Technical Report

Professional Services
Delaware Valley Regional Planning Commission
New Jersey Traffic Signal Retiming Initiative

Princeton-Hightstown Road
Mercer County Route 571

From Old Trenton Road (CR 535) to
Clarksville Road/Grovers Mill Road (CR 638),

In East Windsor Township and West Windsor Township, Mercer County, NJ

May 2022

Prepared For:

Prepared By:

I. Summary

A. *Project Overview*

Under contract with Delaware Valley Regional Planning Commission (DVPRC), in cooperation with Mercer County and the New Jersey Department of Transportation, the Taylor Wiseman & Taylor (TWT) project team has completed traffic signal retiming work at six (6) signalized intersections along Princeton-Hightstown Road (Mercer County Route 571), in East Windsor and West Windsor Townships, Mercer County. This work started in May 2018, following completion of Phase 1 of the contract which evaluated candidate corridors within Mercer County and established a consensus priority list. In accordance with the process jointly established by DVRPC, Mercer County and the TWT team, updated timing plans, including adjustments to cycle lengths, splits, and offsets, as well as the introduction of additional time-of-day coordination patterns, were implemented by April 6, 2022.

Photo 1: WB approach at Clarksville-Grover Mill Road

This project involved extensive traffic data collection, including automatic traffic recorder counts, peak hour turning movement counts, controller assessments and 'before' travel time runs. The collected data was analyzed using traffic engineering software including Synchro™ and Tru-Traffic™. New timing plans were developed for the corridor, which were implemented by the consultant team in April 2022. Fine-tuning and field observations were conducted throughout implementation, resulting in minor timing changes to those initially implemented. Final travel time runs were completed, and comparisons made to the 'before' condition. This report summarizes the activities, observations and results of this project.

B. *Results*

With implementation of the 1) updated timing plans, and 2) modifications to the corridor's time-of-day schedule, the TWT team has documented significant reductions in corridor travel times and delay. The TWT team reduced overall weekday morning, mid-day, evening and weekend mid-day peak travel times by 11%, 9%, 15%, and 16%, respectively. Cumulative Delay on the corridor was impacted more dramatically, as overall weekday morning, mid-day, evening and weekend delays were reduced by 44%, 47%, 42% and 65%. Summary results for the corridor are presented in **Table 1**. Detailed results, showing a further breakdown of this data is presented later in this report. The Tru-Traffic™ comparison (before retiming/after implementation) reports for the weekday morning, mid-day and evening, as well as Saturday peak hours are presented in **Appendix A**.

Cumulative delay was reduced on the corridor 65% during the Weekend Mid-Day Peak

Table 1
Before Retiming/After Implementation Results for Princeton-Hightstown Road (CR 571)
East & West Windsor Townships, Mercer County, New Jersey
(Old Trenton Road to Clarksville Road/Grover Mill Road))
Hamilton Township, Mercer County

Time Period	Travel Time (% Difference)			Cumulative Delay (% Difference)		
	EB	WB	Combined	EB	WB	Combined
Weekday AM	-9%	-13%	-11%	-36%	-48%	-44%
Weekday Mid-Day	-8%	-11%	-9%	-39%	-59%	-47%
Weekday PM	-14%	-15%	-15%	-43%	-42%	-42%
Saturday Mid-Day	-13%	-19%	-16%	-53%	-73%	-65%

C. Project Description

Princeton-Hightstown Road, Mercer County Route 571, is an urban principal arterial with a west to east (primarily) orientation. Within the project area, the roadway is known as Princeton-Hightstown Road. The corridor project limits extend 3.42 miles along County Route 571 (Princeton-Hightstown) from Old Trenton Road (CR 535) at the eastern limit to Clarksville-Grovers Mill Road at the western limit.

The project corridor starts in East Windsor Township with one signal, and the remaining five signals reside in West Windsor, Mercer County. US Route 1 is less than two miles from the Clarksville Road intersection, with two access points from Princeton-Hightstown Road. The Hightstown Bypass (Route 133) is located at the southern limit of the corridor. The bypass provides access to Route 130, Route 33, and the New Jersey Turnpike (I-95). Land use along Princeton-Hightstown Road (CR 571) is primarily residential, although there are some commercial uses. Speed limits along the corridor vary from 40 to 50 miles per hour.

Residential neighborhoods primarily populate the stretch of the Princeton-Hightstown Road corridor. West Windsor-Plainsboro High School South is positioned on the west end of the corridor at the intersection with Clarksville-Grover Mill Road. Primary access point to the school exists on Clarksville-Glover Mill Road, with secondary access points in and out of the school along Princeton-Hightstown Road as well as Penn Lyle Road. At the intersection of Bernt Midland Boulevard, to the northwest, resides the West Windsor Community Park. This park houses several forms of athletic fields, a dog park, a skate park and a waterpark. The northwest quadrant of the CR 571/Southfield Road intersection is occupied by a community shopping center. Toward the eastern limit of the project corridor, land use is a mixed bag of residential, retail, commercial/retail and industrial.

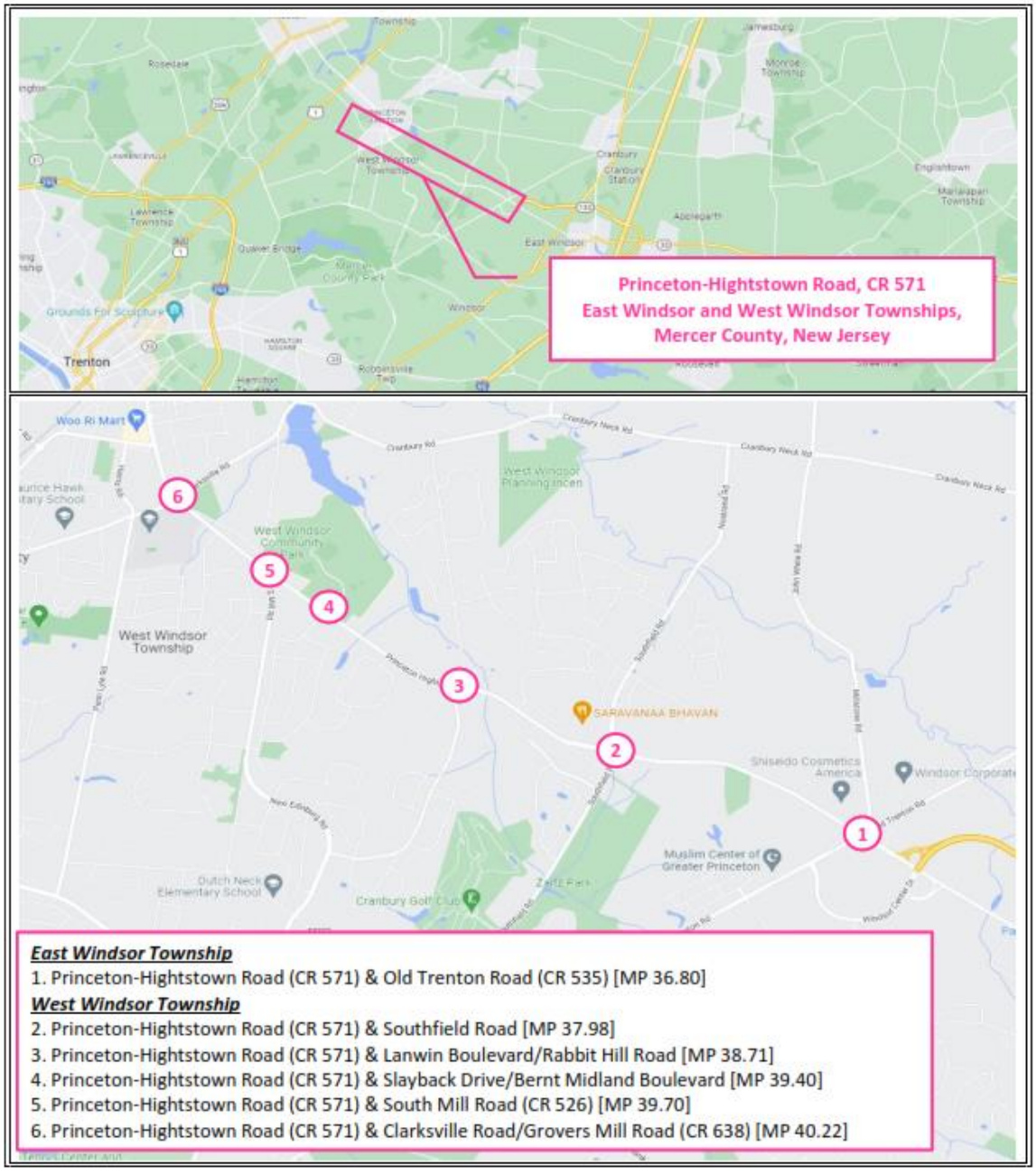
Within the project limits, six (6) signalized intersections exist. The following is a list of signalized intersections within the project limits:

