnes (OR 217-Burnside)	12:00 PM to 1:00 PM	2.03
13	EB Evergreen (CornPass-Cornell)	9:00 PM to 10:00 PM	2.02
14	EB Barnes (OR 217-Burnside)	5:00 PM to 6:00 PM	2.01
15	SB Cedar Hills (Cornell-Canyon)	8:00 AM to 9:00 AM	2.00
16	EB Barnes (OR 217-Burnside)	8:00 PM to 9:00 PM	1.98
17	EB Barnes (OR 217-Burnside)	6:00 PM to 7:00 PM	1.97
18	SB Scholls Ferry (BH Hwy-Hall)	7:00 AM to 8:00 AM	1.96
19	WB Cornell (158th-185th)	10:00 PM to 11:00 PM	1.95
19	WB Barnes (Burnside-OR 217)	11:00 PM to 12:00 AM	1.95
21	EB Barnes (OR 217-Burnside)	4:00 PM to 5:00 PM	1.94
22	WB Baseline-Jenkins (Murray-185th)	5:00 PM to 6:00 PM	1.93
22	EB Barnes (OR 217-Burnside)	8:00 AM to 9:00 AM	1.93
24	SB Cedar Hills (Cornell-Canyon)	7:00 AM to 8:00 AM	1.92
24	EB Barnes (OR 217-Burnside)	11:00 AM to 12:00 PM	1.92
26	EB Barnes (OR 217-Burnside)	6:00 AM to 7:00 AM	1.89
26	WB Evergreen (Cornell-CornPass)	5:00 PM to 6:00 PM	1.89
29	WB Canyon (Camelot-OR 217S)	2:00 PM to 3:00 PM	1.88
29	EB Evergreen (CornPass-Cornell)	5:00 PM to 6:00 PM	1.88
29	EB Barnes (OR 217-Burnside)	3:00 PM to 4:00 PM	1.88
31	NB Barnes-Saltzman (OR 217S-Thompson)	5:00 PM to 6:00 PM	1.87
31	EB Barnes (OR 217-Burnside)	10:00 AM to 11:00 AM	1.87
34	EB Durham (Hall to 1-5SB at Bridgeport)	2:00 PM to 3:00 PM	1.84
34	EB Farmington-BH Hwy (Cedar Hills-Oleson)	5:00 PM to 6:00 PM	1.84
34	EB TV Hwy (Murray-OR 217)	7:00 AM to 8:00 AM	1.84
34	EB Durham (Hall to 1-5SB at Bridgeport)	7:00 AM to 8:00 AM	1.84
38	WB Canyon (Camelot-OR 217S)	4:00 PM to 5:00 PM	1.83
38	EB Barnes (OR 217-Burnside)	9:00 AM to 10:00 AM	1.83
38	EB Durham (Hall to 1-5SB at Bridgeport)	8:00 AM to 9:00 AM	1.83
40	EB Barnes (OR 217-Burnside)	1:00 PM to 2:00 PM	1.82
41	NB 185th (TV Hwy/US 26)	7:00 AM to 8:00 AM	1.80
41	EB Barnes (OR 217-Burnside)	10:00 PM to 11:00 PM	1.80
44	SB Scholls Ferry (BH Hwy-Hall)	4:00 PM to 5:00 PM	1.79
44	EB Durham (Hall to 1-5SB at Bridgeport)	5:00 PM to 6:00 PM	1.79
44	WB Scholls Ferry (OR 217-Tile Flat)	5:00 PM to 6:00 PM	1.79
46	NB Murray (Scholls Ferry/TV Hwy)	5:00 PM to 6:00 PM	1.78
46	NB Barnes-Saltzman (OR 217S-Thompson)	8:00 AM to 9:00 AM	1.78
48	WB TV Hwy (OR 217S-Murray)	5:00 PM to 6:00 PM	1.77
51	EB Evergreen (Glencoe-CornPass)	8:00 AM to 9:00 AM	1.76

ROUTE RANKING BY AGGREGATE CONGESTION SCORE

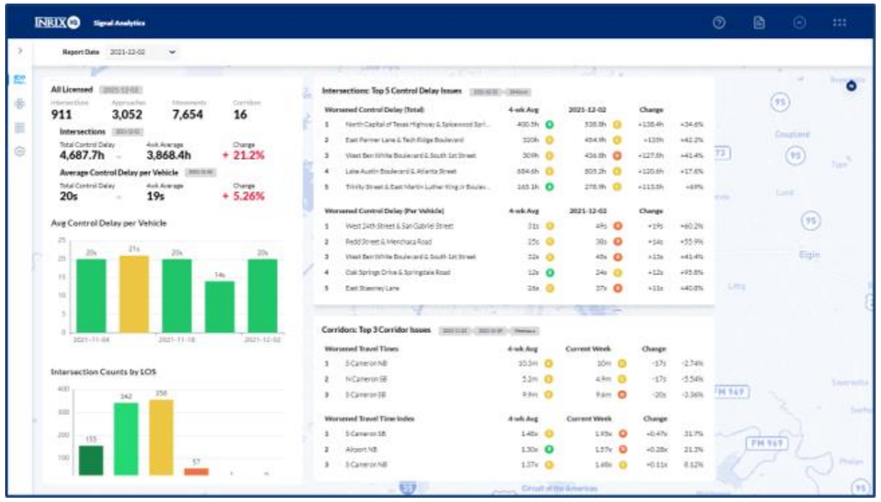
RANK	ROUTE	SCORE
1	EB Barnes (OR 217-Burnside)	29.66
2	EB Durham (Hall to 1-5SB at Bridgeport)	24.47
3	NB Barnes-Saltzman (OR 217S-Thompson)	24.44
4	SB Cedar Hills (Cornell-Canyon)	24.35
5	SB Scholls Ferry (BH Hwy-Hall)	24.27
6	NB Murray (Scholls Ferry/TV Hwy)	23.96
7	EB TV Hwy (Murray-OR 217)	23.73
8	SB Boones Ferry (Tualatin-Ibach)	23.64
9	EB Farmington-BH Hwy (Cedar Hills-Oleson)	23.23
10	EB Evergreen (CornPass-Cornell)	23.17
11	NB Boones Ferry (Martinazzi to I-5SB)	23.10
11	NB Boones Ferry (Martinazzi-Carman)	23.10
13	NB 185th (TV Hwy/US 26)	23.08
14	WB Evergreen (Cornell-CornPass)	22.77
15	EB Herman-Tualatin (124th-Boones)	22.51
16	EB Evergreen (Glencoe-CornPass)	22.47
17	SB Murray (TV Hwy/Scholls)	22.43
18	WB Cornell (158th-185th)	22.36
19	WB Baseline-Jenkins (Murray-185th)	22.33
20	WB Cornell (Miller-143rd)	22.32
21	EB Allen-Garden Home (Murray-Oleson)	22.27
22	SB Boones Ferry (Carman-Martinazzi)	22.14
23	EB Cornell (Main-185th)	21.96
24	EB Cornell (185th-158th)	21.96
25	EB West Union-Thompson (185th-Saltzman)	21.95
26	EB Cornell (143rd-Miller)	21.73
27	WB Scholls Ferry (OR 217-Tile Flat)	21.72
28	WB TV Hwy (OR 217S-Murray)	21.56
29	NB Murray (TV Hwy-Cornell)	21.55
30	EB Tualatin-Sherwood (Langer Pkwy to I-5NB)	21.35
31	SB Saltzman-Barnes (Thompson-OR 217)	21.29
32	SB Murray (Cornell-TV Hwy)	21.24
33	SB Brookwood (US 26-TV Hwy)	21.05
34	WB Farmington-BH Hwy (Oleson-Cedar Hills)	20.72
35	WB Tualatin-Herman (Boones-124th)	20.61
36	NB Boones Ferry (Ibach-Tualatin)	20.54
37	EB Farmington (209th-Murray)	20.41
38	WB Baseline/Main (185th-Cornell)	20.33
39	WB Barnes (Burnside-OR 217)	20.25
40	WB Walker Rd (OR 217-185th)	20.06
41	NB Cornelius Pass (TV Hwy/US 26)	19.83
42	NB OR 99W (Tualatin-Sherwood-Durham)	19.78
42	SB OR 99W (Durham to Tualatin-Sherwood)	19.78
44	NB 1st/Glencoe (Main-Evergreen)	19.57
45	WB Farmington (Murray-209th)	19.52
46	WB Cornell (185th-Main)	19.48
47	NB Oleson Rd (Hall-BH Hwy)	19.42
48	EB Walker Rd (185th-OR 217)	19.26
49	WB Allen-Garden Home (Oleson-Murray)	19.17

Ranking | CongestionScore | data_score_hourly | data_hourly_rank | data_agg_rank | data_outlier | ref