1. Princeton-Hightstown Road (CR 571) & Old Trenton Road (CR 535)[MP 36.80]
2. Princeton-Hightstown Road (CR 571) & Southfield Road [MP 37.98]
3. Princeton-Hightstown Road (CR 571) & Lanwin Boulevard/Rabbit Hill Road [MP 38.71]
4. Princeton-Hightstown Road (CR 571) & Slayback Drive/Bernt Midland Boulevard [MP 39.40]
5. Princeton-Hightstown Road (CR 571) & South Mill Road [MP 39.70]
6. Princeton-Hightstown Road (CR 571) & Clarksville-Grovers Mill Road (CR 638) [MP 40.22]

The project corridor location is shown in **Exhibit 1**.

Exhibit 1 – Project Corridor Location and Intersections

LOCATION MAP
DVRPC NEW JERSEY SIGNAL TIMING INITIATIVE
CR 571 - PRINCETON-HIGHTSTOWN ROAD
EAST WINDSOR TOWNSHIP & WEST WINDSOR TOWNSHIP, MERCER COUNTY



East Windsor Township
1. Princeton-Hightstown Road (CR 571) & Old Trenton Road (CR 535) [MP 36.80]

West Windsor Township
2. Princeton-Hightstown Road (CR 571) & Southfield Road [MP 37.98]
3. Princeton-Hightstown Road (CR 571) & Lanwin Boulevard/Rabbit Hill Road [MP 38.71]
4. Princeton-Hightstown Road (CR 571) & Slayback Drive/Bernt Midland Boulevard [MP 39.40]
5. Princeton-Hightstown Road (CR 571) & South Mill Road (CR 526) [MP 39.70]
6. Princeton-Hightstown Road (CR 571) & Clarksville Road/Grovers Mill Road (CR 638) [MP 40.22]

All six intersections are included in the retiming work effort. Each of the six project intersections have an electrical plan and layout plan, issued by Mercer County Engineering Department. The existing day plan schedule for the project intersections was straightforward: the six signals under Mercer County jurisdiction operated with a single "free" plan 24 hours a day, 7 days per week. The existing timing directives for each intersection are shown in **Appendix B.**

II. Data Collection

A. Turning Movement Counts

Peak hour intersection counts were conducted at the project intersections during the weekday morning (7:00 AM to 9:00 AM), weekday mid-day (12:00 PM to 2:30 PM) and evening (3:30 PM to 7:00 PM) peak hour periods. Saturday counts were taken between 10:00 AM to 2:00 PM. The manual turning movement counts were taken on Saturday, October 2, 2021 and Tuesday, October 5, 2021 by the TWT team. The TMCs are available on the project website, http://www.dvrpc.taylorwiseman.com/.

B. Automatic Traffic Recorder (ATR) Counts

In September/October 2021, automatic traffic recorder counts were taken by the TWT team as presented in Table 2:

Table 2
2021 Average Daily Traffic
Princeton-Hightstown Road
East & West Windsor Townships, Mercer County, New Jersey

Location	Average Daily Traffic
Princeton-Hightstown Road, west of Windsor Drive, EB traffic	10,992 vehicles
Princeton-Hightstown Road, west of Windsor Drive, WB traffic	9.701 vehicles
Total ADT	**20,693 vehicles**
Princeton-Hightstown Road, west of Bentley Drive, EB traffic	8,536 vehicles
Princeton-Hightstown Road, west of Bentley Drive, WB traffic	9,273 vehicles
Total ADT	**17,809 vehicles**
Princeton-Hightstown Road, west of Old Trenton Road, EB traffic	9,039 vehicles
Princeton-Hightstown Road, west of Old Trenton Road, WB traffic	9,212 vehicles
Total ADT	**18,251 vehicles**

The twenty-four hour counts clearly show the fluctuation of traffic volumes the project corridor experiences on any given day. The western segment (in the vicinity of the West Windsor Plainsboro High School) of the corridor experiences about 10 percent more traffic as the eastern section of the corridor. The automatic traffic recorder counts are available on the project website: http://dvrpc.taylorwiseman.com/.

C. *Travel Time Runs*

Travel time runs were collected within the project area both before and after initial timing plan implementation. Using a GPS enabled laptop and the software Tru-Traffic™, trip logs were recorded along eastbound and westbound Princeton-Hightstown Road. Tru-Traffic™ was also utilized during implementation to fine-tune splits and offsets.

D. *Traffic Signal Timing and Phasing Data*

Traffic signal timing and phasing data were obtained from the Mercer County Engineering Office for the project corridor. As noted previously, the existing timing directives are presented in **Appendix B**. Movement, sequence, and timing information, as well as various NEMA settings and time of day/date were field verified in the existing controllers. The controller units were set to universal time utilizing smart phone applications and time variances were noted.

E. *Field Review of Existing Operations*

Field notes were collected at each of the locations on various intersection, signal, and traffic characteristics to assist in model development and signal optimization. Information gathered included lane geometry, storage lengths, number and types of signal heads, cabinet and pedestrian push button locations, and signal phasing.

Posted speed limits, left turn types (protected, protected/permitted, or permitted), turn restrictions, and the presence of roadway lighting and signal back plates were noted. Vehicle detection was observed for proper operation, both on the street and in the cabinet. Pedestrian push buttons were tested for proper operation during the permit compliance. Any other unique characteristics were also recorded.