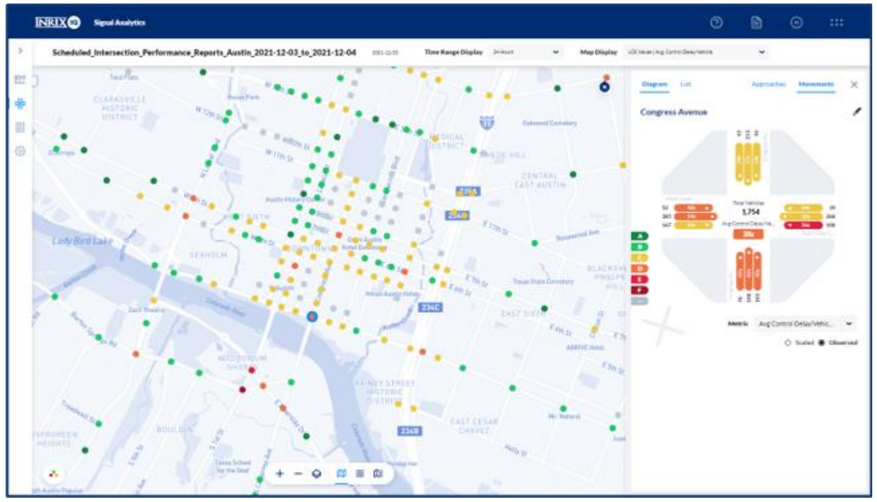
Signal Analytics

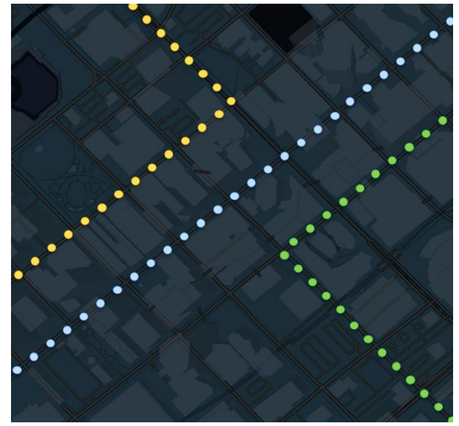


DASHBOARD

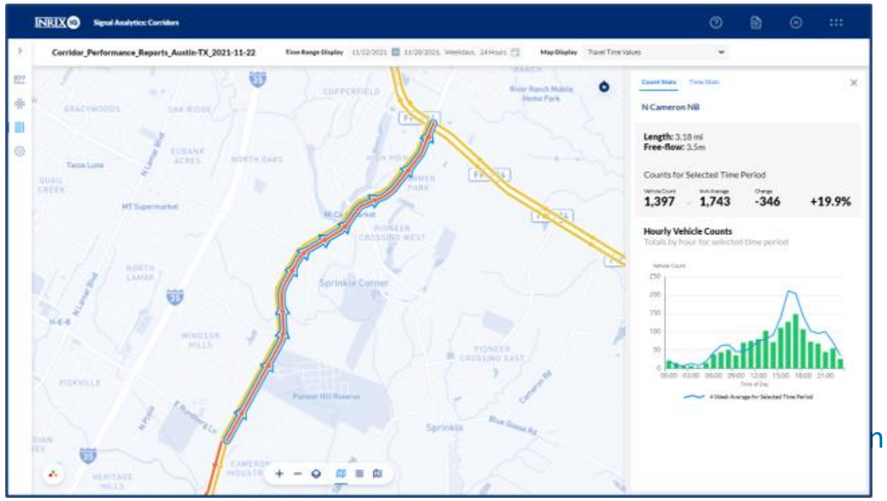


INTERSECTION ANALYTICS

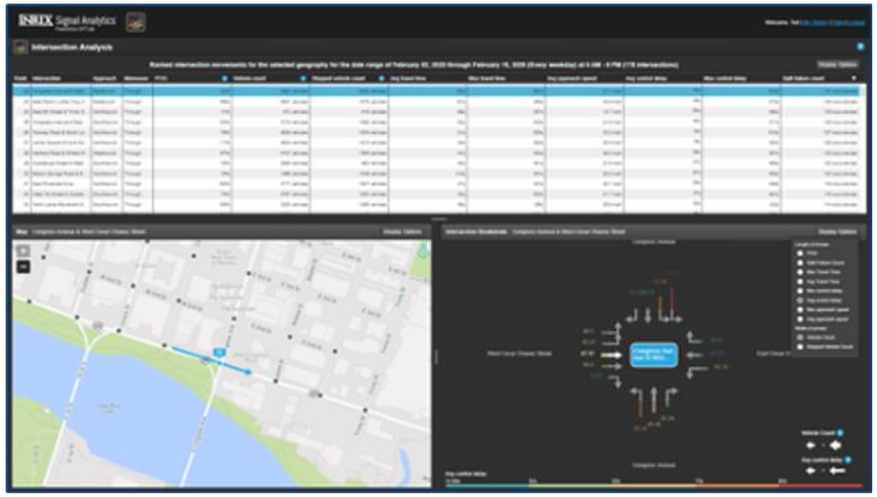


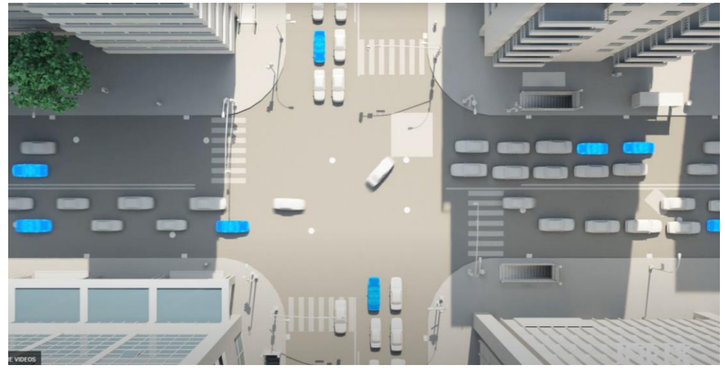


CORRIDOR ANALYTICS

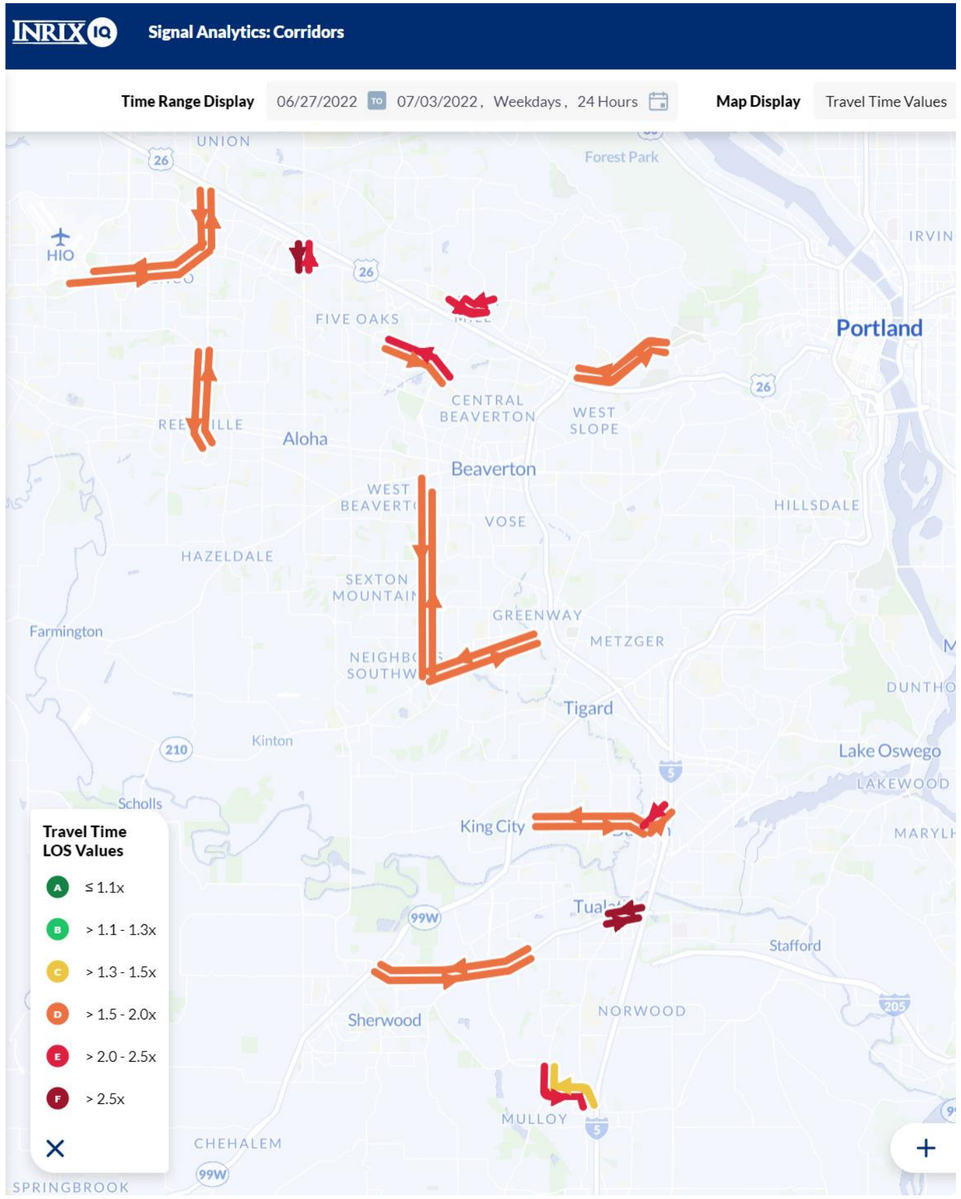


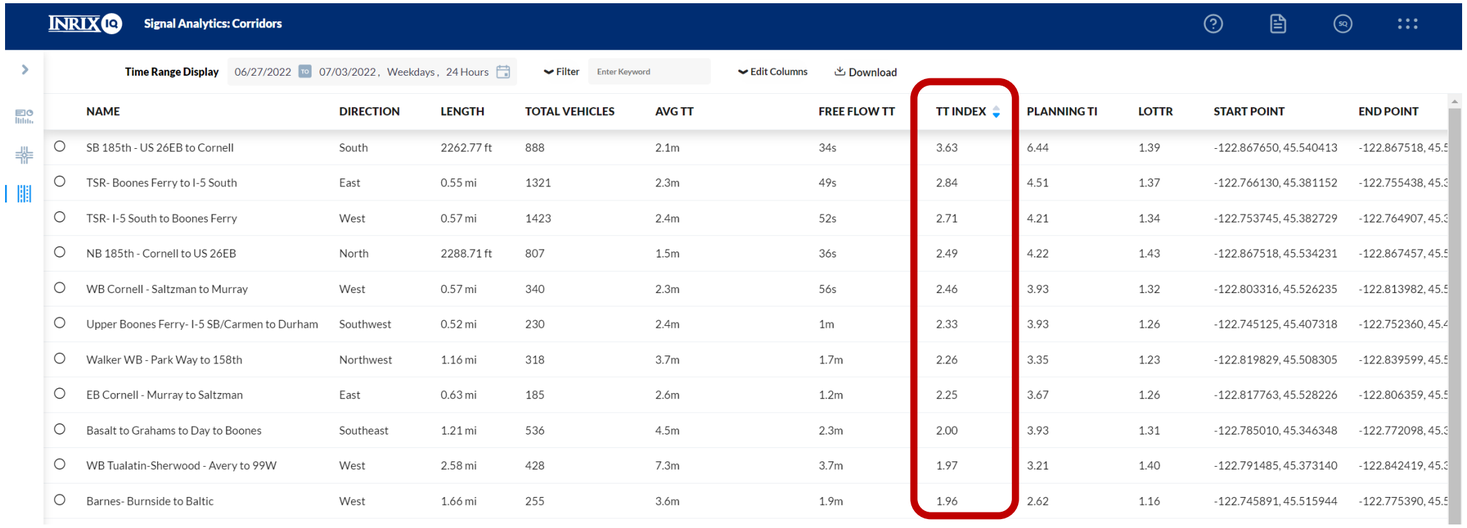
CUSTOM REPORTS



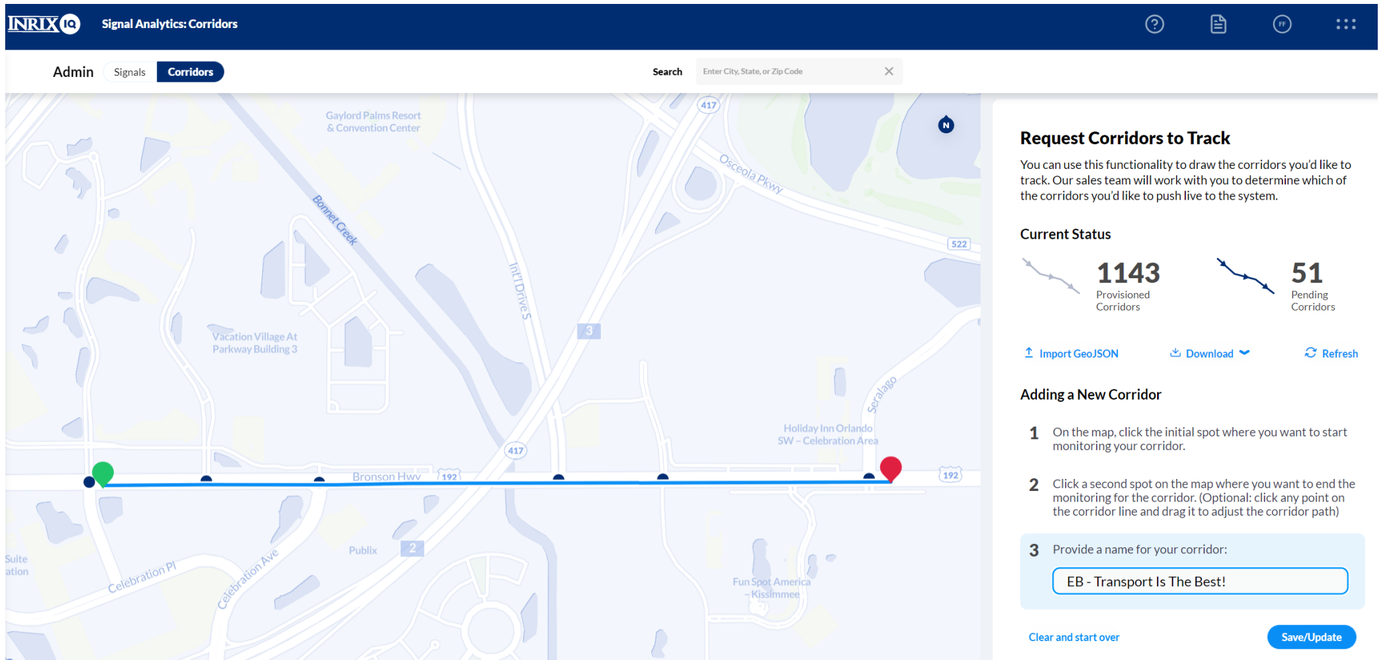


Corridor Analytics





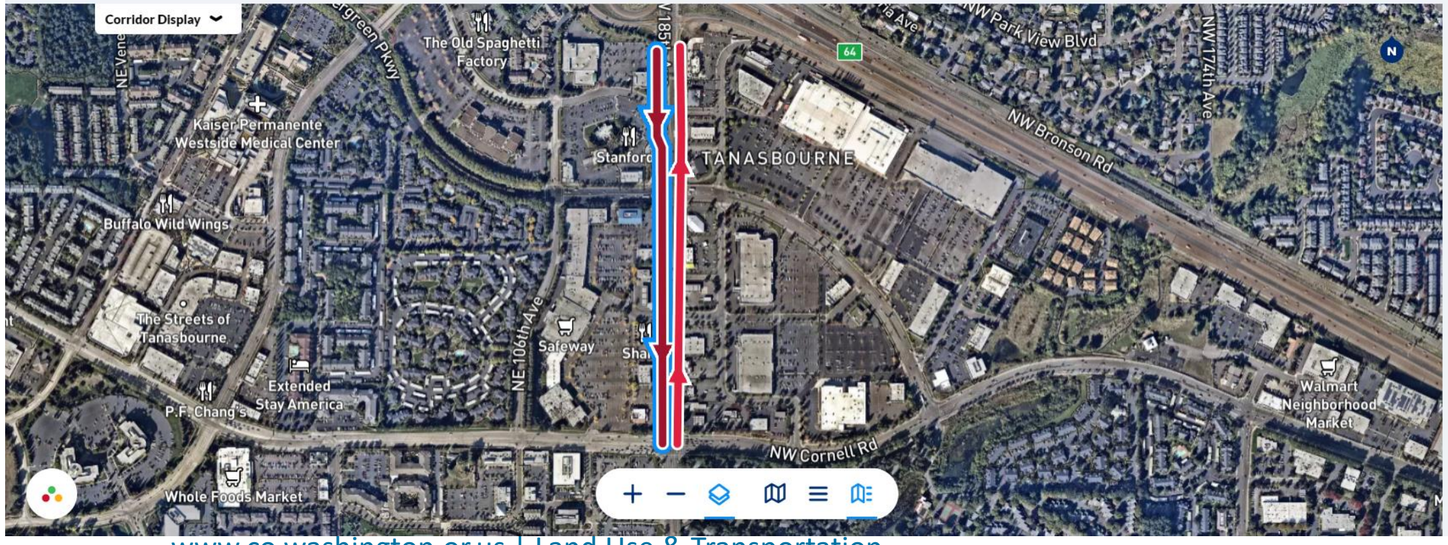
NAME	DIRECTION	LENGTH	TOTAL VEHICLES	AVG TT	FREE FLOW TT	TT INDEX	PLANNING TI	LOTTR	START POINT	END POINT
SB 185th - US 26EB to Cornell	South	2262.77 ft	888	2.1m	34s	3.63	6.44	1.39	-122.867650, 45.540413	-122.867518, 45.5
TSR- Boones Ferry to I-5 South	East	0.55 mi	1321	2.3m	49s	2.84	4.51	1.37	-122.766130, 45.381152	-122.755438, 45.3
TSR- I-5 South to Boones Ferry	West	0.57 mi	1423	2.4m	52s	2.71	4.21	1.34	-122.753745, 45.382729	-122.764907, 45.3
NB 185th - Cornell to US 26EB	North	2288.71 ft	807	1.5m	36s	2.49	4.22	1.43	-122.867518, 45.534231	-122.867457, 45.5
WB Cornell - Saltzman to Murray	West	0.57 mi	340	2.3m	56s	2.46	3.93	1.32	-122.803316, 45.526235	-122.813982, 45.5
Upper Boones Ferry- I-5 SB/Carmen to Durham	Southwest	0.52 mi	230	2.4m	1m	2.33	3.93	1.26	-122.745125, 45.407318	-122.752360, 45.4
Walker WB - Park Way to 158th	Northwest	1.16 mi	318	3.7m	1.7m	2.26	3.35	1.23	-122.819829, 45.508305	-122.839599, 45.5
EB Cornell - Murray to Saltzman	East	0.63 mi	185	2.6m	1.2m	2.25	3.67	1.26	-122.817763, 45.528226	-122.806359, 45.5
Basalt to Grahams to Day to Boones	Southeast	1.21 mi	536	4.5m	2.3m	2.00	3.93	1.31	-122.785010, 45.346348	-122.772098, 45.3
WB Tualatin-Sherwood - Avery to 99W	West	2.58 mi	428	7.3m	3.7m	1.97	3.21	1.40	-122.791485, 45.373140	-122.842419, 45.3
Barnes- Burnside to Baltic	West	1.66 mi	255	3.6m	1.9m	1.96	2.62	1.16	-122.745891, 45.515944	-122.775390, 45.5



Corridor Analytics

Time Range Display 06/27/2022 TO 07/03/2022, Weekdays, 24 Hours | Filter | Enter Keyword | Edit Columns | Download

	NAME	DIRECTION	LENGTH	TOTAL VEHICLES	AVG TT	FREE FLOW TT	TT INDEX
◉	SB 185th - US 26EB to Cornell	South	2262.77 ft	888	2.1m	34s	3.63
○	TSR- Boones Ferry to I-5 South	East	0.55 mi	1321	2.3m	49s	2.84
○	TSR- I-5 South to Boones Ferry	West	0.57 mi	1423	2.4m	52s	2.71
○	NB 185th - Cornell to US 26EB	North	2288.71 ft	807	1.5m	36s	2.49
○	WB Cornell - Saltzman to Murray	West	0.57 mi	340	2.3m	56s	2.46
○	Upper Boones Ferry- I-5 SB/Carmen to Durham	Southwest	0.52 mi	230	2.4m	1m	2.33
○	Walker WB - Park Way to 158th	Northwest	1.16 mi	318	3.7m	1.7m	2.26
○	EB Cornell - Murray to Saltzman	East	0.63 mi	185	2.6m	1.2m	2.25
○	Basalt to Grahams to Day to Boones	Southeast	1.21 mi	536	4.5m	2.3m	2.00



Count Stats | Time Stats

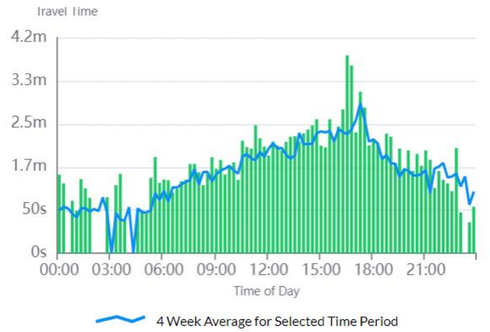
SB 185th - US 26EB to Cornell

Length: 2262.77 ft
Free-flow: 34s

Metrics for Selected Time Period

Average Travel ...	4wk Average	Change		
2.1m	1.8m	13s	+12.1%	
Travel Time Ind...	4wk Average	Change		
3.63x	3.13x	0.51x	+16.2%	
Planning Time I...	4wk Average	Change		
6.44x	5.62x	0.82x	+14.5%	

Metric: Travel Time over Time for Selected Time Period | CDF | **TT Over Time**



Count Stats | Time Stats

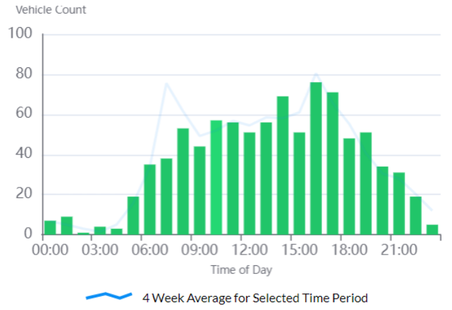
SB 185th - US 26EB to Cornell

Length: 2262.77 ft
Free-flow: 34s

Counts for Selected Time Period

Vehicle Count	4wk Average	Change	
888	931	-43	+4.59%

Hourly Vehicle Counts
Totals by hour for selected time period



Draft Comparison Analysis

- Overlapping 13 Corridors, 26 Routes
- March 21-25, 2022; PM Peak (4pm-7pm)
- Compare BlueMAC vs. INRIX
  - Route Length
  - Sample Size
  - Average Travel Time
  - Travel Time Reliability (TTI, PTI)

LAND USE & TRANSPORTATION MEMORANDUM

Engineering, Traffic and Survey

To: Matt Dorado
From: McKenzie Traetow and Cadell Chand
Date: July 11, 2022
Subject: BlueMAC Metrics and INRIX Metrics Comparison

Introduction

This memorandum summarizes a comparative evaluation of BlueMAC and INRIX travel time data. BlueMAC is a platform that manages data collected from roadside Bluetooth readers. While the data includes only a sample of all traffic (only vehicles with discoverable Bluetooth are recorded[1]), traffic metrics such as travel time, reliability, average speed, and origin-destinations may still be derived. These Bluetooth metrics are often considered reliable representations of ground-truth accuracy & used to evaluate cloud-based probe data source accuracy, like INRIX[2]. INRIX collects similar data but does not rely on roadside sensors. Instead, INRIX is "a cloud-based analytics application that uses connected vehicle data…"[3]. INRIX collects waypoint data for corridors at a frequency of less than 45 seconds per vehicle and interpolates to provide trajectories and travel times.

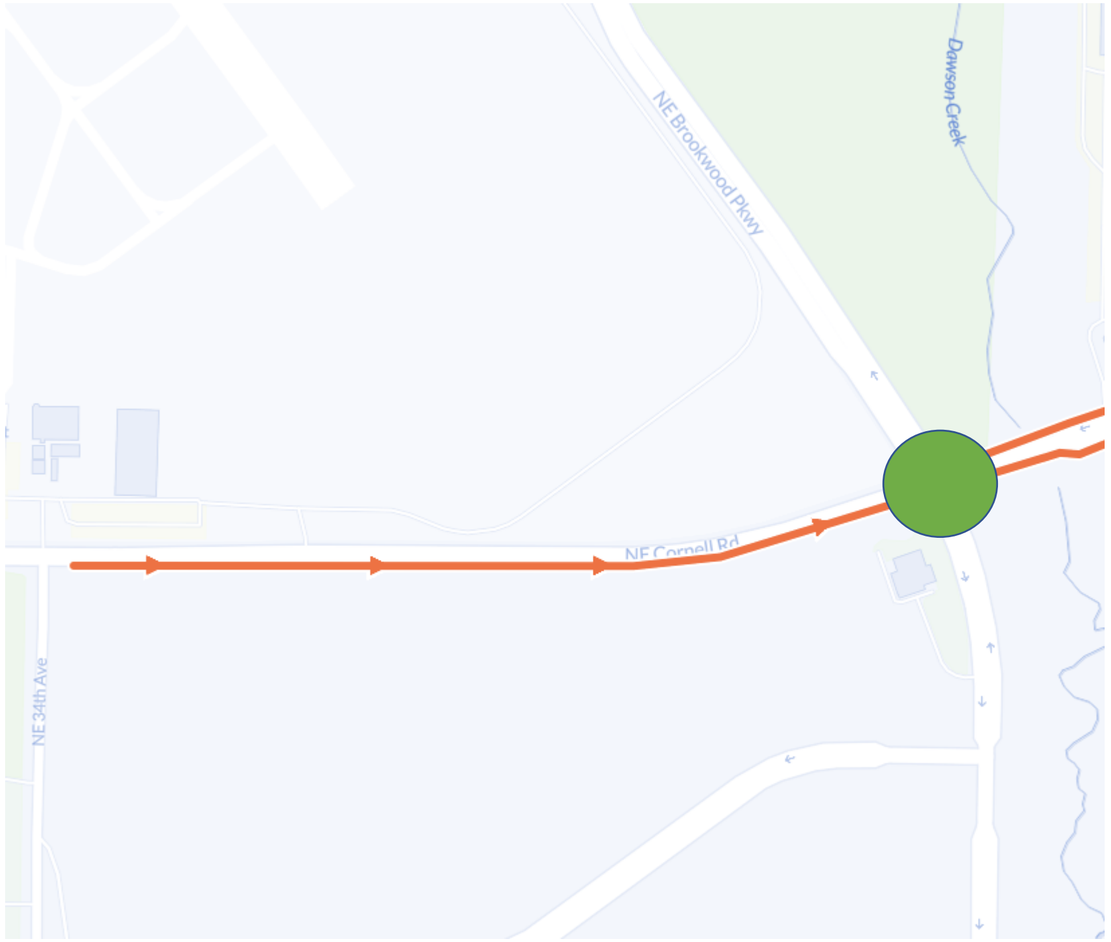
This comparative evaluation included corridor dimensions, sample sizes, average travel time, travel time index (average travel time/free flow travel time) and planning time index (95th percentile travel time/free flow travel time). The comparisons were made at both the overall network and individual route level. Data were collected during the PM peak (4:00pm to 7:00pm) on weekdays from March 21-25, 2022. Additionally, data from weekends and major holidays were not considered in the comparison. It should be noted that the study period was Spring Break for many schools in Oregon, which could potentially result in atypical traffic patterns observed. However, because data from both BlueMAC and INRIX were drawn from the same date and time periods, this should not impact the validity of general trends and comparisons derived between the two datasets.

20 of 26 routes in BlueMAC and INRIX had similar lengths (less than 6% difference). Differences in route lengths could have been due to different start and end points in INRIX. BlueMAC and INRIX routes had similar average travel times, with an average difference of 2.7% amongst all routes evaluated. 23 of 26 routes had a larger sample size in BlueMAC, with BlueMAC traversal count having captured about 7% of the point-based ADT; and INRIX traversal count having captured about 2% of the point-based ADT. Finally, there were large differences in the congestion scores and the planning time index with INRIX estimating greater congestion than BlueMAC. This was due to the different definitions of free flow in BlueMAC and INRIX.

Route Length

TABLE 1: INRIX VERSUS BLUEMAC ROUTE LENGTH COMPARISON					
Route Name	Dir.	Route Length (Miles)			Percent Difference
		Measured	INRIX	BlueMAC	
185th Cornell to US 26	NB	0.5	0.43	0.45	3.8%
	SB	0.5	0.43	0.44	2.7%
Barnes Baltic to Burnside	EB	1.7	1.66	1.67	0.5%
	WB	1.7	1.66	1.67	0.6%
Cornelius Pass Blanton to Baseline	NB	1.6	1.61	1.62	0.6%
	SB	1.6	1.58	1.57	0.6%[1]
Cornelius Pass Cornell to US 26	NB	0.9	0.91	0.91	0.5%
	SB	0.9	0.94	0.93	0.6%
Cornell Brookwood to Cornelius Pass	EB	2.0	2.42	2.01	17.0%[2]
	WB	2.0	2.01	2.01	0.0%[2]
Cornell Murray to Saltzman	EB	0.4	0.63	0.41	35.1%[2]
	WB	0.4	0.57	0.41	27.8%[2]
Durham 108th to Upper Boones	EB	1.8	1.84	1.75	5.1%[2]
	WB	1.8	1.84	1.75	5.0%[2]
Tualatin-Sherwood 99W to Avery	EB	2.6	2.58	2.59	0.5%[2]
	WB	2.6	2.58	2.59	0.5%[2]
Tualatin-Sherwood Boones Ferry to I-5 SB	EB	0.5	0.55	0.54	1.2%
	WB	0.5	0.57	0.57	0.1%
Murray 6th to Scholls Ferry	NB	3.0	3.00	3.30	10.0%[2]
	SB	3.0	3.26	3.28	0.5%[2]
Upper Boones Ferry Durham to I-5 SB/Carmen	NB	0.5	0.51	0.51	0.3%
	SB	0.5	0.52	0.51	1.0%
Scholls Ferry Murray to Nimbus	EB	1.9	1.89	1.88	0.5%
	WB	1.9	1.85	1.88	1.5%
Walker 158th to Park Way	EB	1.2	1.16	0.97	16.5%
	WB	1.2	1.16	0.97	16.3%

[1] Unknown reason for BlueMAC route length underestimation
[2] INRIX route extents are before or after the center of starting or ending intersections



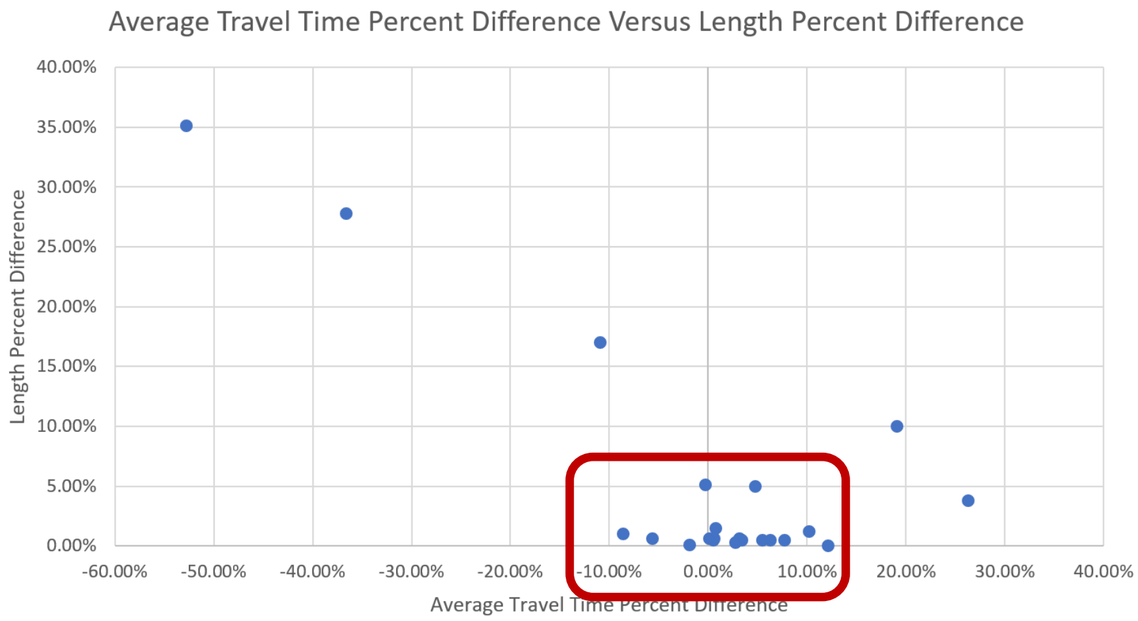
Traversal Count to Point ADT

TABLE 2: RATIO OF PROBE TRAVERSAL COUNT TO POINT-BASED TUBE COUNT FOR BLUEMAC AND INRIX			
Route	**Dir.**	**BlueMAC**	**INRIX**
185th Cornell to US 26[1]	NB	1.9%	8.0%
Barnes Baltic to Burnside	EB	12.1%	2.5%
	WB	10.4%	4.1%
Cornelius Pass Blanton to Baseline	NB	2.4%	1.3%
	SB	3.8%	2.6%
Cornelius Pass Cornell to US 26	SB	1.9%	1.6%
Cornell Brookwood to Cornelius Pass[2]	EB	4.3%	2.2%
	WB	6.7%	2.3%
Cornell Murray to Saltzman[2]	EB	27.0%	2.0%
	WB	26.4%	3.6%
Tualatin-Sherwood 99W to Avery[2]	EB	4.5%	2.4%
	WB	7.2%	2.7%
Tualatin-Sherwood Boones Ferry to I-5 SB	EB	13.3%	0.5%
	WB	15.6%	5.5%
Murray 6th to Scholls Ferry[2]	NB	3.7%	2.1%
	SB	3.2%	2.3%
Scholls Ferry Murray to Nimbus	EB	9.5%	5.2%
	WB	9.4%	5.5%
	Average % of ADT:	6.8%	2.4%

[1]Not enough data from BlueMAC for selected time period to evaluate SB metrics
[2]INRIX route extents are before or after the center of the starting or ending intersection

Average Travel Time

TABLE 4: INRIX VERSUS BLUEMAC AVERAGE TRAVEL TIME COMPARISON					
Route Name	Dir.	BlueMAC Avg. TT (Min)	INRIX Avg. TT (Min)	Avg. TT Percent Difference	Length Percent Difference
185th Cornell to US 26	NB	2.44	1.80	26.3%	3.8%
Barnes Baltic to Burnside	EB	3.52	3.50	0.5%	0.5%
	WB	3.52	3.50	0.6%	0.6%
Cornelius Pass Blanton to Baseline	NB	4.81	4.80	0.1%	0.6%
	SB	4.65	4.50	3.2%	0.6%
Cornelius Pass Cornell to US 26	SB	2.56	2.70	-5.6%	0.6%
Cornell Brookwood to Cornelius Pass	EB	4.69	5.20	-10.9%	17.0%
	WB	5.34	4.70	12.1%	0.0%
Cornell Murray to Saltzman	EB	1.64	2.50	-52.8%	35.1%
	WB	1.54	2.10	-36.6%	27.8%
Durham 108th to Upper Boones	EB	3.99	4.00	-0.3%	5.1%
	WB	4.30	4.10	4.8%	5.0%
Tualatin-Sherwood 99W to Avery	EB	6.24	5.90	5.5%	0.5%
	WB	7.58	7.10	6.3%	0.5%
Tualatin-Sherwood Boones Ferry to I-5 SB	EB	2.67	2.40	10.2%	1.2%
	WB	2.36	2.40	-1.9%	0.1%
Murray 6th to Scholls Ferry	NB	8.04	6.50	19.1%	10.0%
	SB	7.45	7.20	3.4%	0.5%
Upper Boones Ferry Durham to I-5 SB/Carmen	NB	1.65	1.60	2.8%	0.3%
	SB	2.30	2.50	-8.6%	1.0%
Scholls Ferry Murray to Nimbus	EB	4.33	4.00	7.7%	0.5%
	WB	4.03	4.00	0.8%	1.5%

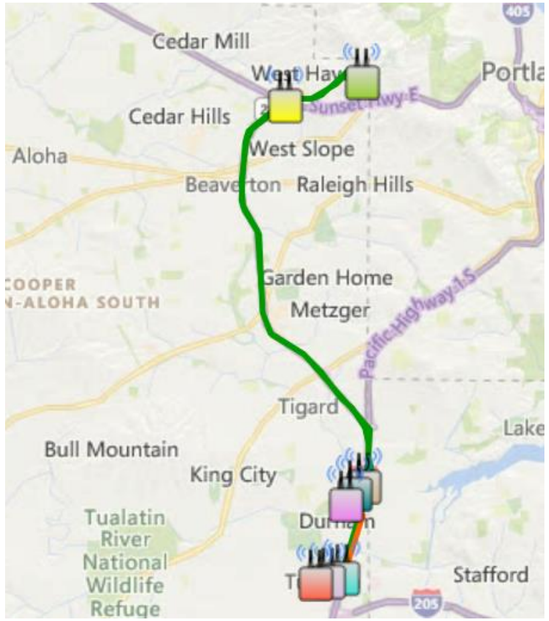


Free Flow Travel Times

TABLE 4: COMPARISON OF BLUEMAC AND INRIX CALCULATED FREE FLOW TRAVEL TIMES				
Route Name	Dir.	BlueMAC Free Flow Travel Time (Min)	INRIX Free Flow Travel Time (Min)	Percent Difference
185th Cornell to US 26	NB	1.7	0.6	68%
Barnes Baltic to Burnside	EB	2.7	2.3	16%
	WB	3.8	2.1	44%
Cornelius Pass Blanton to Baseline	SB	3.2	2.5	23%
Cornelius Pass Cornell to US 26	NB	2.8	1.1	60%
	SB	3.6	1.2	68%
Cornell Brookwood to Cornelius Pass	EB	3.5	3.0	13%
	WB	3.9	2.7	32%
Cornell Murray to Saltzman	EB	1.0	0.8	21%
	WB	1.0	0.8	14%
Durham 108th to Upper Boones	EB	3.0	2.7	9%
	WB	3.4	2.7	19%
Tualatin-Sherwood 99W to Avery	EB	4.3	3.4	20%
	WB	4.8	3.6	25%
Tualatin-Sherwood Boones Ferry to I-5 SB	EB	1.6	0.8	49%
	WB	1.6	0.9	46%
Murray 6th to Scholls Ferry	NB	5.3	3.7	31%
	SB	7.1	4.4	39%
Upper Boones Ferry Durham to I-5 SB/Carmen	NB	1.3	0.8	34%
	SB	1.3	0.8	36%
Scholls Ferry Murray to Nimbus	EB	3.1	2.4	22%
	WB	3.1	2.3	27%

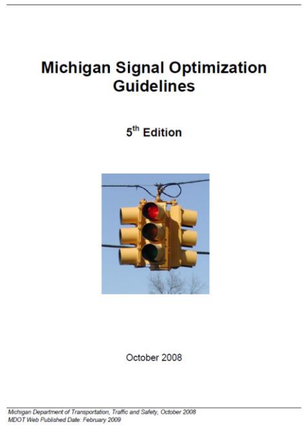
Summary Conclusions

- INRIX & BlueMAC produce **similar travel time results**
  - Average < 3% when adjusting for length differences
- **INRIX reflects higher congestion values** (TTI, PTI)
  - Assumes a faster free flow value (5th %ile midnight to 6am)
- INRIX data set is **more complete**
- INRIX has **lower corridor sample size**
  - BlueMAC avg. 7%, INRIX avg. 2.5%



Historical Process

Define Specs



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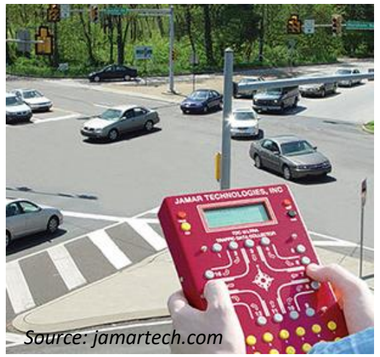
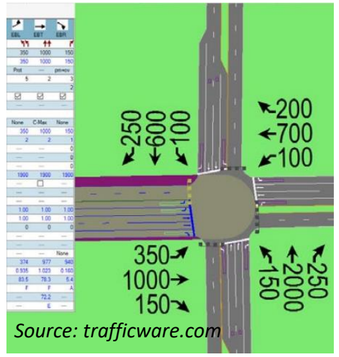
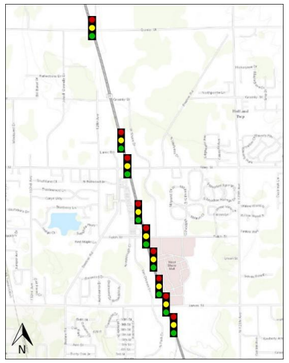
Data Collection



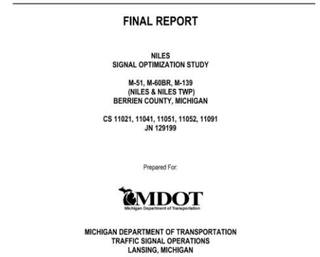
Modeling



Implement

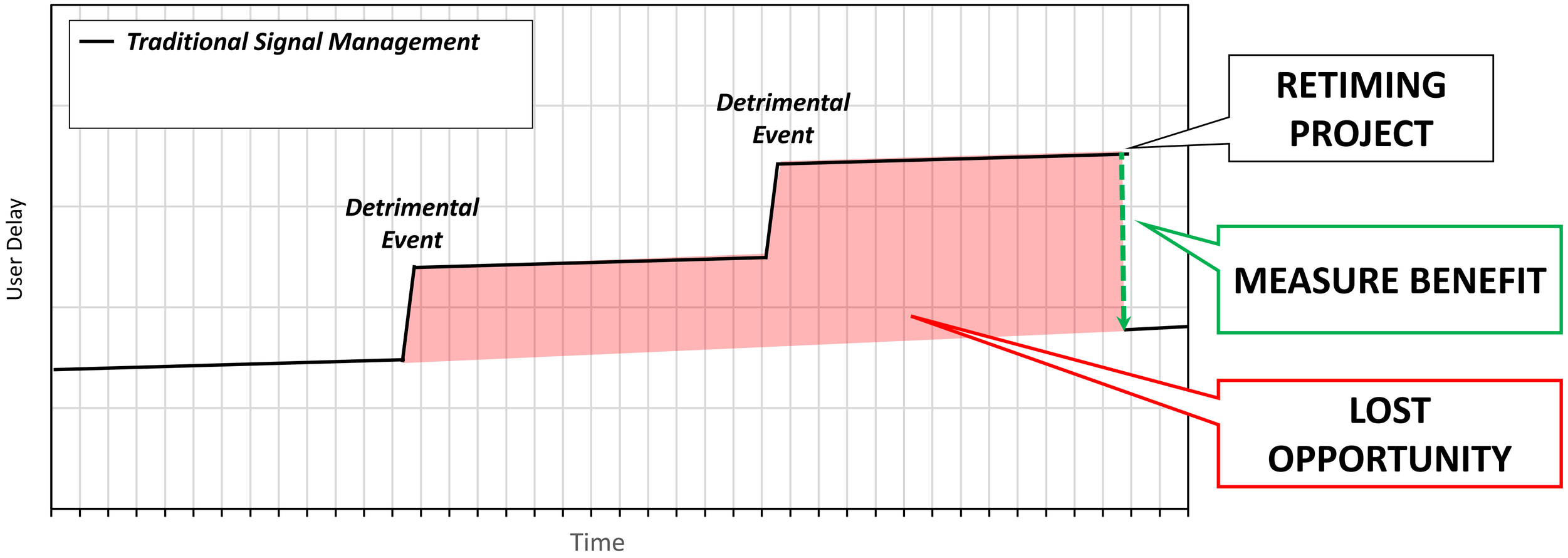


Results



HIGH BENEFIT COST-RATIO

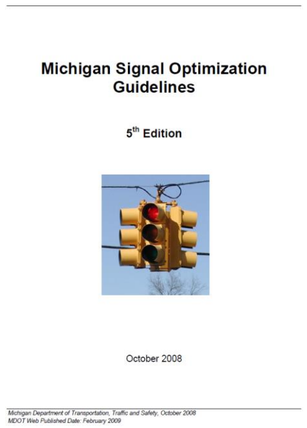
Current Operations



Cloud-Based SPMs Process

INRIX Signal Analytics Suite

Define SPM Outcomes


Michigan Signal Optimization Guidelines

5th Edition

October 2008

Michigan Department of Transportation, Traffic and Safety, October 2008
MDOT Web Published Date: February 2009

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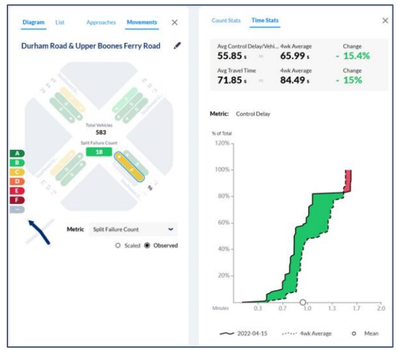
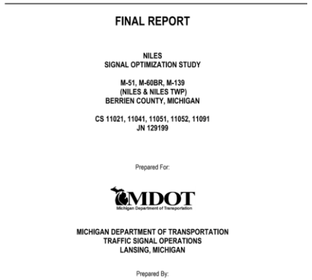
Analyze Streaming SPMs



Field Validate

Implement Changes

Document Results


FINAL REPORT

NILES
SIGNAL OPTIMIZATION STUDY

M-51, M-60BR, M-139
(NILES & NILES TWP)
BERRIEN COUNTY, MICHIGAN

CS 11021, 11041, 11051, 11052, 11091
JN 129199

Prepared For:

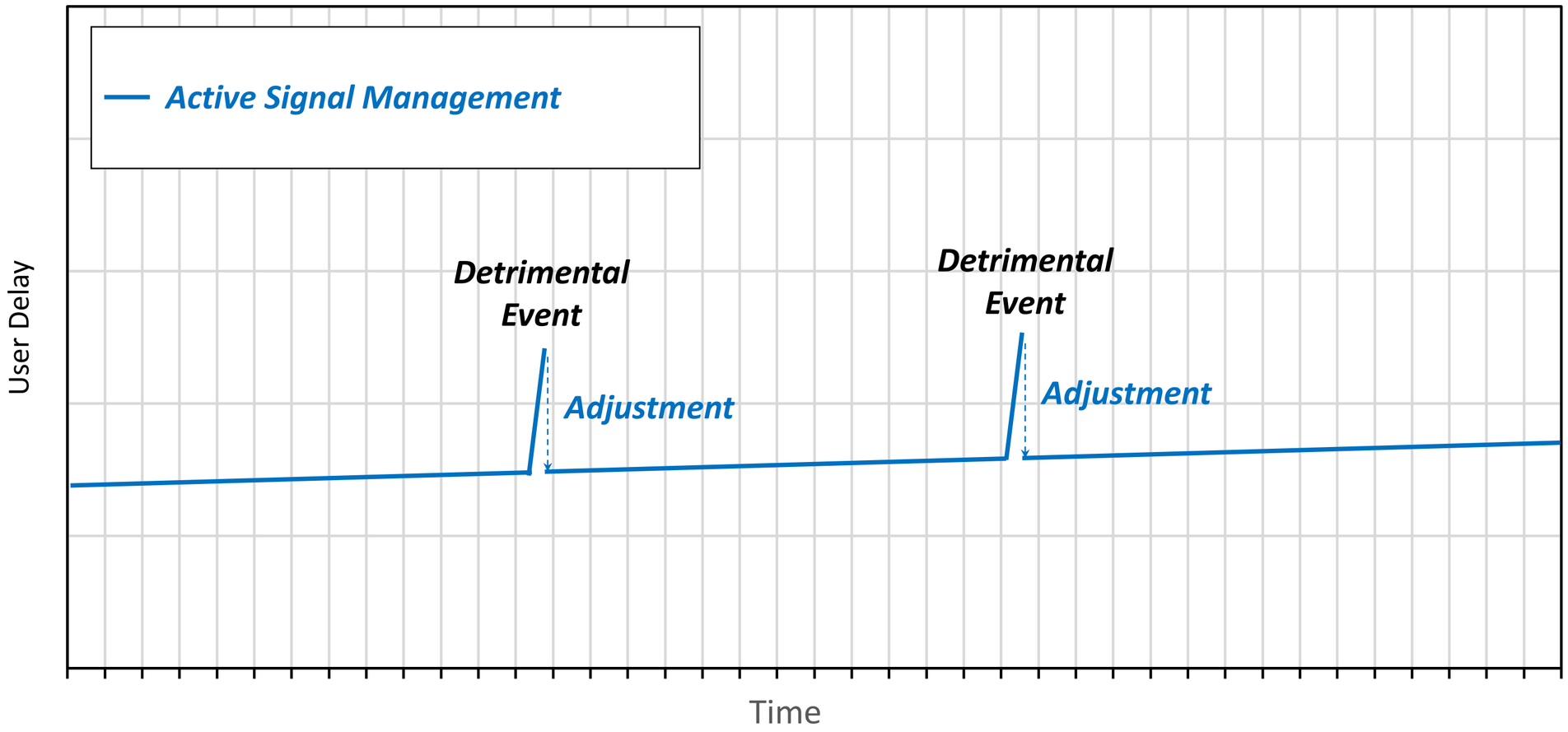
MDOT

MICHIGAN DEPARTMENT OF TRANSPORTATION
TRAFFIC SIGNAL OPERATIONS
LANSING, MICHIGAN

Prepared By:

HIGHER BENEFIT COST-RATIO --> Better Value Proposition

Potential for Actively Monitored Traffic Signals



Data Directly from Vehicles

High Frequency Waypoint Data

Vehicle GPS Trajectory Data

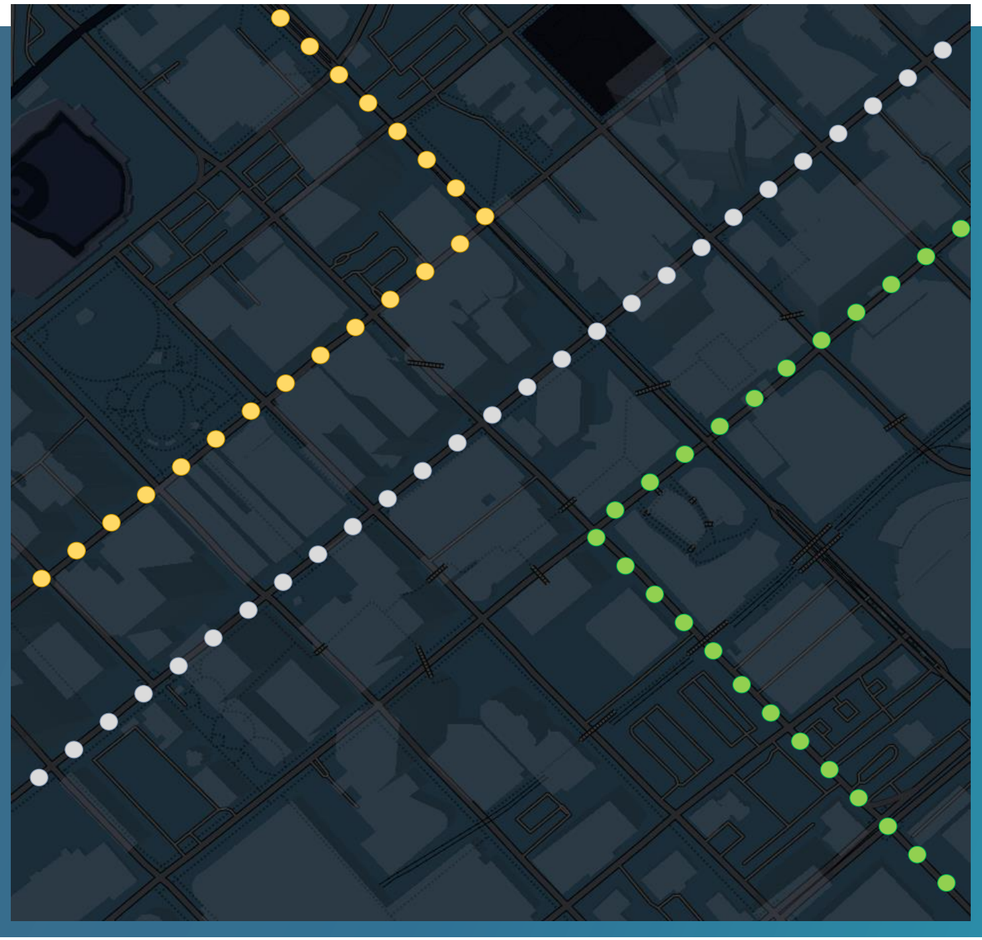
Data collected from GPS devices built into the vehicle

High Frequency Waypoints

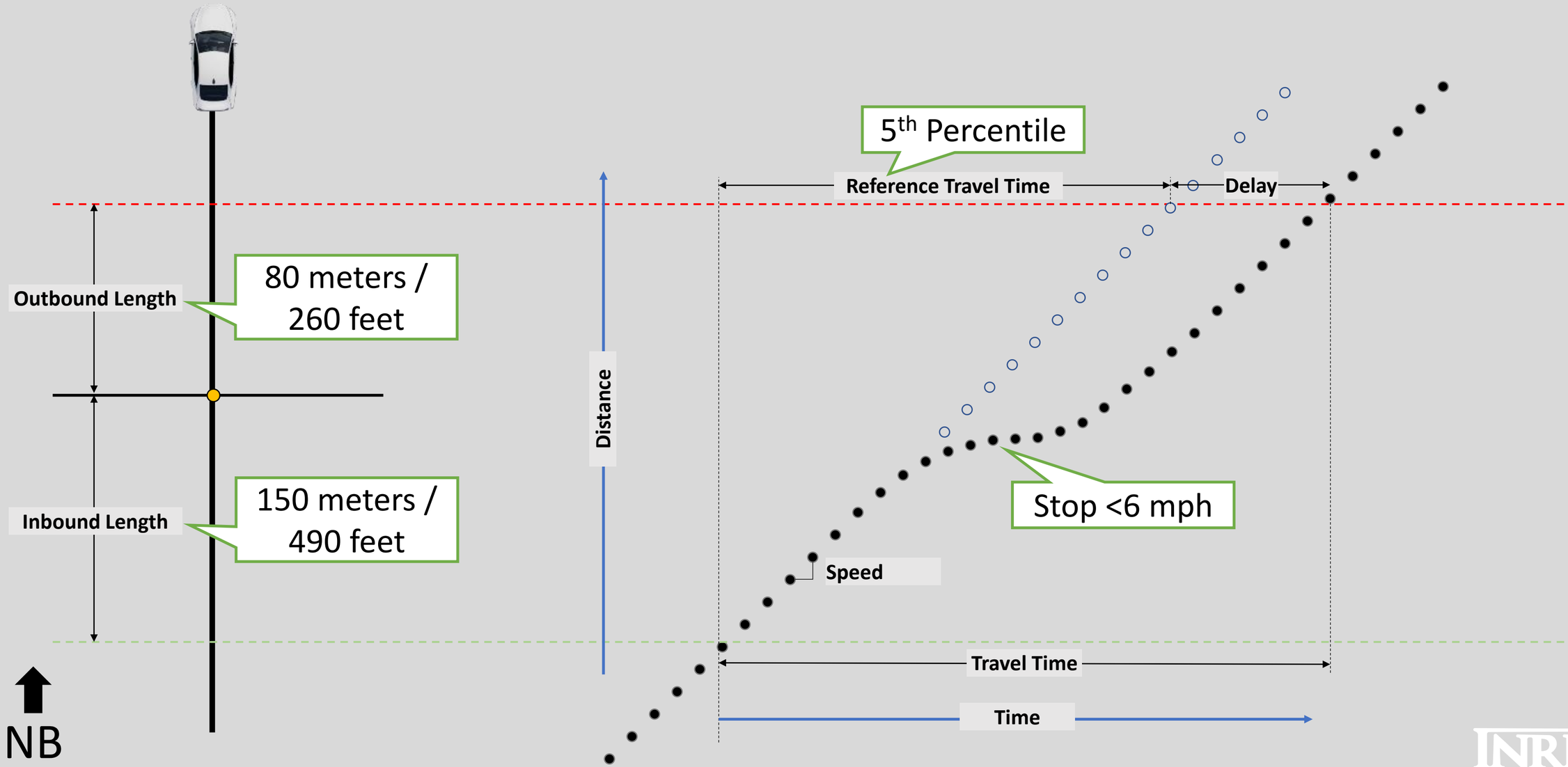
Waypoints collected every 3 to 5 seconds are used