All Mercer County project corridor controllers are Econolite ASC/3-2100 in a NEMA TS-1 configuration. The field review identified points of concern at each project intersection regarding detection, time synchronization and pedestrian access. Specifically, these concerns include:

Photo 2: Controller Assembly at S. Mill Road

Princeton-Hightstown Road (CR 571) and Clarksville-Grovers Mill Road (CR 638):

- During the initial field view, the TWT team noticed that constant detection calls were placed for the left-turn phases on Princeton-Hightstown Road. This was reported to Mercer County and was corrected. The phasing at this intersection creates a yellow trap situation for the eastbound left-turn movement. When the permissive portion of the eastbound left-turn terminates, drivers may assume the westbound right-turn would be doing the same but the green arrow comes on with the yellow of Phase 4 (EB). To alleviate this situation Mercer County would have to reprogram/rewire the overlap to begin with ⌀1 green.
- The GPS in the cabinet is not functional and should be repaired.
- Time clock was reading 12/24/1971 on 11/23/2021. Time of day read 1550 at 0950 hours.
- Push button in the southwest quadrant is not placing a call in the controller cabinet.

Princeton-Hightstown Road (CR 571) and South Mill Road (CR 526):

- UPS in the cabinet was audibly beeping throughout the inspection, with the status showing "OFF".
- Pedestrian display on the northwest corner of the intersection for pedestrian ⌀4 is not displaying the countdown.
- There is no GPS or communication in the controller to ensure daily clock synchronization.
- Time clock was found to be 1 minute, 39 seconds slow compared to universal time.

Princeton-Hightstown Road (CR 571), Bernt Midland Boulevard/Slayback Drive:

- The advance eastbound left-turn phase (⌀1) is registering false calls. The video detection scheme should be adjusted to optimize the phase.
- There is no GPS or communication in the controller to ensure daily clock synchronization.
- Time clock was found to be 10 seconds fast compared to universal time.

Princeton-Hightstown Road (CR 571), Rabbit Hill Road and Lanwin Boulevard:

- Countdown on pedestrian display for pedestrian ⌀4 on southwest corner is not illuminating.
- There is no GPS or communication in the controller to ensure daily clock synchronization.
- Time clock was found to be five minutes, 23 seconds slow compared to universal time.

Princeton-Hightstown Road (CR 571) and Southfield Road:

- ⌀4 (southbound through traffic) and ⌀7 (southbound left-turn) are exhibiting constant calls in the controller, resulting in the side street utilizing all available time each cycle, regardless of vehicular/pedestrian demand. This dramatically impacts the efficiency of the intersection.
- There is no GPS or communication in the controller to ensure daily clock synchronization.
- Time clock was found to be 5 seconds slow compared to universal time.

Princeton-Hightstown Road (CR 571) and Old Trenton Road (CR 535)

- There is no GPS or communication in the controller to ensure daily clock synchronization.
- Time clock was found to be 41 seconds fast compared to universal time.

III. Analysis and Implementation

A. *Modeling*

The TWT team developed a set of base Synchro™ models for management of the new traffic data, initial analysis of the intersection with and without various timing changes and a screening level review of each intersection's overall potential for capacity-level improvements using the Intersection Capacity Utilization (ICU) Methodology. Microscopic simulation using SimTraffic™ was used to assess the impact of unmet demand, turn pocket overflow, metering and spillback, and the effects of origin-destination pairs. Tru-Traffic™ was used to assist in offset determination in order to assess early release issues created when minor phases gap out and unused cycle time is typically sent back to the coordinated phases.

It is important to note that the delay minimization focus of the optimization routine in Synchro™ is helpful to a point in deriving improved cycle lengths and splits; however, this method does not necessarily favor corridor progression and bandwidth requirements. After development of the base models and supplemental evaluations in SimTraffic™, the UTDF file transfer feature with various spreadsheets was used to create base Tru-Traffic™ models for more in-depth optimization. Synchro summary reports are available on the project website: http://www.dvrpc.taylorwiseman.com/.

B. *Implementation*

During the week between Saturday, April 2, 2022 and Saturday, April 9, 2022, the consultant team implemented the optimized timing plans into the Princeton-Hightstown Road coordinated section (Old Trenton Road to Clarksville Road/Grovers Mill Road). The consultant team verified that each controller maintained a common time standard.

For the most part the corridor was placed in coordinated operation from 7:00 AM to 7:30 PM, with an AM commuter peak (100 second cycle), mid-day peak (80 second cycle), PM commuter peak (100 second cycle) and PM off peak (80 second cycle) implemented. The implemented timing plans took into account the impacts of the West Windsor Plainsboro High School at the intersection of Clarksville Grover Mills Road (CR 571) and the project corridor. The intersection of Clarksville Grover Mills Road is placed into free during school ingress (7:00 AM to 7:30 AM) and egress (2:30 PM to 3:00 PM) times with different maximum times programmed into the controller.

On Saturday/Sunday, most of the project corridor operates in coordination. On Saturday, Princeton-Hightstown Road operates in coordination from 9:00 AM to 7:30 PM. (AM Saturday, 80 second cycle; mid-day Saturday, 90 second cycle and PM Saturday, 80 second cycle). On Sunday, the project corridor is in coordination between 10:00 AM and 6:30 PM. There are three coordinated programs: Sunday a.m (10:00 AM to 12:00 PM, 80 second cycle), Sunday afternoon (12:00 PM to 4:00 PM) and Sunday late-afternoon/evening (4:00 PM to 6:30 PM).

The intersection of Princeton-Hightstown Road (CR 571) and Old Trenton Road (CR 535) always operates in free mode. Phase timings, clearance intervals and pedestrian timings were updated during this project.

Details of the TWT team's deployment are provided in **Appendix C**.

C. *Fine-Tuning of Signal Timings*

The TWT team observed each new timing plan at every intersection during its respective peak hour to ensure each phase split was appropriate for the traffic conditions present. If a movement or intersection was over capacity, split adjustments were made to manage queue spillback and blockage.

In addition to fine-tuning splits, offset adjustments often have a larger effect on the performance of the corridor. Offsets were adjusted at the coordinated intersections by conducting field observations along the corridor. During implementation, the TWT team utilized Tru-Traffic ™ in conjunction with a direct connect GPS unit to observe the operation of the progressive system. TWT team engineers can track the system time as well as their location within the time-space diagram for any time period. This effort results in several minor adjustments to split and offset times during a time period.

The revised signal timings are available from the project website, http://www.dvrpc.taylorwiseman.com Updated signal timing directives were developed by the consultant team, with electronic and paper copies delivered to Mercer County and laminated copies placed in each controller.

IV. Results

A. *Before and After Data*

Photo 3: Looking WB at Southfield Road

Travel time data along the corridor was collected before and after implementation of the initial timing plans during the weekday morning, mid-day, evening and the weekend mid-day peak hour periods.

With implementation of the new timing plans and maintenance of a uniform time clock between controllers, progression along Princeton-Hightstown Road (CR 571) improved significantly, in both the eastbound and westbound directions. For all four peak hour periods, the implemented retiming is producing positive results and significant savings in travel time, delay, the number of stops, and travel speed in both directions. Refer to **Appendix A** for the travel time summary reports for the time periods. **Table 3** summarizes both the directional and cumulative summary of performance metrics collected on Princeton-Hightstown Road (CR 571).