No Infrastructure Required

No connection to detectors or the signal cabinet is required



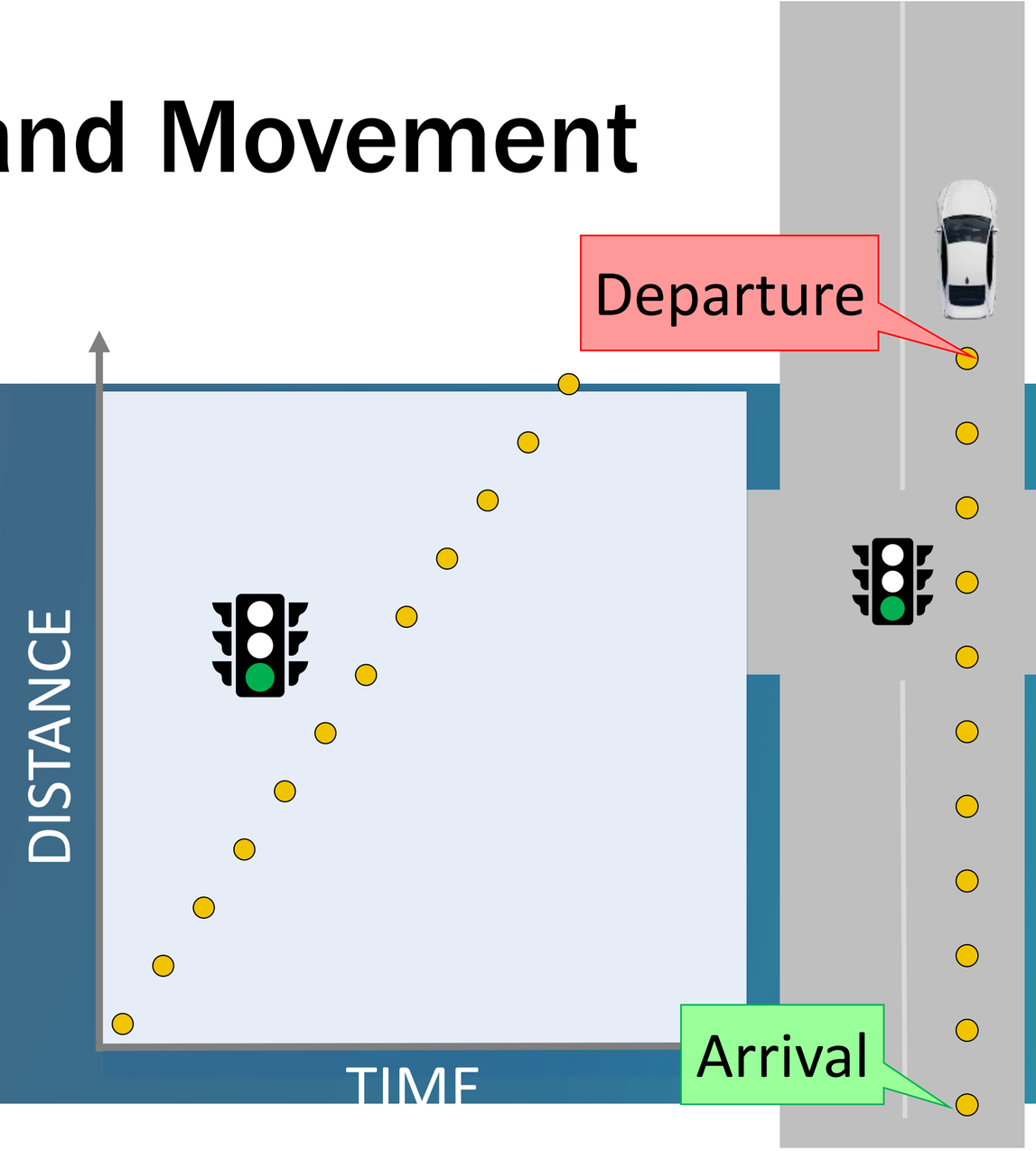
Developing the Metrics



Intersection, Approach and Movement Level Metrics

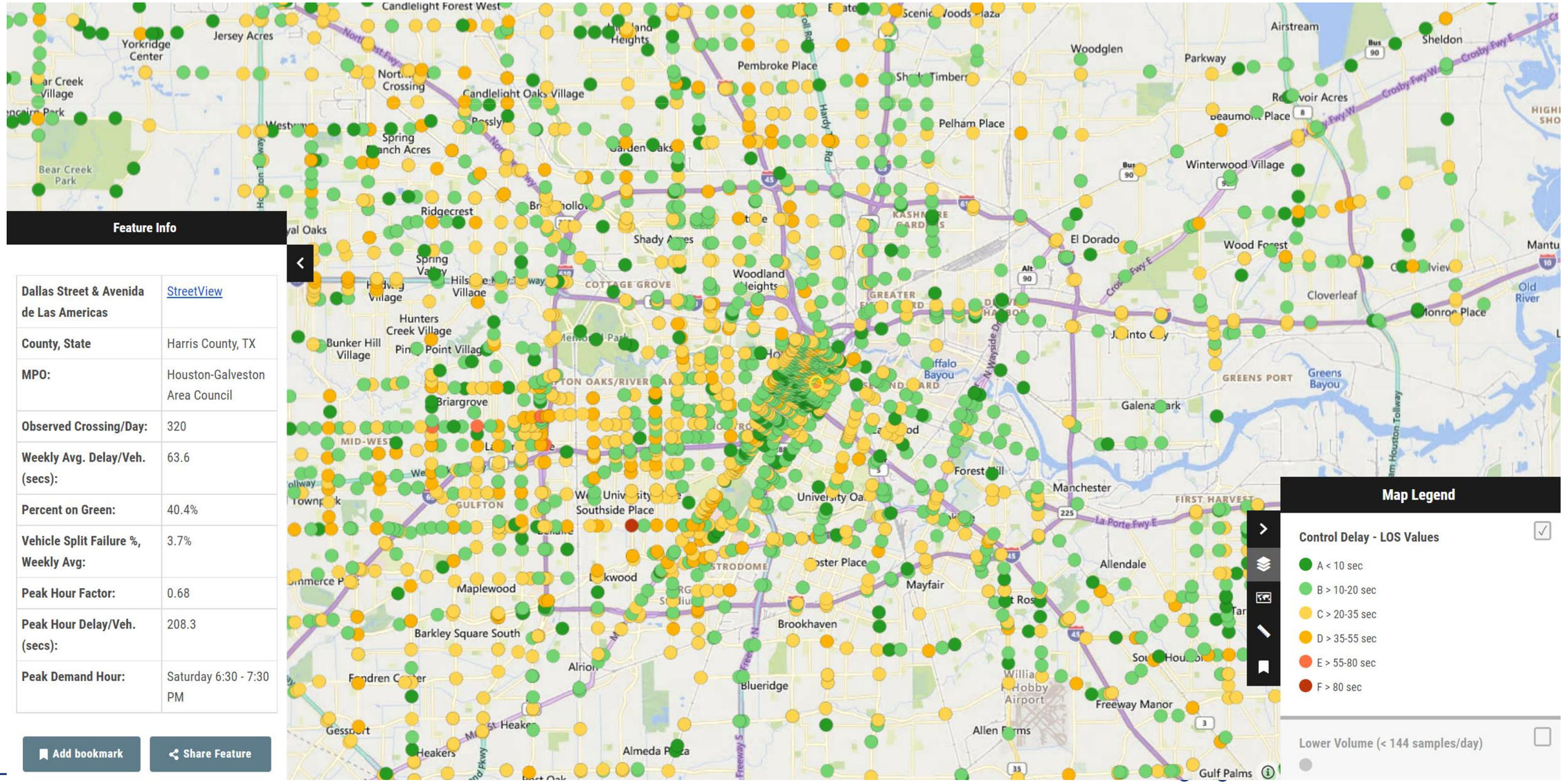
Signal Performance Metrics

- Travel Time
- Approach Speed
- Control Delay
- Level of Service
- Turn Ratios
- Vehicle Counts
- Split Failures
- Stops / AOG



INRIX US Signals Scorecard – Dec 2021

https://mangomap.com/inrix-signals/maps/128205/2022-signals-scorecard?preview=true#

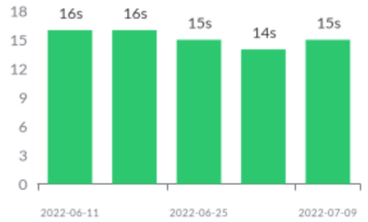


Examples – Daily Email

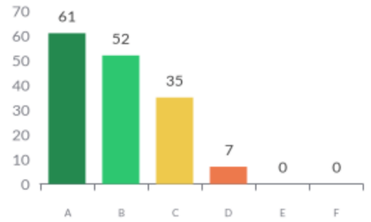
All Licensed | 2022-07-09 | Washington County OR

Intersections	Approaches	Movements	Corridors
155	539	1,375	28

Average Control Delay per Vehicle



Intersection Counts LOS



Intersections: Top 5 Control Delay Issues | 2022-07-09 | 24 Hrs

Worsened Control Delay (Total)	4-wk Avg	2022-07-09	Change	
1 Cornell Rd & Brookwood Pkwy	327.1h C	361.2h C	34.2h	+10%
2 Scholls Ferry Road & Nimbus Avenue	269.1h B	303.1h B	34h	+13%
3 Butler Street & Cornell Road	137h B	168.3h B	31.3h	+23%
4 Durham Road & Upper Boones Ferry Road	207.9h C	236.5h C	28.6h	+14%
5 Baseline Rd & 185th Ave	585.8h C	614.1h C	28.2h	+5%
Worsened Control Delay (per Vehicle)	**4-wk Avg**	**2022-07-09**	**Change**	
1 Upper Boones Ferry & Sequoia Pkwy	10s A	14s B	+4s	+42%
2 Durham Road & Upper Boones Ferry Road	29s C	33s C	+4s	+14%
3 Butler Street & Cornell Road	16s B	20s B	+4s	+23%
4 Evergreen Pkwy & Century Blvd	15s B	17s B	+3s	+19%
5 Cornell Rd & Brookwood Pkwy	26s C	29s C	+3s	+10%

Corridors: Top 3 Corridor Issues | 2022-06-27 | 2022-07-04 | weekdays

Worsened Travel Times	4-wk Avg	Current Week	Change	
1 WB Tualatin-Sherwood - Avery to 99W	7.1m E	7.3m D	+14s	+3.27%
2 SB 185th - US 26EB to Cornell	1.8m F	2.1m F	+13s	+12.10%
3 EB Tualatin-Sherwood - 99W to Avery	6.2m D	6.5m D	+13s	+3.39%
Worsened Travel Time Index	**4-wk Avg**	**Current Week**	**Change**	
1 SB 185th - US 26EB to Cornell	3.13x F	3.63x F	+0.51x	+16.25%
2 Walker WB - Park Way to 158th	1.89x D	2.26x E	+0.37x	+19.44%
3 Barnes- Burnside to Baltic	1.70x D	1.96x D	+0.26x	+15.02%

Intersections: Top 5 Control Delay Issues 2022-04-13 24 Hrs

Worsened Control Delay (Total)	4-wk Avg	2022-04-13	Change	
1 Tualatin Sherwood & Pacific Hwy 99	483.5h	598.4h	+114.9h	+24%
2 Evergreen Parkway & Cornelius Pass Road	420.8h	520.4h	+99.6h	+24%
3 Cornell Rd & Saltzman Rd	211h	283.4h	+72.4h	+34%
4 Cornell Road & Trail St - Sunset HS	84.9h	156.8h	+71.9h	+85%
5 Durham Road & Upper Boones Ferry Road	293h	354.2h	+61.1h	+21%

Intersections: Top 5 Control Delay Issues | 2022-07-04 | 24 Hrs

Worsened Control Delay (Total)	4-wk Avg	2022-07-04	Change	
1 Evergreen Pkwy & Imbrie Dr	38.7h A	79.4h B	40.7h	+105%
2 Evergreen Pkwy & Century Blvd	74.6h B	96.5h C	21.9h	+29%
3 Main Street & 10th Avenue	236.8h C	251.4h C	14.6h	+6%
4 Durham Road & 92nd Avenue	49.9h A	59.4h B	9.6h	+19%
5 Farmington Road & 160th Avenue	49.5h A	54.5h B	5h	+10%
Worsened Control Delay (per Vehicle)	**4-wk Avg**	**2022-07-04**	**Change**	
1 Evergreen Pkwy & Imbrie Dr	10s A	20s B	+10s	+105%
2 Evergreen Pkwy & Century Blvd	16s B	21s C	+5s	+29%
3 Durham Road & 92nd Avenue	9s A	11s B	+2s	+19%
4 Main Street & 10th Avenue	25s C	26s C	+2s	+6%
5 Farmington Road & 160th Avenue	9s A	10s B	+1s	+10%

Active Signal Management

Leveraged Daily Emails to Investigate Recurring Issues

Intersections: Top 5 Control Delay Issues — 2021-12-06 — 24 Hrs

	Worsened Control Delay (Total)	4-wk Avg	2021-12-06	Change	
1	Southwest Tualatin Sherwood Road & Southwest Martinazzi Avenue	357.6h C	530.1h D	+172.5h	+48%
2	Southwest Tualatin Sherwood Road	502.3h C	611.1h C	+108.8h	+22%
3	Southwest Walker Road & Southwest 158th Avenue	369.3h C	431h D	+61.8h	+17%
4	Southwest Tualatin Sherwood Road & Southwest Boones Ferry Road	557.4h D	613.9h D	+56.5h	+10%
5	East Main Street & Southeast Cornelius Pass Road	540.9h C	594.4h C	+53.6h	+10%

Intersections: Top 5 Control Delay Issues — 2021-12-07 — 24 Hrs

	Worsened Control Delay (Total)	4-wk Avg	2021-12-07	Change	
1	Southwest Tualatin Sherwood Road & Southwest Martinazzi Avenue	406.8h C	575h D	+168.1h	+41%
2	Southwest Tualatin Sherwood Road & Southwest Boones Ferry Road	641.6h D	747.2h D	+105.6h	+16%
3	Southwest Hall Boulevard & Southwest Scholls Ferry Road	546h D	629.1h D	+83.1h	+15%
4	Southwest Tualatin Sherwood Road	538.3h C	590.8h C	+52.5h	+10%
5	Southwest Oleson Road	293.1h C	343.8h C	+50.7h	+17%

Intersections: Top 5 Control Delay Issues — 2021-12-08 — 24 Hrs

	Worsened Control Delay (Total)	4-wk Avg	2021-12-08	Change	
1	Southwest Tualatin Sherwood Road & Southwest Martinazzi Avenue	441.5h C	608.2h D	+166.7h	+38%
2	Southwest Tualatin Sherwood Road	502.6h C	594.7h C	+92.2h	+18%
3	Southwest 170th Avenue	395.5h C	456.5h C	+60.9h	+15%
4	Southwest Hall Boulevard & Southwest Scholls Ferry Road	581.4h D	634.7h D	+53.3h	+9%
5	East Main Street & Southeast Brookwood Avenue	335.7h C	382.8h C	+47h	+14%

Intersections: Top 5 Control Delay Issues — 2021-12-09 — 24 Hrs

	Worsened Control Delay (Total)	4-wk Avg	2021-12-09	Change	
1	Southwest Tualatin Sherwood Road & Southwest Martinazzi Avenue	319.4h C	551.2h D	+231.9h	+73%
2	Southwest Tualatin Sherwood Road	483.3h C	633.6h C	+150.4h	+31%
3	Southwest Tualatin Sherwood Road & Southwest Boones Ferry Road	586h D	707.1h D	+121.1h	+21%
4	Southwest Walker Road & Southwest Murray Boulevard	455.7h C	562.3h D	+106.5h	+23%
5	Southwest Tualatin She				

From: Mark Player <Mark_Player@co.washington.or.us>
Sent: Thursday, December 16, 2021 1:03 PM
To: Shaun Quayle <Shaun_Quayle@co.washington.or.us>
Subject: Re: Trying to understand 48% delay jump at Martinazzi-TSR

The comm was down at Nyberg @ Fred Meyer. I'm sure that wasn't helping things. I was able to get the comm back up. It should be good now. Not sure about Martinazzi though.

Mark

Sent from my iPhone

On Dec 16, 2021, at 9:26 AM, Shaun Quayle <Shaun_Quayle@co.washington.or.us> wrote:

Hi Kevin,

Can you have someone swing by TSR/Martinazzi and Nyberg/Cabelas to check on detector health?

John, Matt, Mike, I took a quick look at the reported 48% jump in delay at Martinazzi/TSR, which is orders of magnitude larger than our other Countywide sample of Inrix Signals IQ locations.
Attached is a word document comparing TSR/Martinazzi this Monday to the previous four Mondays. There is an obvious jump in delay after Thanksgiving, particularly for EB through traffic. This maybe reflecting increased turning traffic demand to/from Nyberg Woods shopping center and Fred Meyer. SCATS adaptive is likely having to allocate more green time to this turning/side-street shopping/retail traffic, which is taking time from the mainline through traffic on Nyberg - Tualatin-Sherwood Road.

Active Signal Management

Leveraged Daily Emails to Investigate Recurring Issues

Intersections: Top 5 Control Delay Issues		2022-01-08	24 Hrs		
Worsened Control Delay (Total)		4-wk Avg	2022-01-08	Change	
1	Scholls Ferry Rd & 125th - North Dakota St	197.8h B	298.4h C	+100.6h	+51%
2	Scholls Ferry Rd & Murray Blvd	388.2h C	462h D	+73.7h	+19%
3	Cornell Rd & 25th Ave	240.8h B	312.5h C	+71.7h	+30%
4	Tualatin Sherwood Road & Boones Ferry Road	309.3h C	377.4h C	+68.2h	+22%
5	Scholls Ferry Road & Nimbus Avenue	103.6h A	157.5h B	+53.9h	+52%

Intersections: Top 5 Control Delay Issues		2022-01-09	24 Hrs		
Worsened Control Delay (Total)		4-wk Avg	2022-01-09	Change	
1	Scholls Ferry Rd & 125th - North Dakota St	161.6h B	256.8h C	+95.2h	+59%
2	Tualatin Sherwood Road & Boones Ferry Road	222.8h C	263.5h C	+40.9h	+18%
3	Baseline Rd & 185th Ave	304.4h C	332.7h C	+28.3h	+9%
4	Scholls Ferry Road & 121st Avenue	125.3h B	146.4h B	+21h	+17%
5	Scholls Ferry Road & Roy Rogers Road	94.6h B	115.2h B	+20.6h	+22%

From: Mark Leavitt <mleavitt@beavertonoregon.gov>
Sent: Thursday, January 13, 2022 12:27 PM
To: Shaun Quayle <Shaun_Quayle@co.washington.or.us>
Subject: [EXTERNAL] RE: Ped button stuck on Murray-Allen

Shaun,

Scholls @ 125th we discovered a hung up Loop card. It was reset. Now Murray @ Allen we didn't find any issues. No calls on the controller and the DC isolator card had no recall, and no button was stuck. Are you still seeing any issues there?

Identify Underperforming Intersections

Countywide Analysis of Split Failures by Movement

Frequency in Top 10 for Total # of Weekday Split Failures, 5am-9pm								
Intersection	**Approach**	**Maneuver**	**June**	**May**	**April**	**March**	**February**	**% in Top 10**
Southwest Pacific Highway & TSR	Southbound	Through	1	2	5	3	6	100%
Southwest 124th Avenue & Southwest Tualatin Sherwood Road	Westbound	Through	2					20%
Northwest 185th Avenue & Northeast Evergreen Parkway	Eastbound	Left	3	3				40%
Southwest Durham Road & Southwest Upper Boones Ferry Road	Eastbound	Left	4	7	3, 7		9	60%
Northwest Cornell Road & Murray Road	Westbound	Left	5	4	1	4	10	100%
Southwest Durham Road & Southwest Upper Boones Ferry Road	Northbound	Through	6	10	4	9		80%
Southwest Pacific Highway & TSR	Northbound	Through	7	6	2	2	1	100%
Northeast Brookwood Parkway & Northeast Cornell Road	Eastbound	Left	8		10			40%
Southwest Tualatin Sherwood Road & Southwest Boones Ferry Road	Westbound	Left	9		8	5	8	80%
Northwest 185th Avenue & Northeast Evergreen Parkway	Southbound	Left	10					20%
Southwest Baseline Road & 185th Avenue	Northbound	Through				7	2	40%
Southwest Martinazzi Avenue & Southwest Tualatin Sherwood Road	Eastbound	Through		1			3	40%
Southwest Baseline Road & 185th Avenue	Northbound	Left					4	20%
Southwest 92nd Avenue & Southwest Durham Road	Northbound	Left				1	5	40%
Southwest Baseline Road & 185th Avenue	Southbound	Through		9	6	6	7	80%
Southwest Tualatin Sherwood Road & Southwest Boones Ferry Road	Eastbound	Through		5				20%
Northwest Cornell Road & 48th Avenue	Eastbound	Left		8				20%
Southwest Nyberg Street & Fred Meyer Entrance	Southbound	Left				8		20%
Southwest Tualatin Sherwood Road & Southwest Boones Ferry Road	Southbound	Through				10		20%
Southwest Pacific Highway & TSR	Southbound	Right			9			20%

Intersection Analysis

Analyze statistics on the number of vehicles that have passed through intersections to identify issues with signal timing.