Table 3
Coordinated Segment of Princeton-Hightstown Road (Mercer County Route 571)
Clarksville Grovers Mill Road(CR 638) to Old Trenton Road (CR 535)
East Windsor Township, West Windsor Township; Mercer County, New Jersey
Peak Hour Travel Time and Delay Comparison*—Before/After Optimized Signal Timings

Direction		AM Peak		Mid-day Peak		PM Peak		Weekend Mid-day Peak	
		Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)
Eastbound	Existing	333	48	336	53	337	40	330	37
	Implemented	304	31	309	32	288	23	288	17
	Difference	-29	-17	-26	-21	-49	-17	-42	-20
	% Difference	**-9%**	**-36%**	**-8%**	**-39%**	**-14%**	**-43%**	**-13%**	**-53%**
Westbound	Existing	371	71	329	42	341	43	360	56
	Implemented	322	37	293	17	289	25	293	15
	Difference	-49	-34	-36	-24	-51	-18	-67	-41
	% Difference	**-13%**	**-48%**	**-11%**	**-59%**	**-15%**	**-42%**	**-19%**	**-73%**
Both Directions	Existing	353	60	332	47	339	41	345	47
	Implemented	314	34	302	25	289	24	291	16
	Difference	**-39**	-26	-31	-22	-50	-17	-54	-30
	% Difference	**-11%**	**-44%**	**-9%**	**-47%**	**-15%**	**-42%**	**-16%**	**-65%**

Eastbound: Clarksville Grovers Mill Road to Old Trenton Road
Westbound: Old Trenton Road to Clarksville Grovers Mill Road
**Value as reported in Tru-Traffic summary report. Rounding errors possible.*

B. Opportunities for Improvement

Princeton-Hightstown Road, Mercer County Route 571, had basic timing in-place at the start of this project. Maintenance of the signal system, as well as the on-street equipment was observed to be fair to good. Working with Mercer County Traffic Engineering, the Regional Signal Timing Initiative has shown significant benefit to updated traffic signal timing in reduced delay, travel time and stops by motorists. The updated timing scheme allows the traffic signal controllers an opportunity to better serve peak hour commuter as well as weekend traffic efficiently.

The DVRPC Regional Traffic Signal Timing Initiative has shown that significant improvement in traffic operations is possible with the introduction of new timing plans as well as a common time standard on the Princeton-Hightstown Road (CR 571) arterial. The TWT team recommends the following:

1. Regular surveillance and adjustment of controller clock time to ensure the individual controllers maintain a common time standard. Installation of GPS units in the cabinets would alleviate this need.
2. Review and verify all maintenance deficiencies identified earlier in this report, including issues with pedestrian and vehicular detection. Failed pedestrian detection is a foundation safety issue at traffic signals and failed/non-existent vehicular detection severely impacts intersection efficiency.
3. It may be necessary to revisit the intersection of Princeton-Hightstown Road and Clarksville-Grovers Mill Road during football season. It is unclear what impact a home football game may have on corridor traffic.
4. Timing plans on the corridor should be revisited within 3-5 years.
5. Mercer County should consider use of a GPS unit in all future cabinets, ensuring that the controller time clocks are synchronized with atomic time daily.

C. Additional Resources/Project Data

Additional information, including project data, analysis files, and other detailed reports will be available on the project website at: http://www.dvrpc.taylorwiseman.com/

Appendix A

Travel Time & Delay Report for Princeton-Hightstown Rd (CR 571) - AM Peak

Legend:

CTT:
Summarized Cumulative Travel Time since beginning of Run (seconds)

CPLSD:
Summarized Cumulative Posted Speed Limit Delay since beginning of Run (seconds)

CPLRT:
Summarized Cumulative Posted Speed Limit Running Time, or Travel Time since beginning of Run if maintaining Posted Speed Limit (seconds) = accumulation of DL/PLS since beginning of Run

CStopD:
Summarized Cumulative Stopped Delay since beginning of Run (seconds). The "Stopped Delay" is counted from when the speed drops below 5 mph after exceeding 15 mph until it exceeds 15 mph once again

CAS:
Summarized Cumulative Actual Average Speed since beginning of Run (mph) = CTL/CTT

CStops:
Summarized Cumulative number of Stops in Run. A "Stop" is counted when the speed drops below 5 mph after exceeding 15 mph

TV:
Summarized Through Volume (vph)

CPUFC:
Summarized Cumulative Fuel Consumption, from Penic & Upchurch model with TRANSYT7F-10 default coefficients (gal/hr) (= Cumulative (TL/5280*(0.51242*exp(0.024609*DS)/DS) + Delay/3600*(0.0468) + Stops*(3.8424*DS^1.657 + 1.681*DS^1.48922)/1.0E5)*TV)

CUFCOE:
Summarized Cumulative Carbon Monoxide Emissions using Synchro 7 formula (from unpublished Oak Ridge National Labs letter to Federal Highway Administration) and University of Florida model for Fuel Consumption (g/hr) (= Cumulative UFFC*69.9)

Cumulative Summary of runs Eastbound from Clarksville Grovers Mill Rd (CR 638) (#1)

10 Before-type runs, 5 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 11/23/21, over day(s) Tue, with starting times during 7:

10 After-type runs, collected Wednesday 04/06/22 to Tuesday 04/12/22, over day(s) Tue, Wed, with starting times during 7:02:24 AM to 8:4

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to Old Trenton Rd (CR 535) (#6)									
Average Before (n=10)	333	83	251	48	37.7	2	330	72.1	4514.9
Std Dev Before (n=10)	*48*	*48*	*0*	*36*	*5.9*	*1.2*	*330*	*14.3*	*725.3*
Average After (n=10)	304	53	251	31	40.5	1.2	330	61.9	3984.5
Std Dev After (n=10)	*17*	*17*	*0*	*16*	*2.2*	*0.4*	*330*	*5.5*	*198.3*
Difference	-29	-29	0	-17	2.8	-0.8	330	-10.2	-530.4
Std Dev Difference	*51*	*51*	*0*	*39*	*6.3*	*1.2*	*330*	*15.3*	*751.9*
% Difference	-9%	-35%	0%	-36%	7.50%	-40.00%	330	-14.20%	-11.70%

Cumulative Summary of runs Westbound from Old Trenton Rd (CR 535) (#6)

11 Before-type runs, 6 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 11/23/21, over day(s) Tue, with starting times during 6:

11 After-type runs, collected Tuesday 04/05/22 to Tuesday 04/12/22, over day(s) Tue, Wed, with starting times during 7:10:17 AM to 8:58:2

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to Clarksville Grovers Mill Rd (CR 638) (#1)									
Average Before (n=11)	371	120	251	71	33.7	2.1	650	145.6	9493.1
Std Dev Before (n=11)	*52*	*52*	*0*	*42*	*4.1*	*1*	*650*	*24.5*	*1334.5*
Average After (n=11)	322	71	251	37	39	1.4	650	131.2	8505.8
Std Dev After (n=11)	*50*	*50*	*0*	*30*	*6*	*0.8*	*650*	*18.6*	*1109.3*
Difference	-49	-49	0	-34	5.2	-0.7	650	-14.4	-987.2
Std Dev Difference	*72*	*72*	*0*	*51*	*7.3*	*1.3*	*650*	*30.8*	*1735.3*
% Difference	-13%	-40%	0%	-48%	15.50%	-34.80%	650	-9.90%	-10.40%

Cumulative Summary of all runs, either direction through artery

21 Before-type runs, 11 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 11/23/21, over day(s) Tue, with starting times during 7

21 After-type runs, collected Tuesday 04/05/22 to Tuesday 04/12/22, over day(s) Tue, Wed, with starting times during 7:05:31 AM to 9:02:3

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to End of Artery									
Average Before (n=21)	353	102	251	60	35.6	2	980	110.6	7122.5
Std Dev Before (n=21)	*52*	*52*	*0*	*40*	*5.3*	*1.1*	*980*	*42.5*	*2760*
Average After (n=21)	314	63	251	34	39.7	1.3	980	98.2	6352.8
Std Dev After (n=21)	*38*	*38*	*0*	*24*	*4.6*	*0.6*	*980*	*38*	*2446.8*
Difference	-39	-39	0	-26	4.1	-0.8	980	-12.4	-769.7
Std Dev Difference	*65*	*65*	*0*	*46*	*7*	*1.2*	*980*	*57*	*3688.4*
% Difference	-11%	-39%	0%	-44%	11.50%	-37.20%	980	-11.20%	-10.80%

Summary of runs Eastbound from Clarksville Grovers Mill Rd (CR 638) (#1)

10 Before-type runs, 5 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 11/23/21, over day(s) Tue, with starting times during 7:02:48 AM to 8:46:03 AM

10 After-type runs, collected Wednesday 04/06/22 to Tuesday 04/12/22, over day(s) Tue, Wed, with starting times during 7:02:24 AM to 8:49:23 AM

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE

to S Mill Rd (#2)											
Average Before (n=10)	48	2658	7	40	3	39.5	45	0.1	473	9.5	661.8
Std Dev Before (n=10)	*10*	*0*	*10*	*0*	*9*	*6.6*	*0*	*0.3*	*473*	*3.9*	*196.1*
Average After (n=10)	46	2658	6	40	1	39.6	45	0.1	473	9.5	652.3
Std Dev After (n=10)	*5*	*0*	*5*	*0*	*2*	*4*	*0*	*0.3*	*473*	*3.9*	*152.5*
Difference	-1	0	-1	0	-2	0.1	0	0	473	0	-9.5
Std Dev Difference	*12*	*0*	*12*	*0*	*9*	*7.7*	*0*	*0.4*	*473*	*5.5*	*248.4*
% Difference	-3%	0%	-18%	0%	-77%	0.20%	0%	0.00%	473	-0.20%	-1.40%
to Bernt Midland Blvd/Slayback Dr (#3)											
Average Before (n=10)	77	1701	13	63	4	39.7	50	0.2	485	16.5	1121.2
Std Dev Before (n=10)	*12*	*0*	*12*	*0*	*10*	*5.9*	*0*	*0.4*	*485*	*5.8*	*268.5*
Average After (n=10)	73	1701	9	63	1	41.3	50	0.2	485	16.5	1092.9
Std Dev After (n=10)	*8*	*0*	*8*	*0*	*3*	*4.3*	*0*	*0.4*	*485*	*5.8*	*246.6*
Difference	-4	0	-4	0	-3	1.7	0	0	485	0	-28.3
Std Dev Difference	*15*	*0*	*15*	*0*	*10*	*7.3*	*0*	*0.6*	*485*	*8.2*	*364.6*
% Difference	-5%	0%	-30%	0%	-73%	4.20%	0%	0.00%	485	-0.30%	-2.50%
to Rabbit Hill Rd/Lanwin Blvd (#4)											
Average Before (n=10)	140	3612	27	113	9	39.3	50	0.5	466	32.1	2110
Std Dev Before (n=10)	*15*	*0*	*15*	*0*	*10*	*4.4*	*0*	*0.5*	*466*	*7.5*	*344.7*
Average After (n=10)	126	3612	13	113	3	43.4	50	0.3	466	29.1	1916.8
Std Dev After (n=10)	*12*	*0*	*12*	*0*	*5*	*3.8*	*0*	*0.5*	*466*	*6.8*	*301.5*
Difference	-14	0	-14	0	-6	4.1	0	-0.2	466	-3	-193.2
Std Dev Difference	*19*	*0*	*19*	*0*	*12*	*5.8*	*0*	*0.7*	*466*	*10.1*	*458*
% Difference	-10%	0%	-50%	0%	-70%	10.40%	0%	-40.00%	466	-9.30%	-9.20%
to Southfield Rd (#5)											
Average Before (n=10)	220	3899	54	166	27	37.4	50	1.3	377	51.2	3224.9
Std Dev Before (n=10)	*29*	*0*	*29*	*0*	*18*	*5.2*	*0*	*0.8*	*377*	*10.9*	*520.9*
Average After (n=10)	185	3899	19	166	6	44.2	50	0.4	377	40	2633.1
Std Dev After (n=10)	*21*	*0*	*21*	*0*	*11*	*4.5*	*0*	*0.5*	*377*	*7*	*350.9*
Difference	-35	0	-35	0	-20	6.8	0	-0.9	377	-11.2	-591.8
Std Dev Difference	*35*	*0*	*35*	*0*	*21*	*6.9*	*0*	*1*	*377*	*13*	*628.1*
% Difference	-16%	0%	-65%	0%	-77%	18.10%	0%	-69.20%	377	-21.90%	-18.40%
to Old Trenton Rd (CR 535) (#6)											
Average Before (n=10)	333	6237	83	251	48	37.7	50	2	330	72.1	4514.9
Std Dev Before (n=10)	*48*	*0*	*48*	*0*	*36*	*5.9*	*0*	*1.2*	*330*	*14.3*	*725.3*
Average After (n=10)	304	6237	53	251	31	40.5	50	1.2	330	61.9	3984.5
Std Dev After (n=10)	*17*	*0*	*17*	*0*	*16*	*2.2*	*0*	*0.4*	*330*	*5.5*	*198.3*
Difference	-29	0	-29	0	-17	2.8	0	-0.8	330	-10.2	-530.4
Std Dev Difference	*51*	*0*	*51*	*0*	*39*	*6.3*	*0*	*1.2*	*330*	*15.3*	*751.9*
% Difference	-9%	0%	-35%	0%	-36%	7.50%	0%	-40.00%	330	-14.20%	-11.70%

Summary of runs Westbound from Old Trenton Rd (CR 535) (#6)

11 Before-type runs, 6 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 11/23/21, over day(s) Tue, with starting times during 6:59:46 AM to 8:37:40 AM

11 After-type runs, collected Tuesday 04/05/22 to Tuesday 04/12/22, over day(s) Tue, Wed, with starting times during 7:10:17 AM to 8:58:20 AM