1. Select intersections by road name or directly from the map

Select a region: Washington County, OR

Use the controls on the map to define your intersection set. Controls with a '+' allow you to add intersections while controls with a '-' allow you to remove intersections from your selection.

Road: Enter road name

Add intersections

Your selection | Remove all

1 intersection

Northwest Cornell Road

2. Create a time period to analyze

07/22/2021 - through - 08/11/2021

Add another date range

3. Select days of week

Sun | Mon | Tue | Wed | Thu | Fri | Sat

4. Select time of day

12:00 AM — 12:00 PM — 12:00 AM

5:00 AM — 9:00 PM

Add another time of day

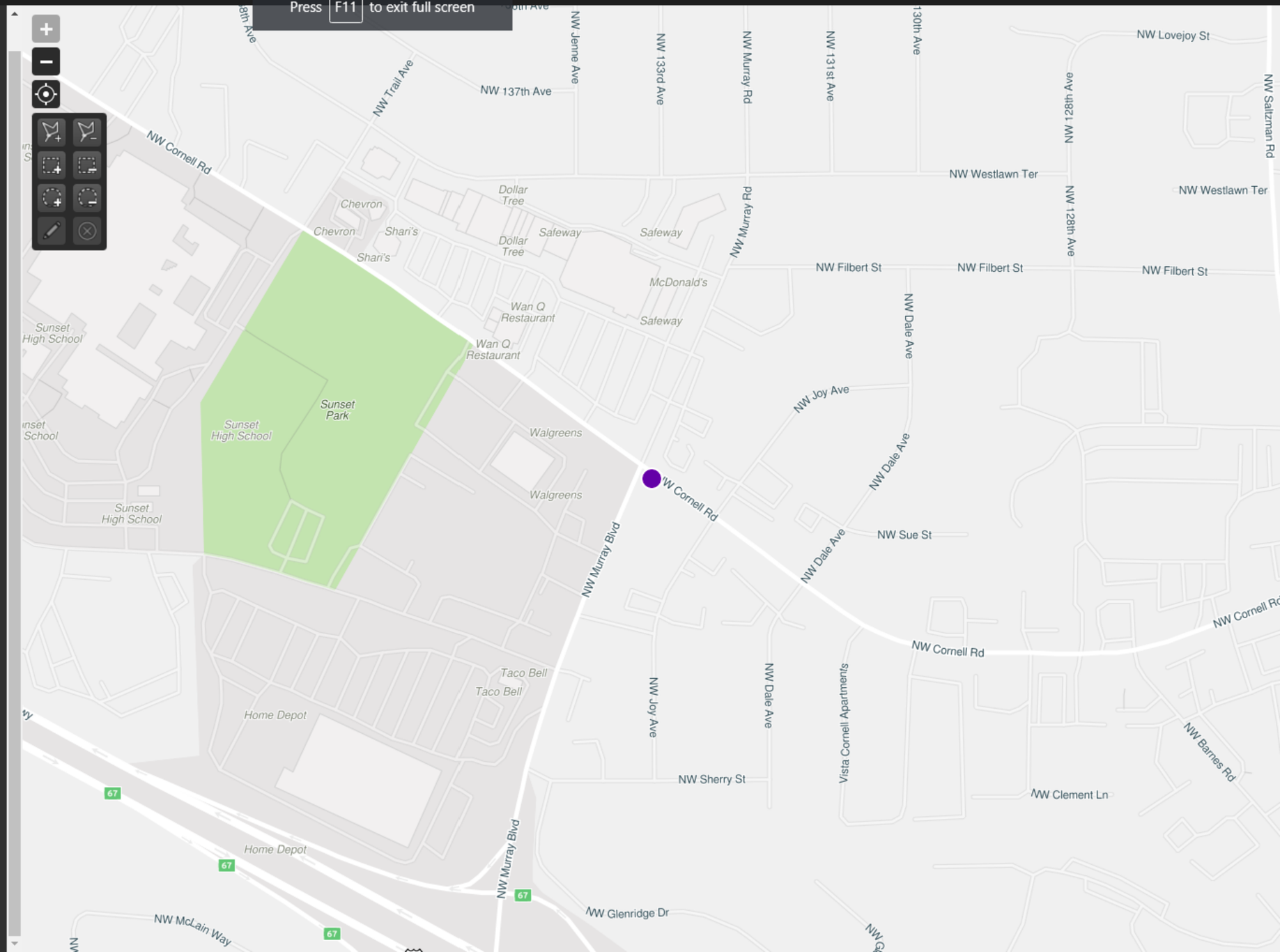
5. Provide a title for this report (optional)

NW Cornell Rd at NW Murray Blvd 7/22-8/11/21 5am-9pm

6. Notes (optional)

Add notes

SUBMIT



Intersection Analysis

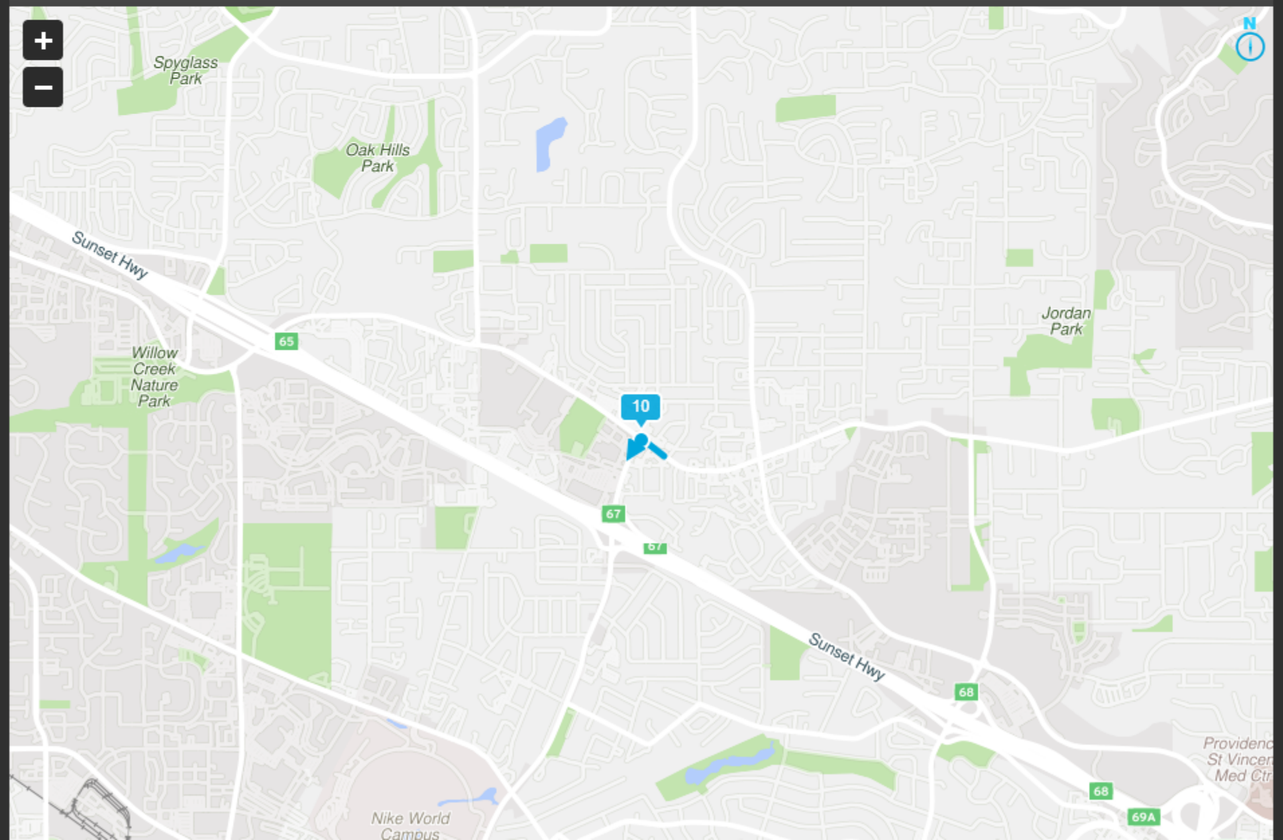
NW Cornell Rd at NW Nurray Blvd 7/22-8/11/21 5am-9pm

Ranked intersection movements for 1 intersection from July 22, 2021 through August 11, 2021 from 5 AM to 9 PM

Filter | Display Options

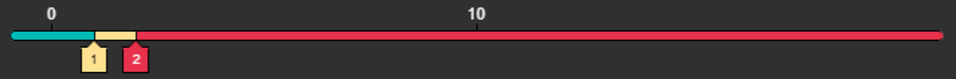
Rank	Intersection	Approach	Movement	Vehicle Count: Total	Vehicle Count: Stopped	POG	Split Failure: Count ▼	Travel Time: Avg (sec)	Travel Time: Max (sec)	Approach Speed: Avg (...	Control Delay: Avg (sec)	Control Delay: Max (sec)
1	Northwest Cornell Road	Westbound	Left	1183	1038	12%	39	74	239	27	57	222
2	Northwest Cornell Road	Eastbound	Left	75	71	5%	3	80	157	28	64	141
3	Northwest Cornell Road	Westbound	Through	1390	702	49%	1	37	118	31	24	105
4	Northwest Cornell Road	Eastbound	Right	974	365	63%	0	27	86	32	12	71
5	Northwest Cornell Road	Westbound	Right	239	95	60%	0	33	95	31	15	77
6	Northwest Cornell Road	Eastbound	Right	1509	711	53%	0	37	165	27	20	148
7	Northwest Cornell Road	Northbound	Through	557	346	38%	0	47	118	30	33	104
8	Northwest Cornell Road	Southbound	Right	15	11	27%	0	49	94	29	28	73
9	Northwest Cornell Road	Northbound	Left	1401	1057	25%	0	59	147	29	44	132

Map | Northwest Cornell Road | Display Options



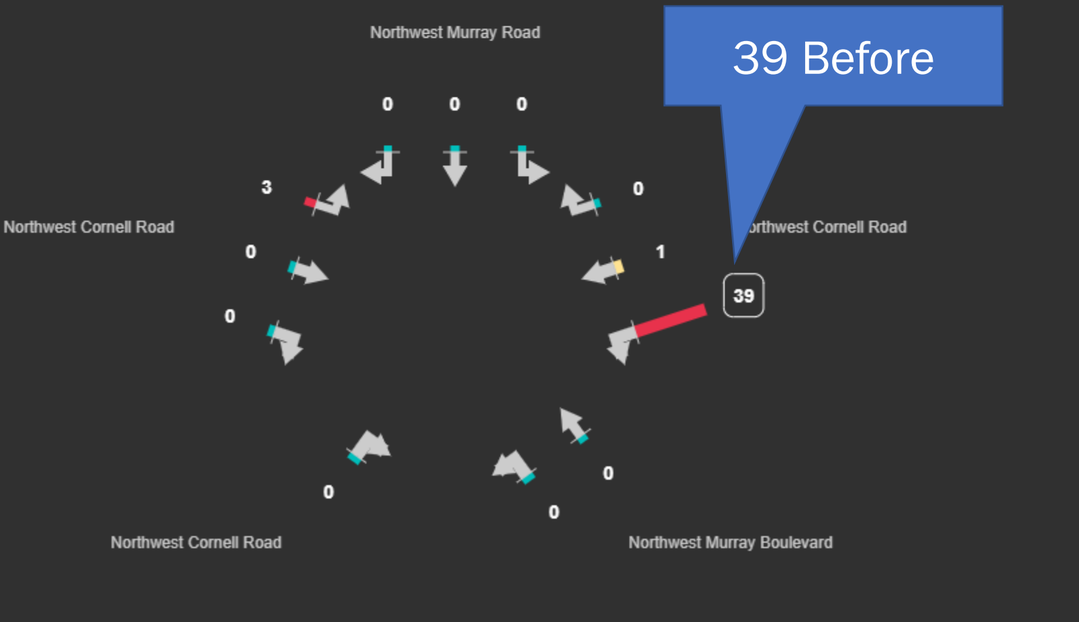
Intersection Breakdown | Northwest Cornell Road | Display Options

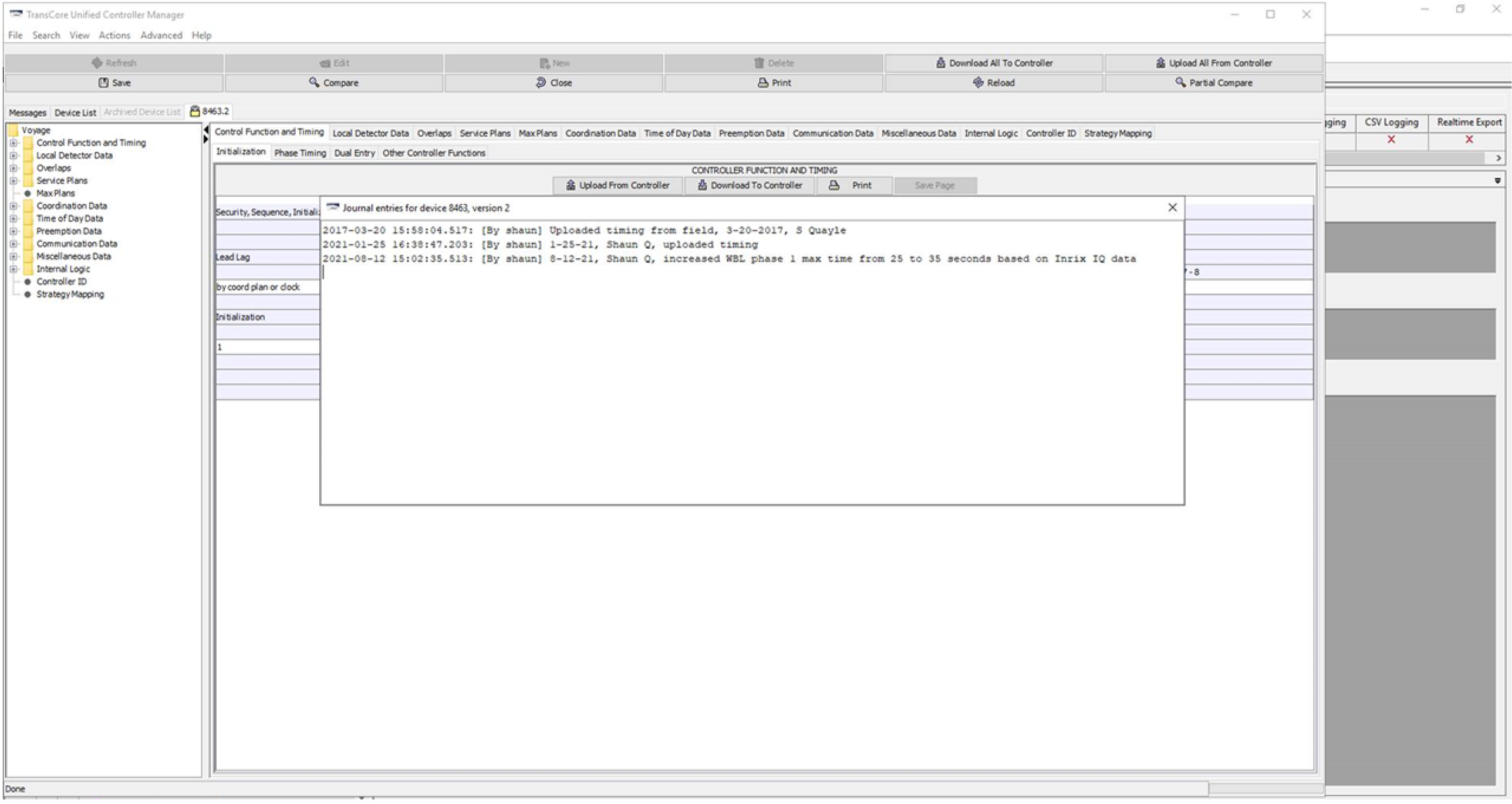
Split Failure: Count



Vehicle Count: Total

Split Failure: Count




TransCore Unified Controller Manager
File Search View Actions Advanced Help
Refresh
Edit
New
Delete
Download All To Controller
Upload All From Controller
Save
Compare
Close
Print
Reload
Partial Compare
Messages
Device List
Archived Device List
8463.2
Voyage
Control Function and Timing
Local Detector Data
Overlaps
Service Plans
Max Plans
Coordination Data
Time of Day Data
Preemption Data
Communication Data
Miscellaneous Data
Internal Logic
Controller ID
Strategy Mapping
Control Function and Timing
Local Detector Data
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Service Plans
Max Plans
Coordination Data
Time of Day Data
Preemption Data
Communication Data
Miscellaneous Data
Internal Logic
Controller ID
Strategy Mapping
Initialization
Phase Timing
Dual Entry
Other Controller Functions
CONTROLLER FUNCTION AND TIMING
Upload From Controller
Download To Controller
Print
Save Page
Security, Sequence, Initiali
Lead Lag
by coord plan or clock
Initialization
1
Journal entries for device 8463, version 2
2017-03-20 15:58:04.517: [By shaun] Uploaded timing from field, 3-20-2017, S Quayle
2021-01-25 16:38:47.203: [By shaun] 1-25-21, Shaun Q, uploaded timing
2021-08-12 15:02:35.513: [By shaun] 8-12-21, Shaun Q, increased WBL phase 1 max time from 25 to 35 seconds based on Inrix IQ data
Done
CSV Logging
Realtime Export

Intersection Analysis

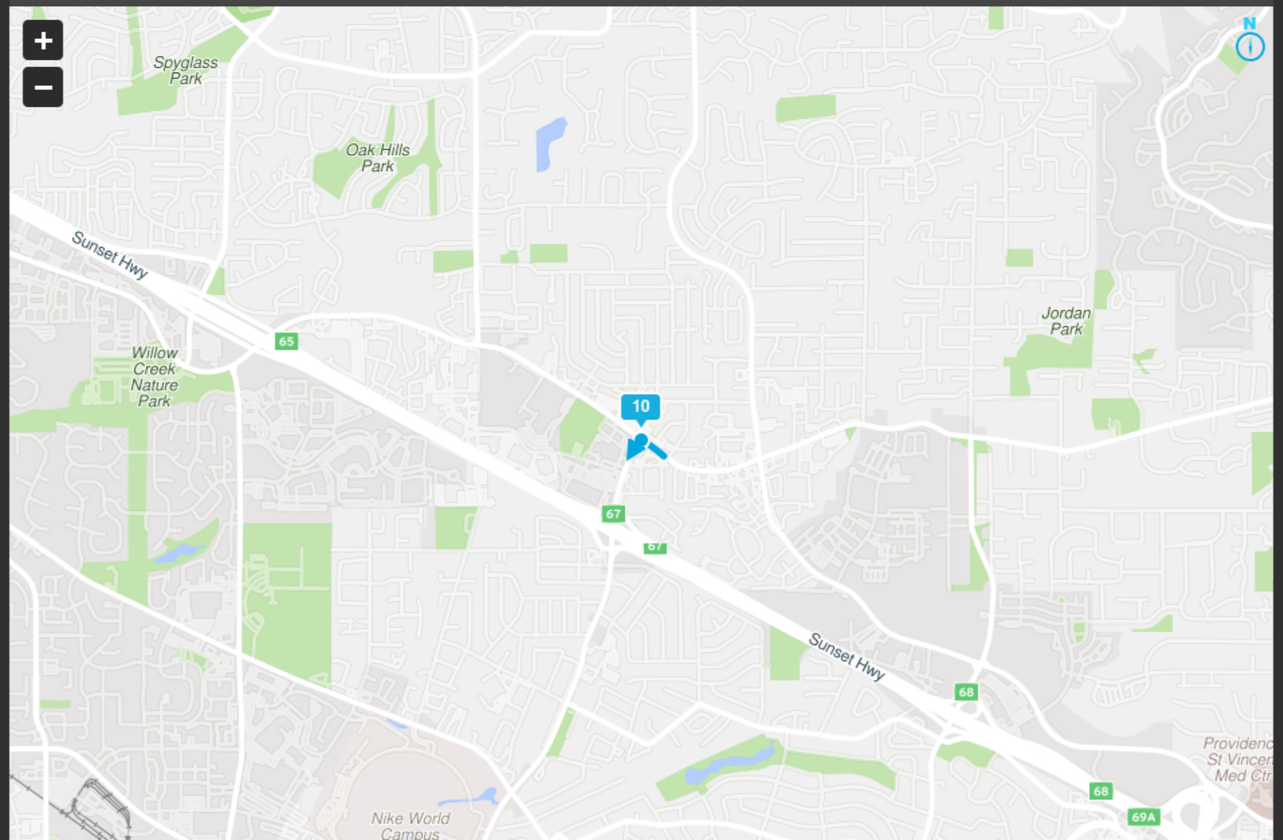
NW Cornell Rd at NW Nurray Blvd 8/13-9/02/21 5am-9pm