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to Southfield Rd (#5)											
Average Before (n=11)	118	6237	33	85	22	36.9	50	0.7	787	50.5	3150.5
Std Dev Before (n=11)	*20*	*0*	*20*	*0*	*20*	*6.3*	*0*	*0.5*	*787*	*11.5*	*579.7*
Average After (n=11)	109	6237	23	85	16	40.7	50	0.5	787	43.7	2808.9
Std Dev After (n=11)	*24*	*0*	*24*	*0*	*20*	*8.8*	*0*	*0.5*	*787*	*12.9*	*701.7*
Difference	-9	0	-9	0	-6	3.8	0	-0.3	787	-6.8	-341.6
Std Dev Difference	*31*	*0*	*31*	*0*	*28*	*10.8*	*0*	*0.7*	*787*	*17.3*	*910.2*
% Difference	-8%	0%	-28%	0%	-27%	10.20%	0%	-37.50%	787	-13.50%	-10.80%
to Rabbit Hill Rd/Lanwin Blvd (#4)											
Average Before (n=11)	187	3899	49	138	27	37.5	50	1	875	80.6	5113.9

Std Dev Before (n=11)	*26*	*0*	*26*	*0*	*23*	*5.5*	*0*	*0.6*	*875*	*16.5*	*858.5*
Average After (n=11)	167	3899	29	138	16	42.1	50	0.5	875	66.3	4381.3
Std Dev After (n=11)	*28*	*0*	*28*	*0*	*20*	*7*	*0*	*0.5*	*875*	*12.9*	*747.7*
Difference	-20	0	-20	0	-11	4.6	0	-0.5	875	-14.3	-732.6
Std Dev Difference	*38*	*0*	*38*	*0*	*30*	*8.9*	*0*	*0.8*	*875*	*21*	*1138.5*
% Difference	-11%	0%	-41%	0%	-40%	12.30%	0%	-54.50%	875	-17.80%	-14.30%
to Bernt Midland Blvd/Slayback Dr (#3)											
Average Before (n=11)	245	3612	58	187	28	38.5	50	1.1	920	105.2	6782
Std Dev Before (n=11)	*26*	*0*	*26*	*0*	*23*	*4.4*	*0*	*0.7*	*920*	*18.5*	*935.3*
Average After (n=11)	221	3612	33	187	16	43	50	0.5	920	88.3	5901.4
Std Dev After (n=11)	*31*	*0*	*31*	*0*	*20*	*5.9*	*0*	*0.5*	*920*	*13*	*776.9*
Difference	-24	0	-24	0	-12	4.4	0	-0.6	920	-16.9	-880.6
Std Dev Difference	*40*	*0*	*40*	*0*	*30*	*7.3*	*0*	*0.9*	*920*	*22.6*	*1215.9*
% Difference	-10%	0%	-42%	0%	-43%	11.50%	0%	-58.30%	920	-16.10%	-13.00%
to S Mill Rd (#2)											
Average Before (n=11)	278	1701	67	211	31	38.2	50	1.2	931	118.5	7707.4
Std Dev Before (n=11)	*29*	*0*	*29*	*0*	*23*	*4.3*	*0*	*0.8*	*931*	*20.4*	*1051.3*
Average After (n=11)	257	1701	47	211	23	41.3	50	0.9	931	112	7237.3
Std Dev After (n=11)	*33*	*0*	*33*	*0*	*18*	*5.3*	*0*	*0.5*	*931*	*14.7*	*865.6*
Difference	-21	0	-21	0	-7	3.2	0	-0.3	931	-6.5	-470.1
Std Dev Difference	*44*	*0*	*44*	*0*	*29*	*6.8*	*0*	*0.9*	*931*	*25.2*	*1361.8*
% Difference	-7%	0%	-31%	0%	-24%	8.30%	0%	-23.10%	931	-5.50%	-6.10%
to Clarksville Grovers Mill Rd (CR 638) (#1)											
Average Before (n=11)	371	2658	120	251	71	33.7	45	2.1	650	145.6	9493.1
Std Dev Before (n=11)	*52*	*0*	*52*	*0*	*42*	*4.1*	*0*	*1*	*650*	*24.5*	*1334.5*
Average After (n=11)	322	2658	71	251	37	39	45	1.4	650	131.2	8505.8
Std Dev After (n=11)	*50*	*0*	*50*	*0*	*30*	*6*	*0*	*0.8*	*650*	*18.6*	*1109.3*
Difference	-49	0	-49	0	-34	5.2	0	-0.7	650	-14.4	-987.2
Std Dev Difference	*72*	*0*	*72*	*0*	*51*	*7.3*	*0*	*1.3*	*650*	*30.8*	*1735.3*
% Difference	-13%	0%	-40%	0%	-48%	15.50%	0%	-34.80%	650	-9.90%	-10.40%

Travel Time & Delay Report for Princeton-Hightstown Rd (CR 571) - MD Peak

Legend:

CTT:
Summarized Cumulative Travel Time since beginning of Run (seconds)

CPLSD:
Summarized Cumulative Posted Speed Limit Delay since beginning of Run (seconds)

CPLRT:
Summarized Cumulative Posted Speed Limit Running Time, or Travel Time since beginning of Run if maintaining Posted Speed Limit (seconds) = accumulation of DL/PLS since beginning of Run

CStopD:
Summarized Cumulative Stopped Delay since beginning of Run (seconds). The "Stopped Delay" is counted from when the speed drops below 5 mph after exceeding 15 mph until it exceeds 15 mph once again

CAS:
Summarized Cumulative Actual Average Speed since beginning of Run (mph) = CTL/CTT

CStops:
Summarized Cumulative number of Stops in Run. A "Stop" is counted when the speed drops below 5 mph after exceeding 15 mph

TV:
Summarized Through Volume (vph)

CPUFC:
Summarized Cumulative Fuel Consumption, from Penic & Upchurch model with TRANSYT7F-10 default coefficients (gal/hr) (= Cumulative (TL/5280*(0.51242*exp(0.024609*DS)/DS) + Delay/3600*(0.0468) + Stops*(3.8424*DS^1.657 + 1.681*DS^1.48922)/1.0E5)*TV)

CUFCOE:
Summarized Cumulative Carbon Monoxide Emissions using Synchro 7 formula (from unpublished Oak Ridge National Labs letter to Federal Highway Administration) and University of Florida model for Fuel Consumption (g/hr) (= Cumulative UFFC*69.9)

Cumulative Summary of runs Eastbound from Clarksville Grovers Mill Rd (CR 638) (#1)

7 Before-type runs, 7 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 11:1

10 After-type runs, collected Monday 04/04/22 to Tuesday 04/12/22, over day(s) Mon, Tue, with starting times during 9:08:46 AM to 1:00:50

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to Old Trenton Rd (CR 535) (#6)									
Average Before (n=7)	336	85	251	53	37.1	2.3	564	94.8	5810.8
Std Dev Before (n=7)	*37*	*37*	*0*	*30*	*3.7*	*1*	*564*	*13.9*	*703.3*
Average After (n=10)	309	58	251	32	40.1	1.4	564	82	5202
Std Dev After (n=10)	*26*	*26*	*0*	*22*	*3.4*	*0.7*	*564*	*10.6*	*515.2*
Difference	-26	-26	0	-21	3.1	-0.9	564	-12.7	-608.8
Std Dev Difference	*45*	*45*	*0*	*37*	*5.1*	*1.2*	*564*	*17.4*	*871.8*
% Difference	-8%	-31%	0%	-39%	8.30%	-38.80%	564	-13.40%	-10.50%

Cumulative Summary of runs Westbound from Old Trenton Rd (CR 535) (#6)

7 Before-type runs, 7 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 11:0

9 After-type runs, collected Monday 04/04/22 to Tuesday 04/12/22, over day(s) Mon, Tue, with starting times during 9:02:55 AM to 1:01:21 P

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to Clarksville Grovers Mill Rd (CR 638) (#1)									
Average Before (n=7)	329	78	251	42	37.6	2	350	83.1	5208.8
Std Dev Before (n=7)	*25*	*25*	*0*	*13*	*2.8*	*0.8*	*350*	*12.3*	*550*
Average After (n=9)	293	42	251	17	42.2	0.8	350	67.7	4451.4
Std Dev After (n=9)	*25*	*25*	*0*	*14*	*3.3*	*0.4*	*350*	*6.2*	*310.8*
Difference	-36	-36	0	-24	4.5	-1.2	350	-15.5	-757.4
Std Dev Difference	*35*	*35*	*0*	*19*	*4.3*	*0.9*	*350*	*13.8*	*631.7*
% Difference	-11%	-46%	0%	-59%	12.10%	-61.10%	350	-18.60%	-14.50%

Cumulative Summary of all runs, either direction through artery

14 Before-type runs, 14 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 11

19 After-type runs, collected Monday 04/04/22 to Tuesday 04/12/22, over day(s) Mon, Tue, with starting times during 9:11:38 AM to 1:05:27

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to End of Artery									
Average Before (n=14)	332	81	251	47	37.3	2.1	914	89	5509.8
Std Dev Before (n=14)	*30*	*30*	*0*	*23*	*3.2*	*0.9*	*914*	*14*	*682.2*
Average After (n=19)	302	51	251	25	41.1	1.1	914	75.2	4846.4
Std Dev After (n=19)	*26*	*26*	*0*	*20*	*3.4*	*0.7*	*914*	*11.3*	*569.1*
Difference	-31	-31	0	-22	3.7	-1	914	-13.7	-663.3
Std Dev Difference	*40*	*40*	*0*	*30*	*4.7*	*1.1*	*914*	*18*	*888.5*
% Difference	-9%	-38%	0%	-47%	10.00%	-48.40%	914	-15.40%	-12.00%

Summary of runs Eastbound from Clarksville Grovers Mill Rd (CR 638) (#1)

7 Before-type runs, 7 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 11:10:26 AM to 12:57:01 PM

10 After-type runs, collected Monday 04/04/22 to Tuesday 04/12/22, over day(s) Mon, Tue, with starting times during 9:08:46 AM to 1:00:50 PM

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to S Mill Rd (#2)											
Average Before (n=7)	43	2658	3	40	0	42.1	45	0	507	8.8	633.5
Std Dev Before (n=7)	*2*	*0*	*2*	*0*	*0*	*1.9*	*0*	*0*	*507*	*0*	*14.1*
Average After (n=10)	43	2658	3	40	0	42.6	45	0	507	8.8	630
Std Dev After (n=10)	*3*	*0*	*3*	*0*	*0*	*2.9*	*0*	*0*	*507*	*0*	*22.8*
Difference	0	0	0	0	0	0.5	0	0	507	0	-3.5
Std Dev Difference	*4*	*0*	*4*	*0*	*0*	*3.5*	*0*	*0*	*507*	*0*	*26.8*
% Difference	-1%	0%	-15%	0%	N/D	1.20%	0%	N/D	507	-0.10%	-0.50%
to Bernt Midland Blvd/Slayback Dr (#3)											
Average Before (n=7)	75	1701	12	63	4	40.1	50	0.3	490	18.8	1216.3
Std Dev Before (n=7)	*10*	*0*	*10*	*0*	*6*	*4.9*	*0*	*0.5*	*490*	*7.5*	*325.2*
Average After (n=10)	70	1701	6	63	0	42.8	50	0.1	490	15.9	1078.1
Std Dev After (n=10)	*4*	*0*	*4*	*0*	*1*	*2.6*	*0*	*0.3*	*490*	*4.8*	*187.6*
Difference	-6	0	-6	0	-3	2.7	0	-0.2	490	-2.9	-138.3
Std Dev Difference	*11*	*0*	*11*	*0*	*7*	*5.5*	*0*	*0.6*	*490*	*8.9*	*375.4*
% Difference	-7%	0%	-47%	0%	-92%	6.70%	0%	-65.00%	490	-15.30%	-11.40%
to Rabbit Hill Rd/Lanwin Blvd (#4)											
Average Before (n=7)	137	3612	24	113	10	40.5	50	0.9	488	39.1	2382.1
Std Dev Before (n=7)	*20*	*0*	*20*	*0*	*12*	*5.4*	*0*	*0.9*	*488*	*13.7*	*601.9*
Average After (n=10)	122	3612	9	113	0	44.6	50	0.1	488	27.6	1881.3
Std Dev After (n=10)	*6*	*0*	*6*	*0*	*1*	*2*	*0*	*0.3*	*488*	*4.8*	*193.5*
Difference	-15	0	-15	0	-10	4.2	0	-0.8	488	-11.5	-500.7
Std Dev Difference	*21*	*0*	*21*	*0*	*12*	*5.7*	*0*	*1*	*488*	*14.5*	*632.2*
% Difference	-11%	0%	-61%	0%	-97%	10.30%	0%	-88.30%	488	-29.40%	-21.00%
to Southfield Rd (#5)											
Average Before (n=7)	219	3899	53	166	28	37.5	50	1.6	410	58.9	3572
Std Dev Before (n=7)	*27*	*0*	*27*	*0*	*19*	*4.5*	*0*	*1.1*	*410*	*16.5*	*739.5*
Average After (n=10)	192	3899	26	166	12	42.3	50	0.6	410	44.6	2905.8
Std Dev After (n=10)	*17*	*0*	*17*	*0*	*13*	*3.7*	*0*	*0.5*	*410*	*6.8*	*323.8*
Difference	-26	0	-26	0	-16	4.8	0	-1	410	-14.3	-666.2
Std Dev Difference	*32*	*0*	*32*	*0*	*23*	*5.8*	*0*	*1.2*	*410*	*17.9*	*807.3*
% Difference	-12%	0%	-50%	0%	-57%	12.80%	0%	-61.80%	410	-24.30%	-18.70%
to Old Trenton Rd (CR 535) (#6)											
Average Before (n=7)	336	6237	85	251	53	37.1	50	2.3	564	94.8	5810.8
Std Dev Before (n=7)	*37*	*0*	*37*	*0*	*30*	*3.7*	*0*	*1*	*564*	*13.9*	*703.3*
Average After (n=10)	309	6237	58	251	32	40.1	50	1.4	564	82	5202
Std Dev After (n=10)	*26*	*0*	*26*	*0*	*22*	*3.4*	*0*	*0.7*	*564*	*10.6*	*515.2*
Difference	-26	0	-26	0	-21	3.1	0	-0.9	564	-12.7	-608.8
Std Dev Difference	*45*	*0*	*45*	*0*	*37*	*5.1*	*0*	*1.2*	*564*	*17.4*	*871.8*
% Difference	-8%	0%	-31%	0%	-39%	8.30%	0%	-38.80%	564	-13.40%	-10.50%