Ranked intersection movements for 1 intersection from August 13, 2021 through September 02, 2021 from 5 AM to 9 PM

Filter | Display Options

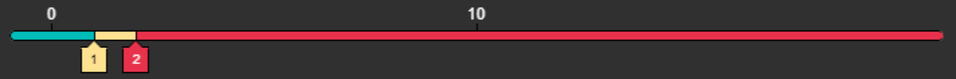
Rank	Intersection	Approach	Movement	Vehicle Count: Total	Vehicle Count: Stopped	POG	Split Failure: Count ▼	Travel Time: Avg (sec)	Travel Time: Max (sec)	Approach Speed: Avg (...	Control Delay: Avg (sec)	Control Delay: Max (sec)
1	Northwest Cornell Road	Westbound	Left	1162	965	17%	3	65	238	28	48	221
2	Northwest Cornell Road	Eastbound	Right	908	393	57%	2	30	229	31	14	213
3	Northwest Cornell Road	Eastbound	Through	1103	840	24%	2	59	156	28	45	142
4	Northwest Cornell Road	Northbound	Left	1363	1042	24%	1	61	158	29	45	142
5	Northwest Cornell Road	Southbound	Through	366	287	22%	1	66	230	28	52	216
6	Northwest Cornell Road	Westbound	Right	214	62	71%	0	30	93	32	13	76
7	Northwest Cornell Road	Eastbound	Right	1559	756	52%	0	38	123	27	21	106
8	Northwest Cornell Road	Westbound	Through	1317	674	49%	0	37	118	32	24	105
9	Northwest Cornell Road	Northbound	Through	566	367	35%	0	49	125	30	35	111

Map | Northwest Cornell Road | Display Options



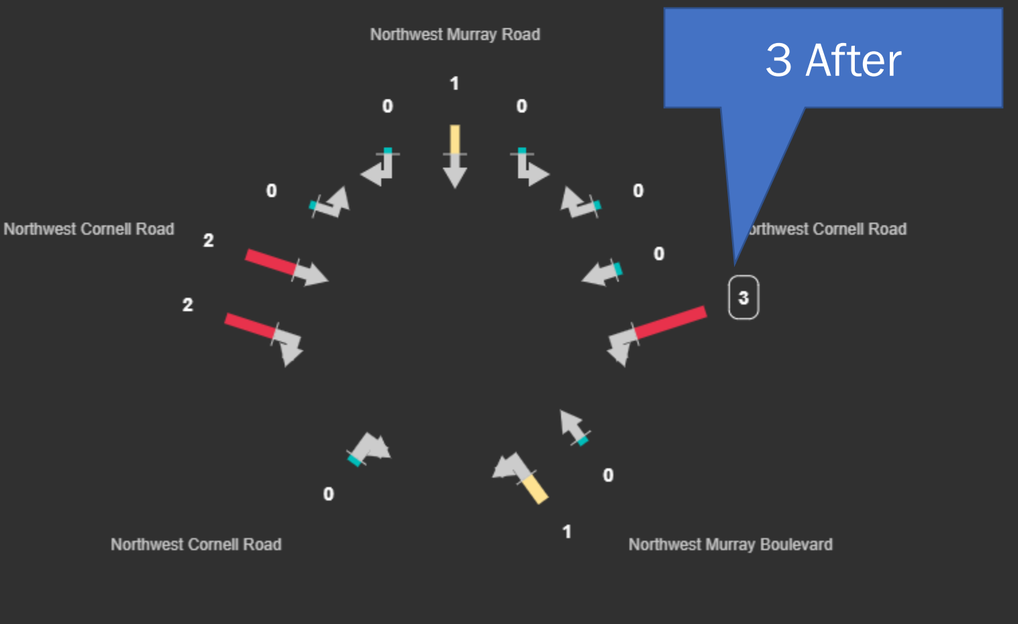
Intersection Breakdown | Northwest Cornell Road | Display Options

Split Failure: Count



Vehicle Count: Total

Split Failure: Count



Intersection Analysis

NW Cornell Rd at NW Nurray Blvd 7/22-8/11/21 5am-9pm

Ranked intersection movements for 1 intersection from July 22, 2021 through August 11, 2021 from 5 AM to 9 PM

Filter | Display Options

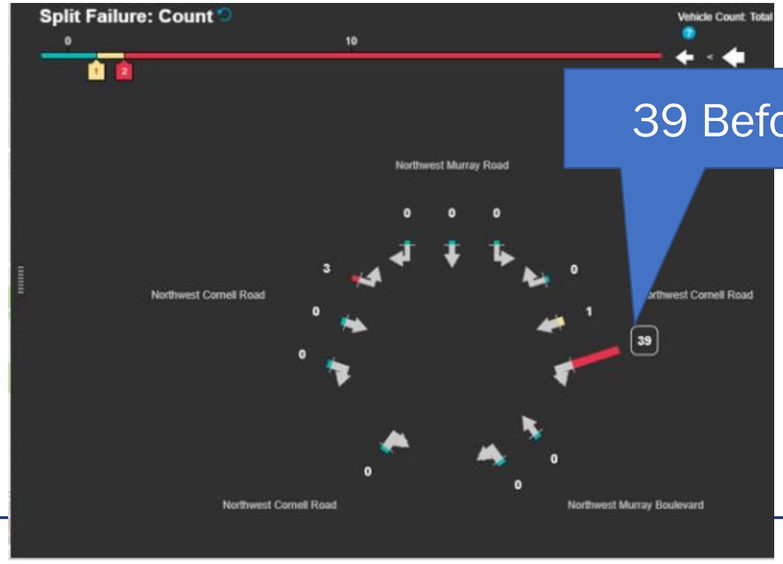
Rank	Intersection	Approach	Movement	Vehicle Count: Total	Vehicle Count: Stopped	POG	Split Failure: Count ▼	Travel Time: Avg (sec)	Travel Time: Max (sec)	Approach Speed: Avg (...	Control Delay: Avg (sec)	Control Delay: Max (sec)
1	Northwest Cornell Road	Westbound	Left	1183	1038	12%	39	74	239	27	57	222
2	Northwest Cornell Road	Eastbound	Left	75	71	5%	3	80	157	28	64	141
3	Northwest Cornell Road	Westbound	Through	1390	702	49%	1	37	118	31	24	105
4	Northwest Cornell Road	Eastbound	Right	974	365	63%	0	27	86	32	12	71
5	Northwest Cornell Road	Westbound	Right	239	95	60%	0	33	95	31	15	77

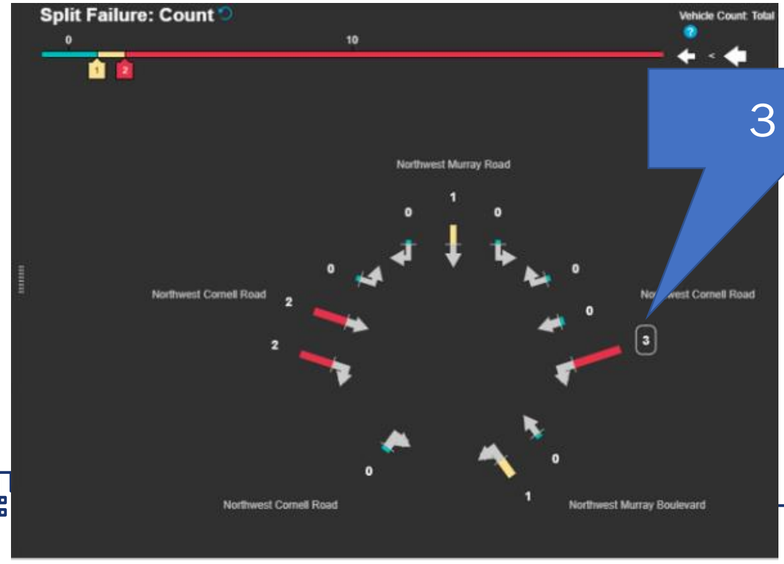
NW Cornell Rd at NW Nurray Blvd 7/22-8/11/21 5am-9pm

Ranked intersection movements for 1 intersection from July 22, 2021 through August 11, 2021 from 5 AM to 9 PM

Filter | Display Options

Rank	Intersection	Approach	Movement	Vehicle Count: Total	Vehicle Count: Stopped	POG	Split Failure: Count ▼	Travel Time: Avg (sec)	Travel Time: Max (sec)	Approach Speed: Avg (...	Control Delay: Avg (sec)	Control Delay: Max (sec)
1	Northwest Cornell Road	Westbound	Left	1183	1038	12%	39	74	239	27	57	222
2	Northwest Cornell Road	Eastbound	Left	75	71	5%	3	80	157	28	64	141
3	Northwest Cornell Road	Westbound	Through	1390	702	49%	1	37	118	31	24	105
4	Northwest Cornell Road	Eastbound	Right	974	365	63%	0	27	86	32	12	71
5	Northwest Cornell Road	Westbound	Right	239	95	60%	0	33	95	31	15	77
6	Northwest Cornell Road	Eastbound	Right	1509	711	53%	0	37	165	27	20	148
7	Northwest Cornell Road	Northbound	Through	557	346	38%	0	47	118	30	33	104
8	Northwest Cornell Road	Southbound	Right	15	11	27%	0	49	94	29	28	73
9	Northwest Cornell Road	Northbound	Left	1401	1057	25%	0	59	147	29	44	132





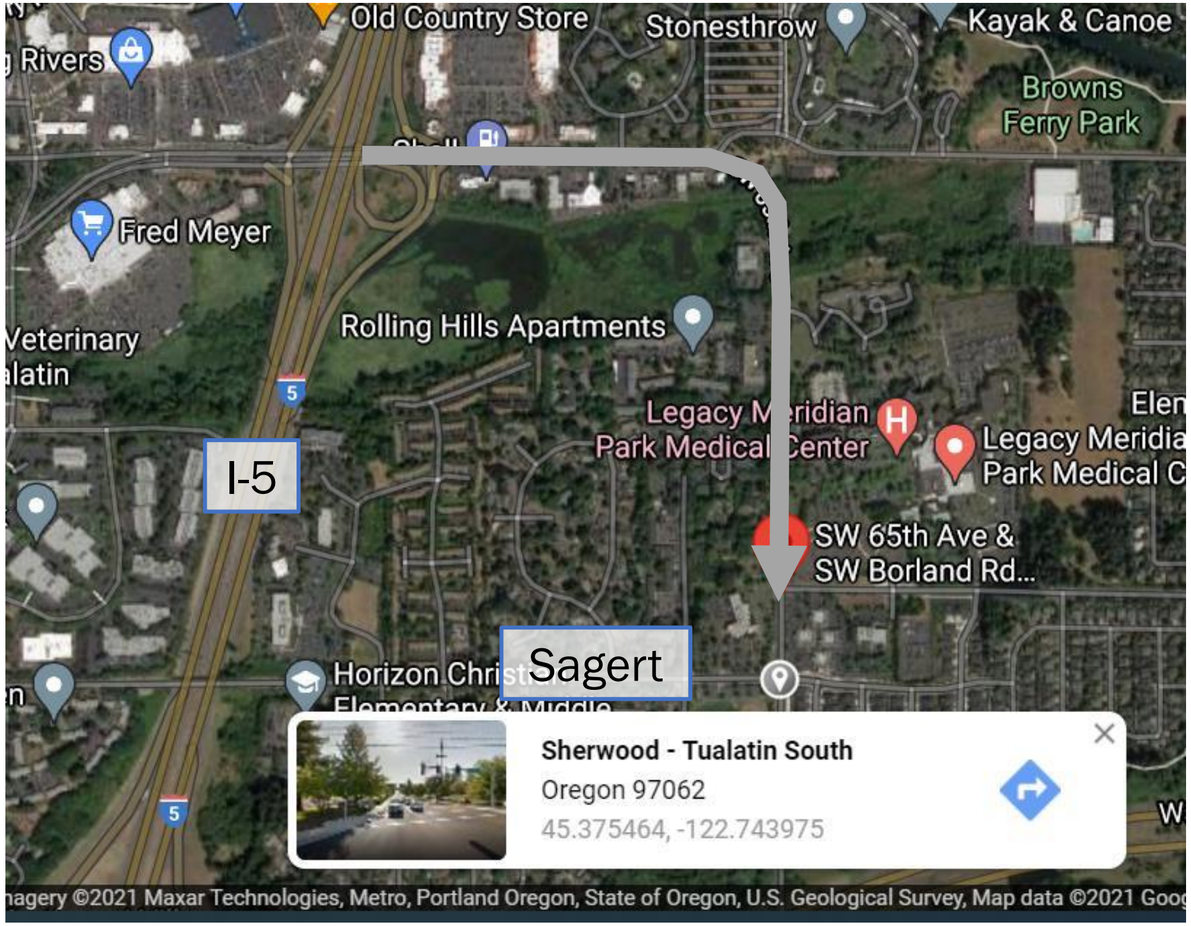
Use Case #3 – Washington County – Customer Complaint Response

Leveraged Signal Analytics to Investigate a Customer Complaint

"Around 4pm major back-ups on 65th near Meridian Park Hospital… takes me longer to get from I-5 to Sagert (0.9 mi) than from Beaverton to I-5 Nyberg exit (~ 8 miles)…

Please look at the signal lights…"

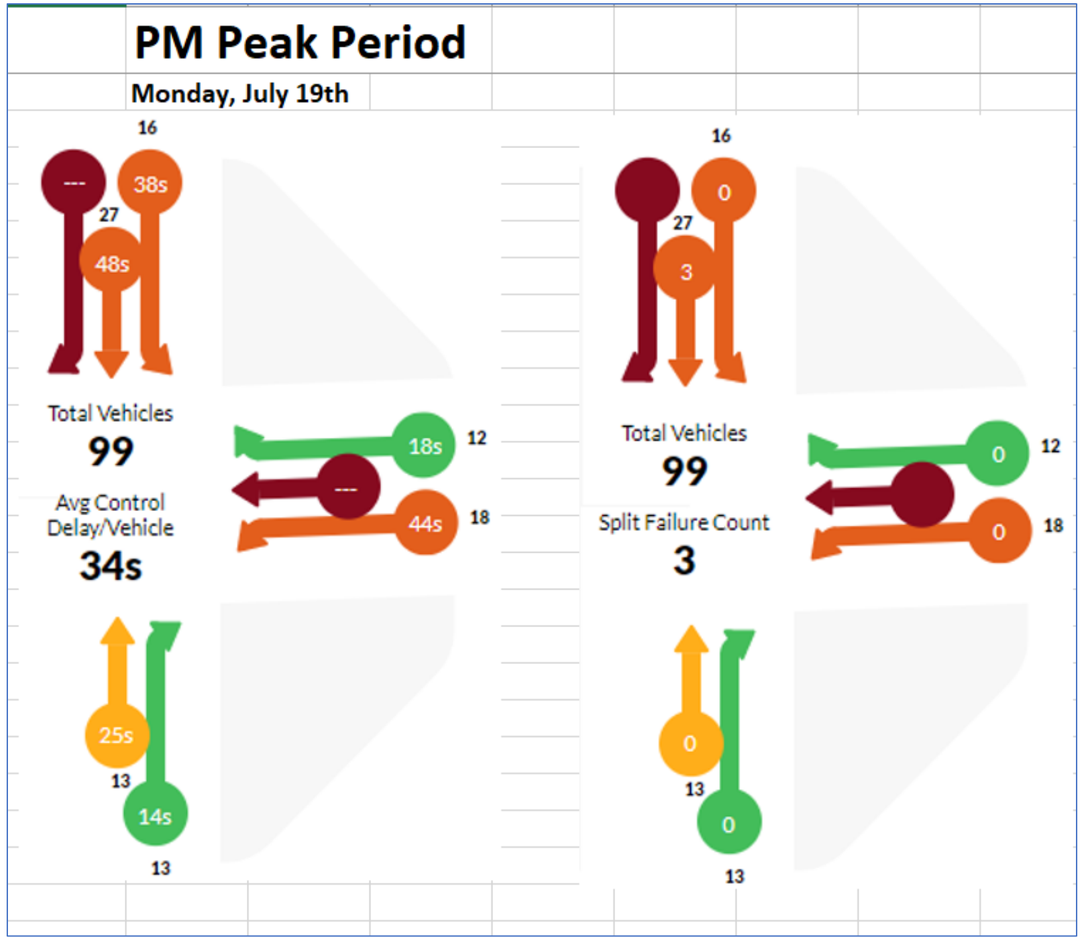
– concerned citizen phone call



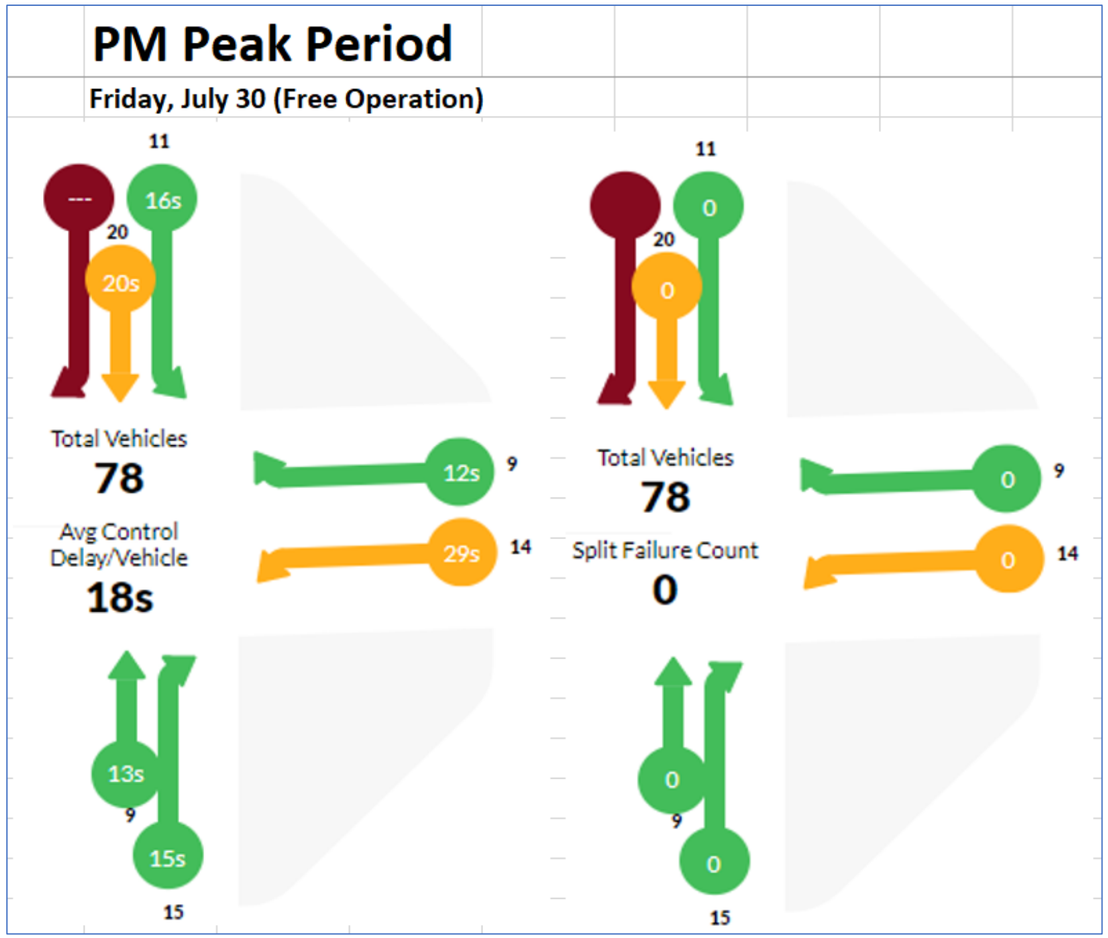
Use Case #3 – Washington County – Customer Complaint Response

Leveraged Signal Analytics to Investigate a Customer Complaint

Before Adjustment



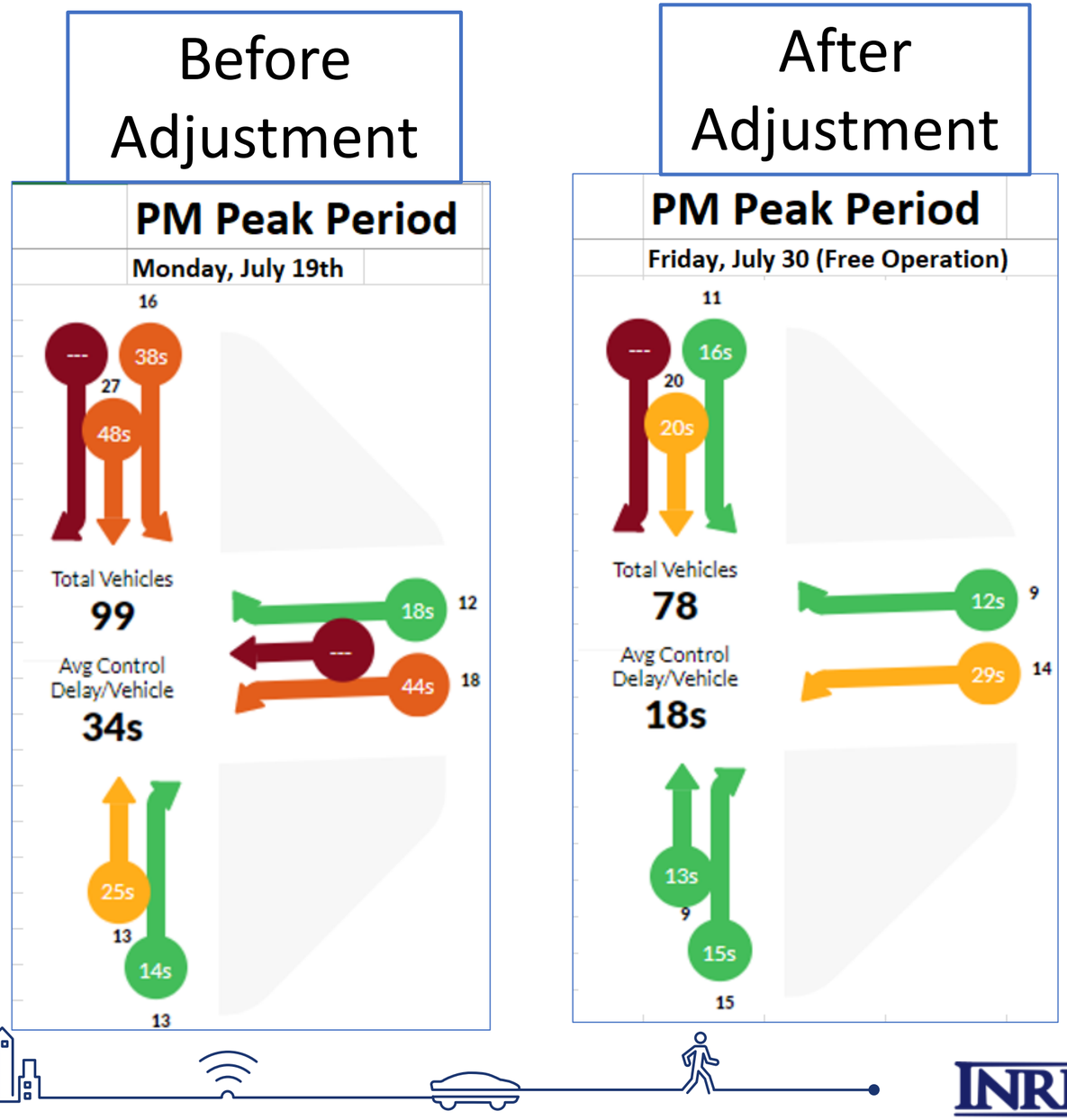
After Adjustment



Washington County Energy Calculator Example

https://inrix.com/green-calculator/

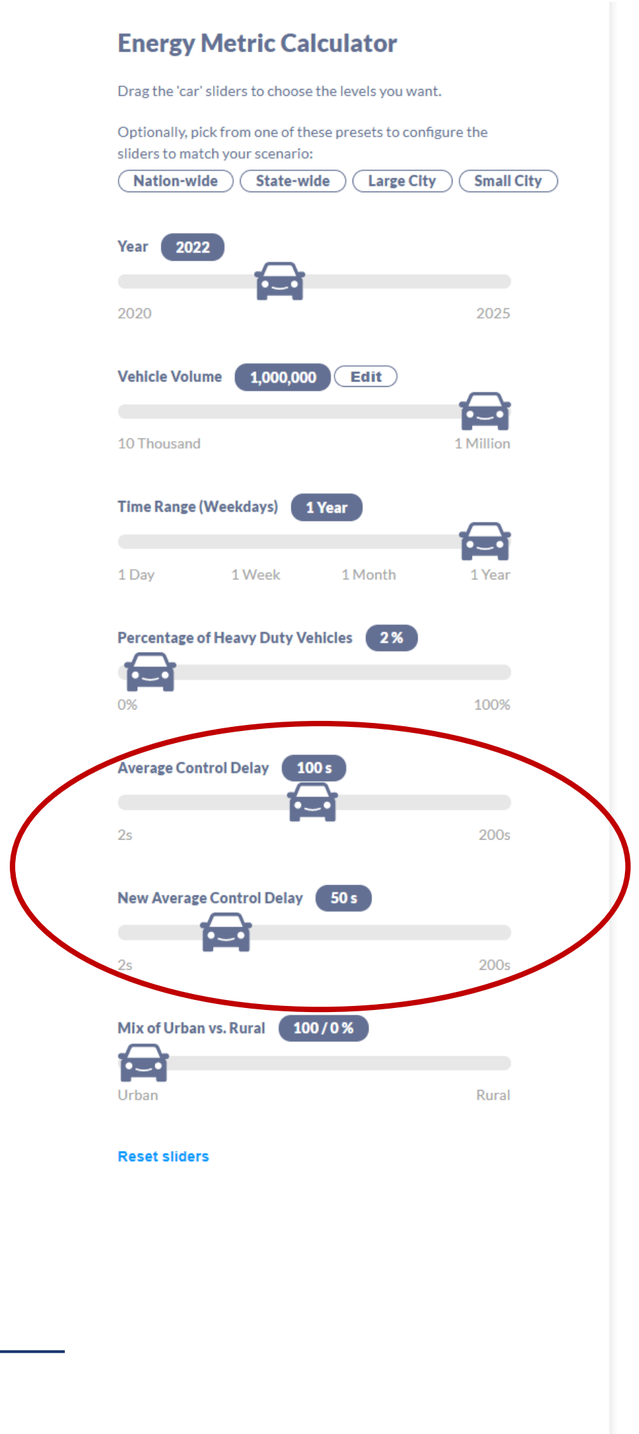
- Using the energy metric calculator on the Washington County example above, there would be a projected annual savings of:
  - 6,160 **vehicle hours** saved,
  - Over 2,195 **gallons of fuel** saved.
  - Over 22 tons of **carbon dioxide equivalents.**

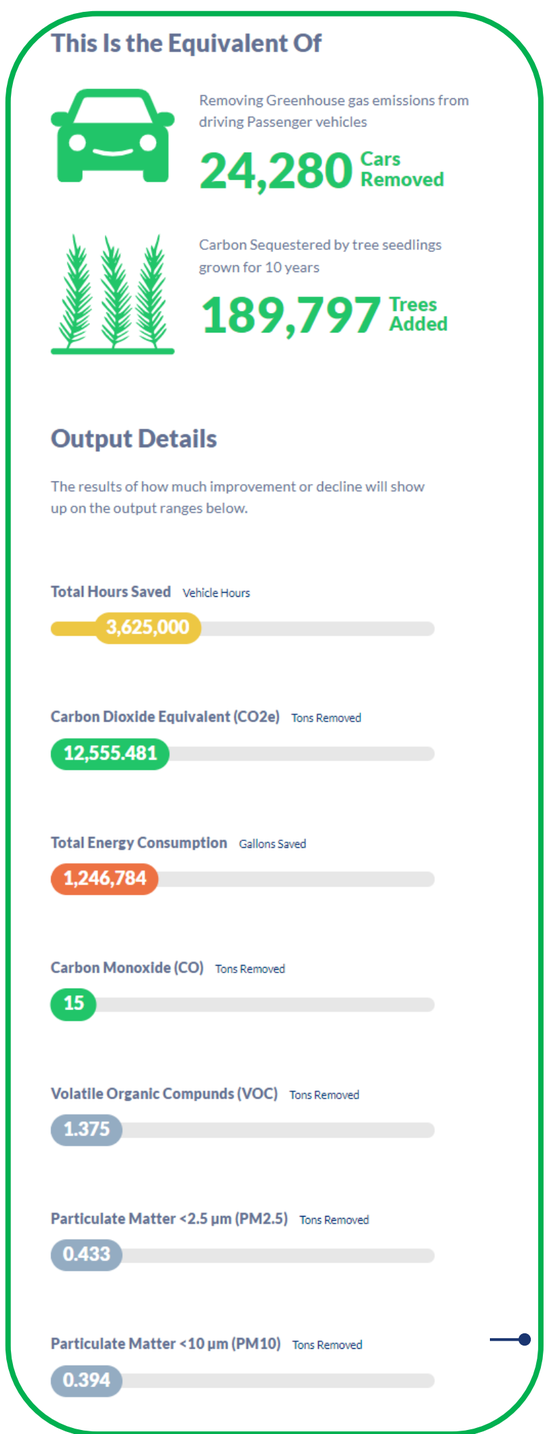


Energy Metric Calculator

- Uses the following inputs:
  - Assumed Fleet Year
  - Vehicle Volume
  - Percentage of Heavy Duty Trucks
  - Initial Average Control Delay
  - Final Average Control Delay
  - Urban or Rural Environment

- To Calculate:
  - Total Hours Saved
  - Carbon Dioxide Equivalents
  - Total Fuel Savings
  - Other GHG reductions

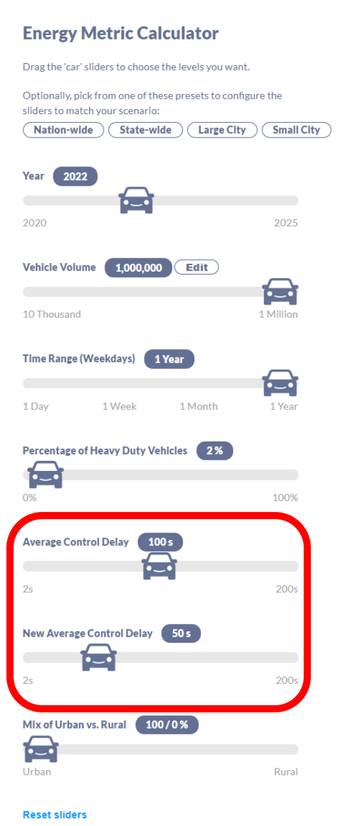


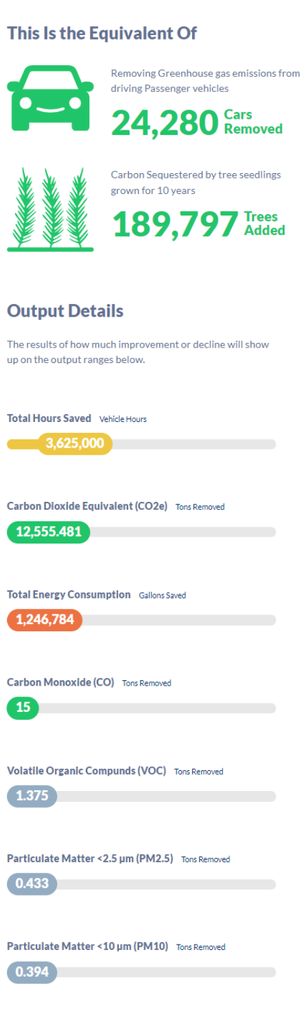


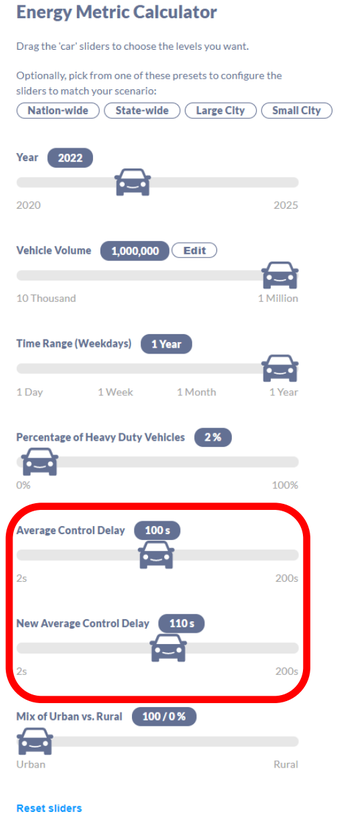
Tell a Green Story for Traffic Signal Investments

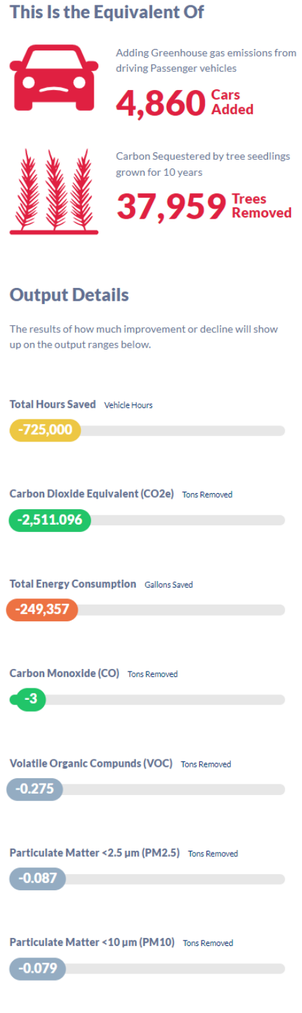
https://inrix.com/green-calculator/

- Any Treatment that Measurably Reduces Intersection Control Delay
- Use INRIX Signal Analytics Tool to Objectively Measure & Document
- Can show environmental impact of lack of investment via degrading delay too.









Catch Contractor Damaged Detection

Intersections: Top 5 Control Delay Issues	2022-02-19	24 Hrs		
Worsened Control Delay (Total)	4-wk Avg	2022-02-19	Change	
1 Tualatin Sherwood & Pacific Hwy 99	672.6h C	957h D	+284.5h	+42%
2 Murray Blvd & Walker Rd	328.2h C	381.2h C	+53.1h	+16%
3 Scholls Ferry Rd & Murray Blvd	442.2h C	470.4h C	+28.2h	+6%
4 Scholls Ferry Road & Roy Rogers Road	179.4h C	205.6h C	+26.1h	+15%
5 Baseline Rd & 185th Ave	369.4h C	394.4h C	+24.9h	+7%

Intersections: Top 5 Control Delay Issues	2022-02-20	24 Hrs		
Worsened Control Delay (Total)	4-wk Avg	2022-02-20	Change	
1 Tualatin Sherwood & Pacific Hwy 99	423.2h C	658.6h D	+235.4h	+56%
2 Greenburg Rd & Washington Square Rd	98.8h B	151.9h C	+53.1h	+54%
3 Hall Blvd & Scholls Ferry Rd	298.3h C	338.2h D	+39.9h	+13%
4 Scholls Ferry Road & Roy Rogers Road	135.1h B	171.2h C	+36.2h	+27%
5 185th Ave & Walker Rd	215.8h C	242.8h C	+27h	+13%

Thanks Shaun,

Looks like the project damaged loops on one side of the split phase and because they share time its starving the other side.

I'll follow up with Matt Meier. And keep you cc'ed.

Patrick Mahedy
Signal Manager (Central), ODOT Region 1
123 NW Flanders St, Portland OR 97209

Subject: FW: [EXTERNAL] Your Signal Performance Report by INRIX | 2022-02-19
Hi Pat,

FYI, something to monitor. Not sure if the increase in delay (+42%) at 99W/TSR on Saturday was related to a kno
event. Whenever we see delay at +30% for multiple days we start to pay attention as there could be an issue wit

Quantify Value of Detection

	Worsened Control Delay (Per Vehicle)	4-wk Avg		2022-04-05		Change	
1	Durham Road & Upper Boones Ferry Road	33s	C	52s	D	+18s	+55.2%
2	Upper Boones Ferry & South 72nd Avenue	8s	A	23s	C	+16s	+202.5%
3	Upper Boones Ferry & Sequoia Pkwy	14s	B	28s	C	+13s	+93.8%
4	Durham Road & 79th Ave	9s	A	17s	B	+8s	+92.8%
5	Murray Blvd & Walker Rd	35s	D	42s	D	+7s	+20.1%

Highway Construction Spillback

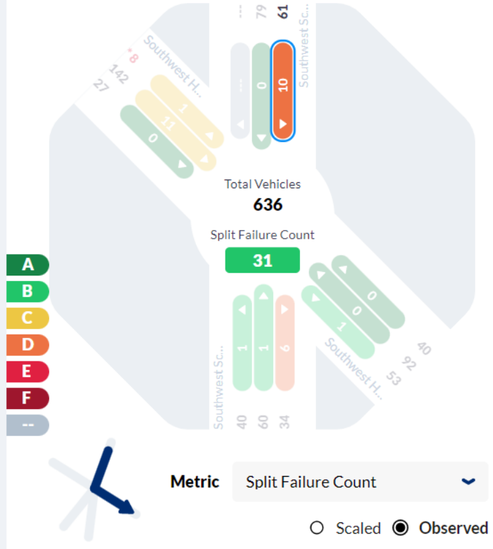
Source = Portland Tribune, https://pamplinmedia.com/sg/77-news/537674-430630-officials-tout-highlights-of-highway-217-improvements

Intersection_Performance_Reports_Washington_Co_OR_2022-04-15_to_2022-04-16 2022-04-15 **Time Range Display** 24 Hours **Filter** Enter Keyword ◉ Observed ○ Scaled **Edit Columns** Do

Intersection	ID	Split Count
Hall Blvd & Scholls Ferry Rd	45.4568_-122.7824	31
Durham Road & Upper Boones Ferry Road	45.4022_-122.7525	18
185th Ave & Evergreen Pkwy	45.5382_-122.8675	15
Cornell Rd & 48th Ave - Costco	45.5336_-122.9338	14
Tualatin Sherwood & 115th Avenue	45.3711_-122.7956	11
Baseline Rd & 185th Ave	45.5156_-122.8675	11
Tualatin Sherwood-Nyberg & Cabelas-FredMeyers	45.3827_-122.7560	10
Murray Blvd & Jenkins Rd	45.5039_-122.8267	10
Cornell Rd & Brookwood Pkwy	45.5327_-122.9381	9
Murray Blvd & Allen Blvd	45.4765_-122.8261	8
185th Ave & Tanasbourne Dr	45.5362_-122.8675	6
Greenburg Rd & Washington Square Rd	45.4459_-122.7764	5
Barnes Rd & Baltic Ave	45.5100_-122.7754	5
Day Road & Boones Ferry Road	45.3404_-122.7736	4
Tualatin Sherwood & Pacific Hwy 99	45.3700_-122.8432	4
Tualatin Sherwood & Avery Street	45.3727_-122.7922	4
Tualatin Sherwood Road & Martinazzi Avenue	45.3815_-122.7590	4
Teal Boulevard & Murray Boulevard	45.4407_-122.8260	4

Diagram | List | Approaches | **Movements**

Hall Blvd & Scholls Ferry Rd



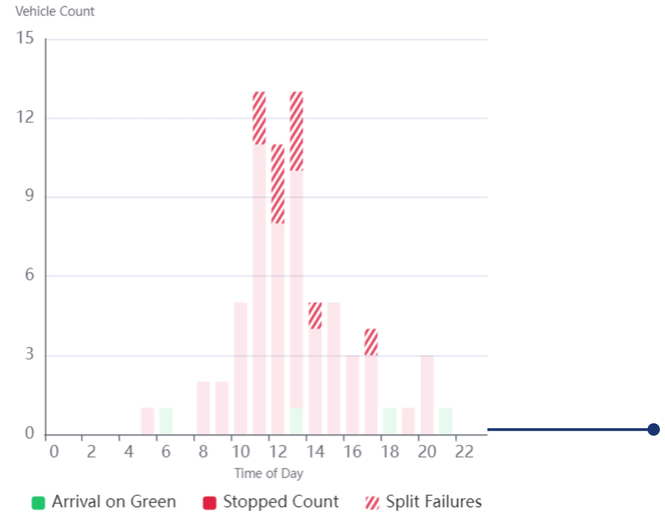
Metric Split Failure Count

○ Scaled ◉ Observed

Count Stats | Time Stats

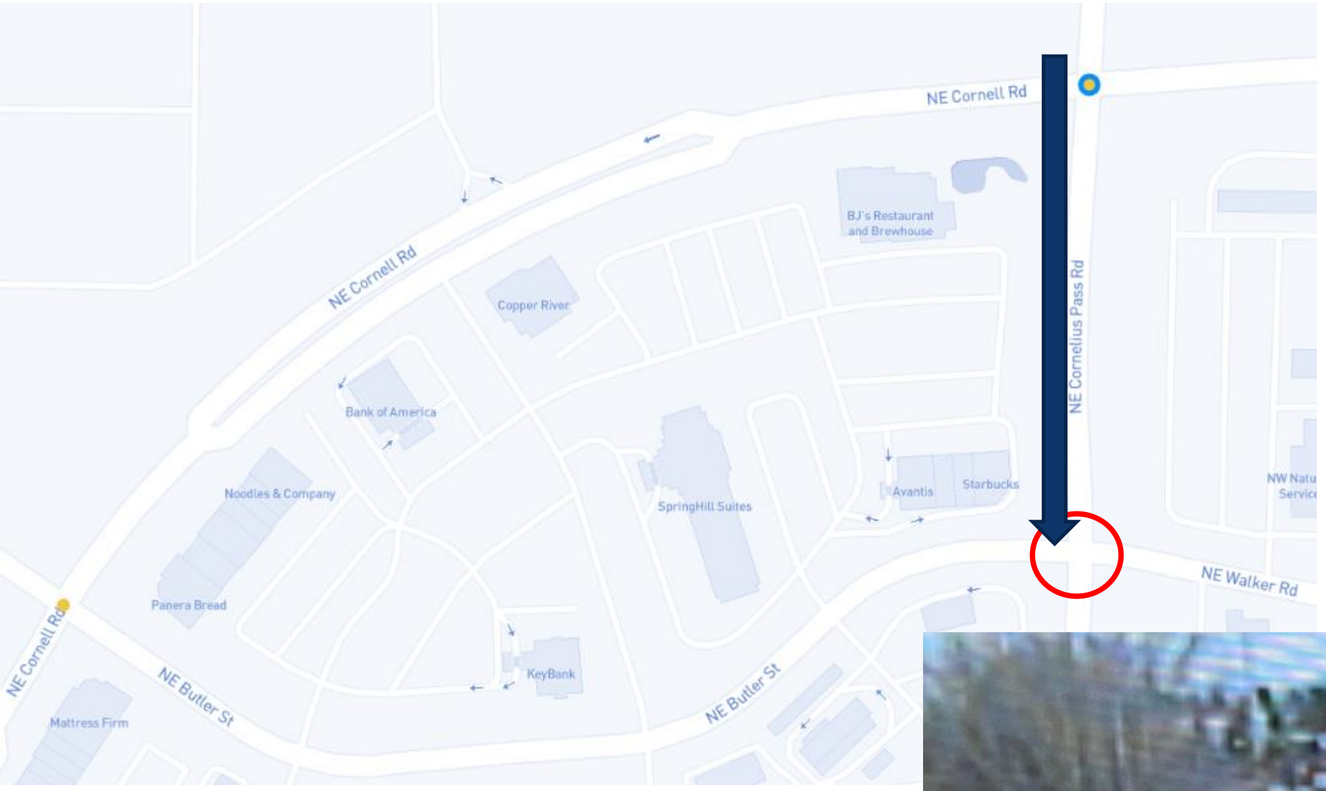
Percent on Green	7 %	vs	4wk Average	10 %	Change - 35.5%
Split Failures	10	vs	4wk Average	2.0	Change + 400%
Vehicle Count	61	vs	4wk Average	44.0	Change + 17
Stopped Count	57	vs	4wk Average	39.0	Change + 18

Resolution: Hourly

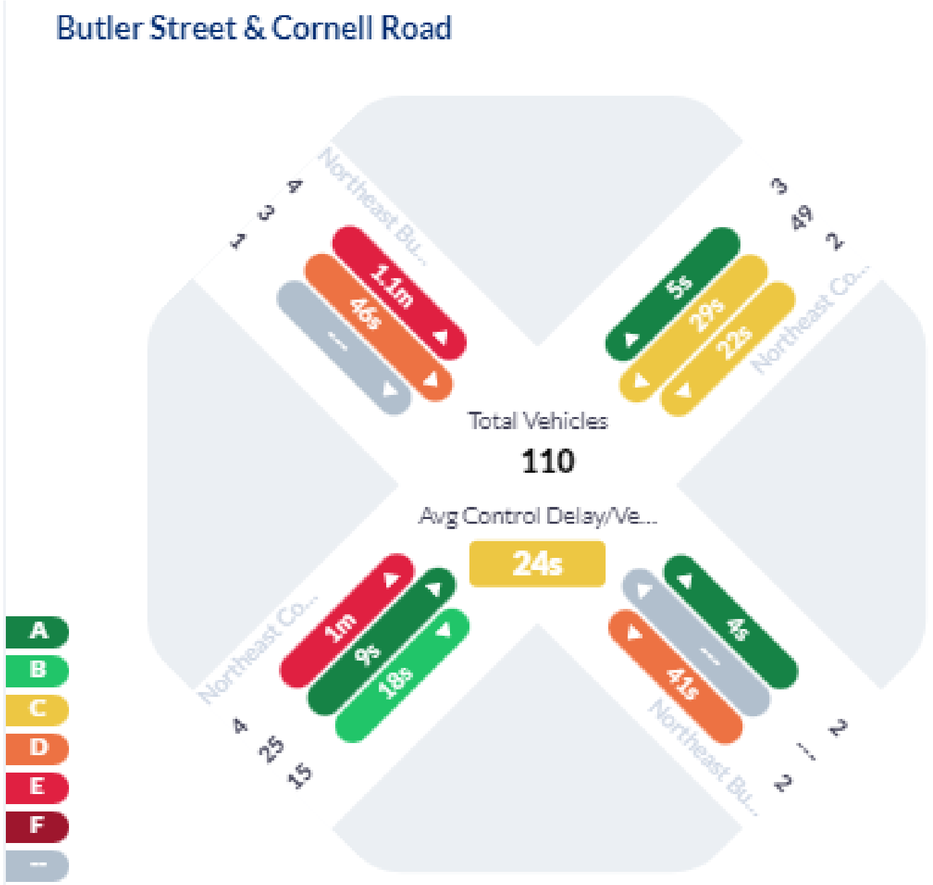


INRIX

Queue Spillback Issue from missing intersection



Crash Example – Feb 19 @ 5pm

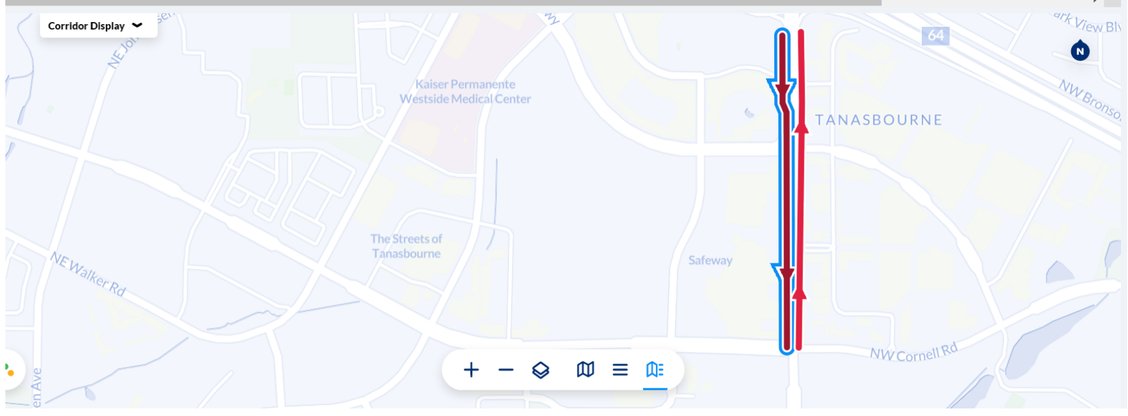


Travel Time Index – Safety Proxy for Congestion Crash Exposure

Normalized TT/Free Flow

Time Range Display 05/23/2022 TO 05/29/2022, Weekdays, 24 Hours Filter Enter Keyword Edit Columns Download

NAME	DIRECTION	LENGTH	TOTAL VEHICLES	AVG TT	FREE FLOW TT	TT INDEX
SB 185th - US 26EB to Cornell	South	2262.77 ft	982	1.9m	36s	3.20
TSR- Boones Ferry to I-5 South	East	0.55 mi	1339	2.3m	50s	2.74
TSR- I-5 South to Boones Ferry	West	0.57 mi	1377	2.3m	52s	2.63
Upper Boones Ferry- I-5 SB/Carmen to Durham	Southwest	0.52 mi	203	2.3m	55s	2.45
NB 185th - Cornell to US 26EB	North	2288.71 ft	895	1.4m	35s	2.42
Upper Boones Ferry- Durham to I-5 SB/Carmen	Northeast	0.51 mi	106	1.5m	36s	2.41
WB Cornell - Saltzman to Murray	West	0.57 mi	325	2.4m	59s	2.40
Walker WB - Park Way to 158th	Northwest	1.16 mi	388	3.8m	1.8m	2.06
EB Cornell - Murray to Saltzman	East	0.63 mi	207	2.8m	1.4m	2.04
Basalt to Grahams to Day to Boones	Southeast	1.21 mi	546	3.8m	2m	1.91



Count Stats | Time Stats

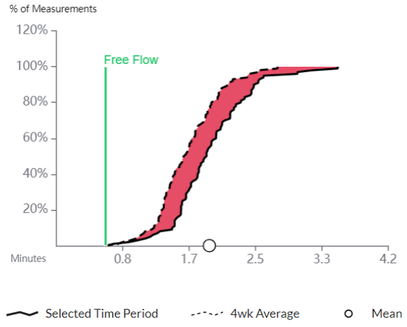
SB 185th - US 26EB to Cornell

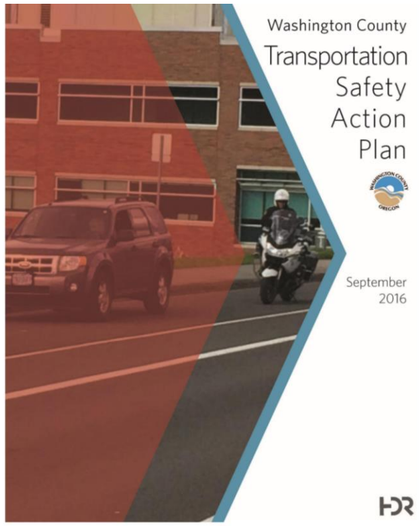
Length: 2262.77 ft
Free-flow: 36s

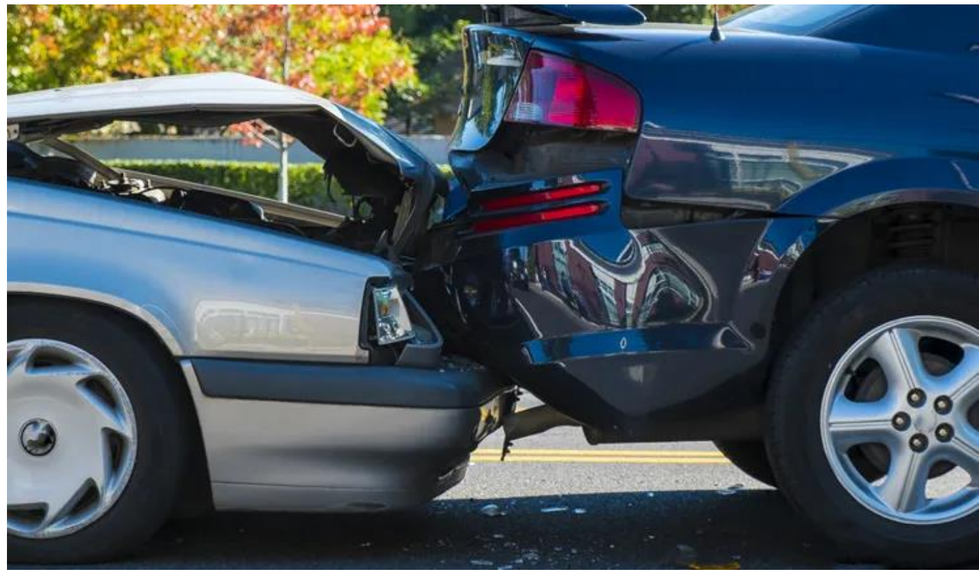
Metrics for Selected Time Period

		4wk Average	Change	
Average Travel ...	1.9m	1.7m	16s	+16.5%
Travel Time Ind...	3.20x	2.87x	0.33x	+11.6%
Planning Time I...	5.75x	5.38x	0.37x	+6.84%

Metric: Travel Time CDF | TT Over Time

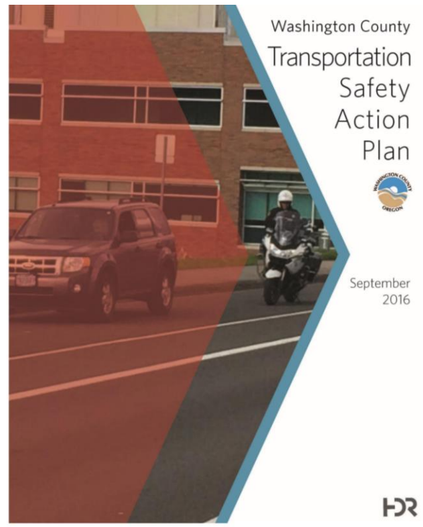






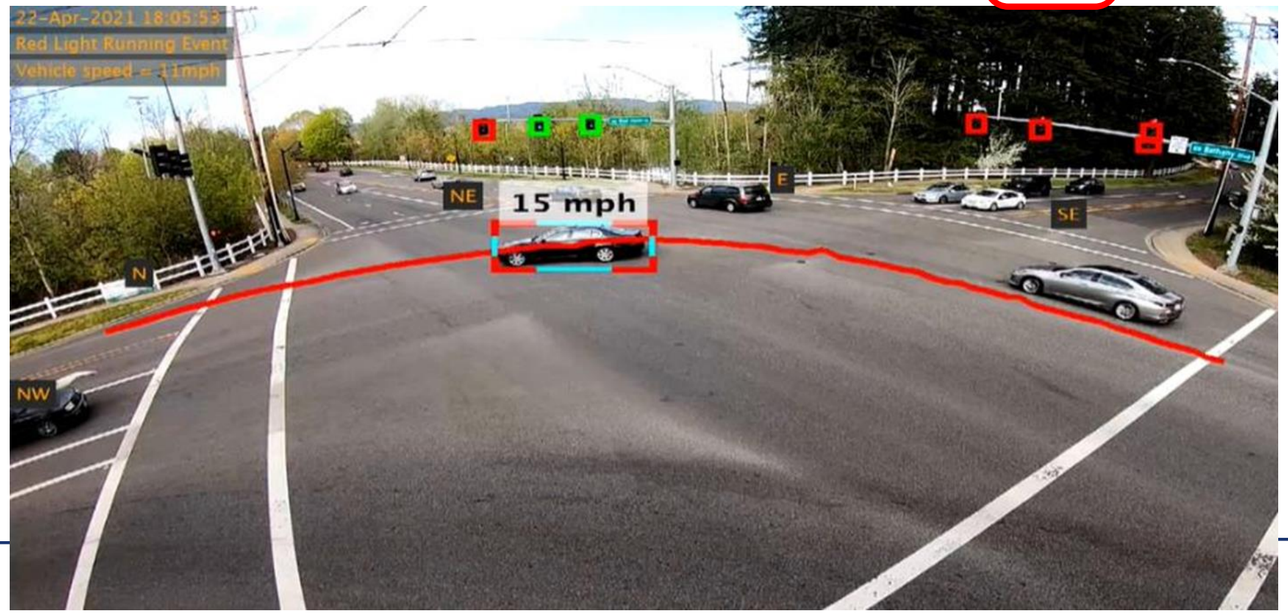
Source = https://www.driversalert.com/common-causes-of-rear-end-collisions/

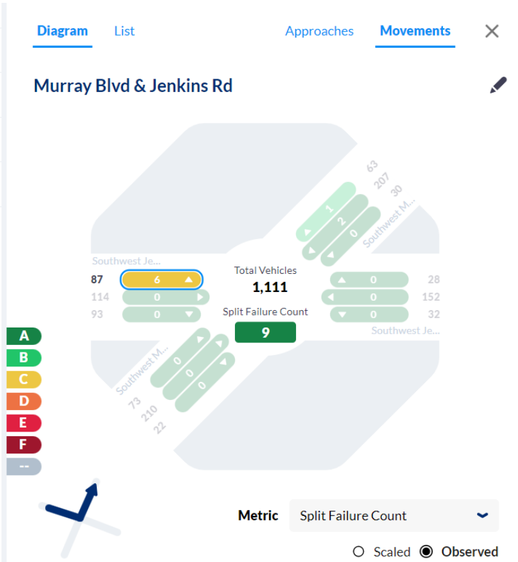
Split Failures – Safety Proxy for Red Light Running

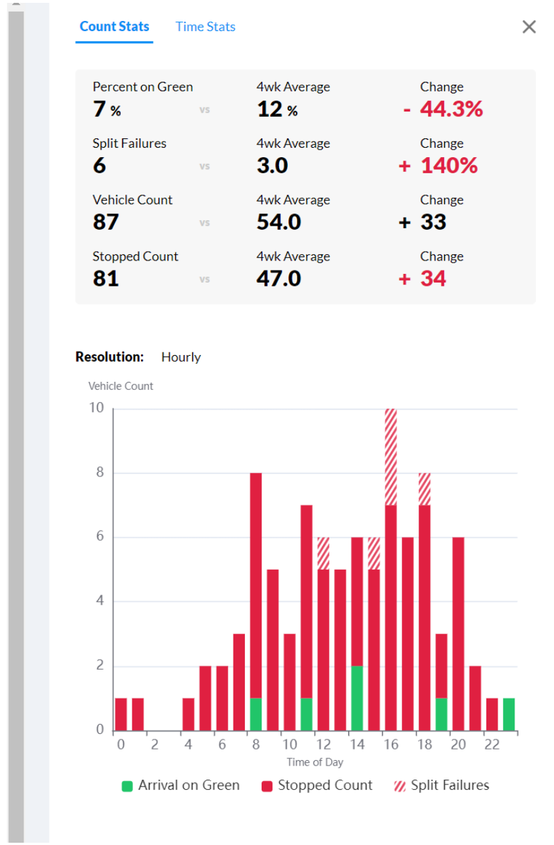


Time Range Display 06/02/2022 24 Hours | Filter | Enter Keyword | Observed | Scaled | Edit Columns | Download

Intersection	ID	Split Count	Split %
Cornell Rd & Brookwood Pkwy	45.5327_-122.9381	11	0.97%
185th Ave & Evergreen Pkwy	45.5382_-122.8675	11	1.07%
Murray Blvd & Jenkins Rd	45.5039_-122.8267	9	0.81%
Tualatin Sherwood Road & Boones Ferry Road	45.3812_-122.7643	8	0.7%
Hall Blvd & Scholls Ferry Rd	45.4568_-122.7824	8	1.08%
Murray Blvd & Allen Blvd	45.4765_-122.8261	7	0.99%
Barnes Road & Catlin Gable	45.5086_-122.7682	7	1.96%
Cornell Rd & 48th Ave - Costco	45.5336_-122.9338	7	1.09%
Baseline Rd & 185th Ave	45.5156_-122.8675	6	0.64%
185th Ave & Tanasbourne Dr	45.5362_-122.8675	6	0.99%
Tualatin Sherwood Road & Martinazzi Avenue	45.3815_-122.7590	5	0.44%







Washington County Next Steps

- Finish Comparison Report
- Expand Analysis by Adding Corridors (& Intersections)
- Compare INRIX SPMs to Q-Free Kinetics SPMs?
- Discuss Benefit/Cost for Regional INRIX Subscription through Metro or Grant $?

Questions & Discussion

Cadell Chand

Cadell chand@co.washington.or.us

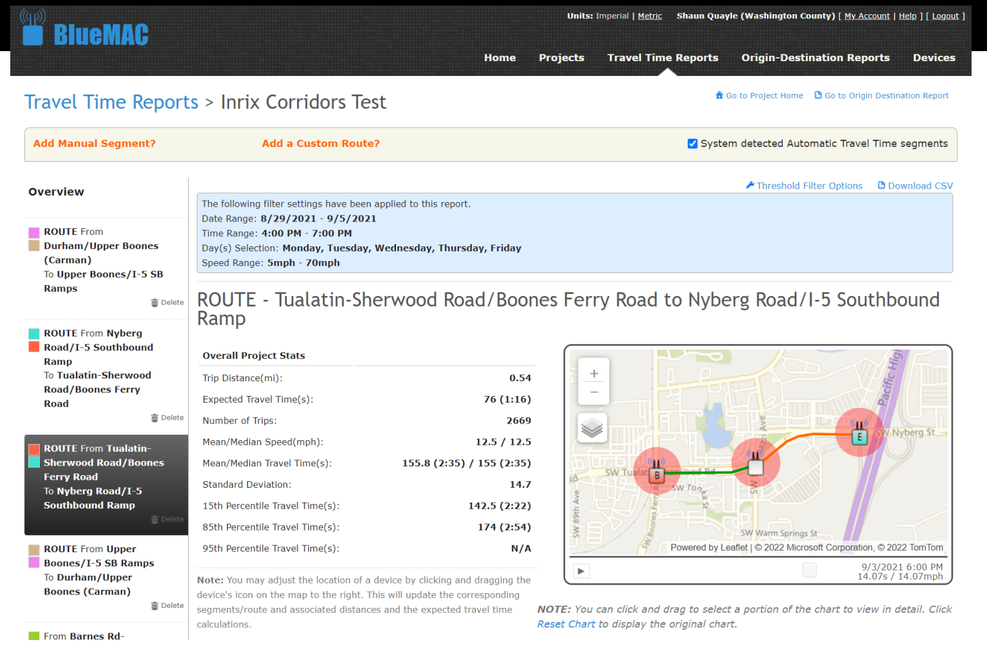
Shaun Quayle, P.E.

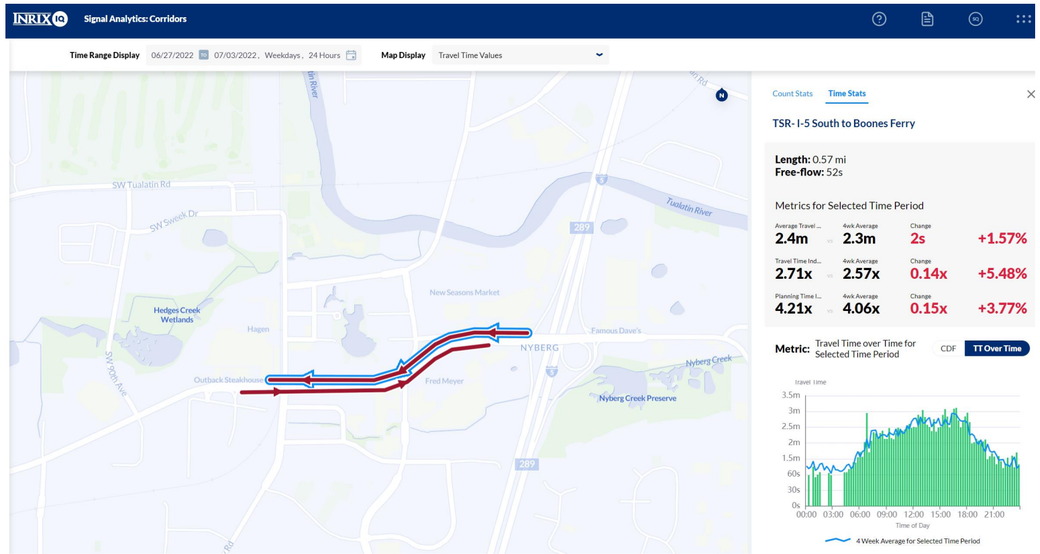
Shaun.quayle@inrix.com

Terri Johnson

Terri.johnson@inrix.com

Please Reach Out… Demonstration & Discussions Available





Land Use & Transportation
Shaun_quayle@co.Washington.or.us