Summary of runs Westbound from Old Trenton Rd (CR 535) (#6)

7 Before-type runs, 7 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 11:01:18 AM to 12:44:47 PM

10 After-type runs, collected Monday 04/04/22 to Tuesday 04/12/22, over day(s) Mon, Tue, with starting times during 9:02:55 AM to 1:01:21 PM

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to Southfield Rd (#5)											
Average Before (n=7)	105	6237	20	85	11	42.3	50	0.4	436	23.9	1529.3
Std Dev Before (n=7)	*25*	*0*	*25*	*0*	*16*	*9.3*	*0*	*0.5*	*436*	*7.4*	*413.6*
Average After (n=10)	107	6237	22	85	12	40.5	50	0.6	436	26.2	1617.2

Std Dev After (n=10)	*18*	*0*	*18*	*0*	*13*	*6*	*0*	*0.5*	*436*	*7.1*	*335.3*
Difference	2	0	2	0	2	-1.7	0	0.2	436	2.3	87.9
Std Dev Difference	*31*	*0*	*31*	*0*	*20*	*11.1*	*0*	*0.7*	*436*	*10.3*	*532.4*
% Difference	2%	0%	8%	0%	15%	-4.10%	0%	40.00%	436	9.50%	5.70%
to Rabbit Hill Rd/Lanwin Blvd (#4)											
Average Before (n=7)	170	3899	32	138	15	41.5	50	0.7	549	43	2731.9
Std Dev Before (n=7)	*27*	*0*	*27*	*0*	*16*	*6.9*	*0*	*0.8*	*549*	*11.6*	*567.6*
Average After (n=9)	165	3899	27	138	13	41.9	50	0.7	549	41.6	2645.2
Std Dev After (n=9)	*17*	*0*	*17*	*0*	*13*	*3.9*	*0*	*0.5*	*549*	*7.2*	*325.5*
Difference	-5	0	-5	0	-2	0.4	0	0	549	-1.4	-86.7
Std Dev Difference	*32*	*0*	*32*	*0*	*20*	*7.9*	*0*	*0.9*	*549*	*13.7*	*654.3*
% Difference	-3%	0%	-15%	0%	-12%	1.00%	0%	-6.70%	549	-3.20%	-3.20%
to Bernt Midland Blvd/Slayback Dr (#3)											
Average Before (n=7)	232	3612	44	187	21	40.5	50	1	536	60.6	3847.2
Std Dev Before (n=7)	*17*	*0*	*17*	*0*	*13*	*2.7*	*0*	*0.6*	*536*	*8.9*	*387.5*
Average After (n=9)	218	3612	30	187	13	43	50	0.7	536	54.4	3522
Std Dev After (n=9)	*18*	*0*	*18*	*0*	*13*	*3.2*	*0*	*0.5*	*536*	*7.2*	*328.7*
Difference	-14	0	-14	0	-8	2.5	0	-0.3	536	-6.2	-325.2
Std Dev Difference	*24*	*0*	*24*	*0*	*18*	*4.2*	*0*	*0.8*	*536*	*11.5*	*508.1*
% Difference	-6%	0%	-32%	0%	-38%	6.30%	0%	-33.30%	536	-10.20%	-8.50%
to S Mill Rd (#2)											
Average Before (n=7)	261	1701	51	211	24	40.4	50	1.1	540	69.1	4388.4
Std Dev Before (n=7)	*19*	*0*	*19*	*0*	*17*	*2.8*	*0*	*0.7*	*540*	*11.3*	*505.1*
Average After (n=9)	243	1701	32	211	13	43.3	50	0.7	540	60.5	3947.3
Std Dev After (n=9)	*19*	*0*	*19*	*0*	*13*	*3.1*	*0*	*0.5*	*540*	*7.2*	*334.8*
Difference	-18	0	-18	0	-11	3	0	-0.5	540	-8.6	-441.1
Std Dev Difference	*27*	*0*	*27*	*0*	*21*	*4.2*	*0*	*0.9*	*540*	*13.4*	*606*
% Difference	-7%	0%	-36%	0%	-45%	7.30%	0%	-41.70%	540	-12.40%	-10.10%
to Clarksville Grovers Mill Rd (CR 638) (#1)											
Average Before (n=7)	329	2658	78	251	42	37.6	45	2	350	83.1	5208.8
Std Dev Before (n=7)	*25*	*0*	*25*	*0*	*13*	*2.8*	*0*	*0.8*	*350*	*12.3*	*550*
Average After (n=9)	293	2658	42	251	17	42.2	45	0.8	350	67.7	4451.4
Std Dev After (n=9)	*25*	*0*	*25*	*0*	*14*	*3.3*	*0*	*0.4*	*350*	*6.2*	*310.8*
Difference	-36	0	-36	0	-24	4.5	0	-1.2	350	-15.5	-757.4
Std Dev Difference	*35*	*0*	*35*	*0*	*19*	*4.3*	*0*	*0.9*	*350*	*13.8*	*631.7*
% Difference	-11%	0%	-46%	0%	-59%	12.10%	0%	-61.10%	350	-18.60%	-14.50%

Travel Time & Delay Report for Princeton-Hightstown Rd (CR 571) - PM Peak

Legend:

CTT:
Summarized Cumulative Travel Time since beginning of Run (seconds)

CPLSD:
Summarized Cumulative Posted Speed Limit Delay since beginning of Run (seconds)

CPLRT:
Summarized Cumulative Posted Speed Limit Running Time, or Travel Time since beginning of Run if maintaining Posted Speed Limit (seconds) = accumulation of DL/PLS since beginning of Run

CStopD:
Summarized Cumulative Stopped Delay since beginning of Run (seconds). The "Stopped Delay" is counted from when the speed drops below 5 mph after exceeding 15 mph until it exceeds 15 mph once again

CAS:
Summarized Cumulative Actual Average Speed since beginning of Run (mph) = CTL/CTT

CStops:
Summarized Cumulative number of Stops in Run. A "Stop" is counted when the speed drops below 5 mph after exceeding 15 mph

TV:
Summarized Through Volume (vph)

CPUFC:
Summarized Cumulative Fuel Consumption, from Penic & Upchurch model with TRANSYT7F-10 default coefficients (gal/hr) (= Cumulative (TL/5280*(0.51242*exp(0.024609*DS)/DS) + Delay/3600*(0.0468) + Stops*(3.8424*DS^1.657 + 1.681*DS^1.48922)/1.0E5)*TV)

CUFCOE:
Summarized Cumulative Carbon Monoxide Emissions using Synchro 7 formula (from unpublished Oak Ridge National Labs letter to Federal Highway Administration) and University of Florida model for Fuel Consumption (g/hr) (= Cumulative UFFC*69.9)

Cumulative Summary of runs Eastbound from Clarksville Grovers Mill Rd (CR 638) (#1)

15 Before-type runs, 10 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 11/23/21, over day(s) Tue, with starting times during 3

13 After-type runs, collected Tuesday 04/05/22 to Tuesday 04/12/22, over day(s) Tue, Wed, with starting times during 2:54:40 PM to 5:34:52

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to Old Trenton Rd (CR 535) (#6)									
Average Before (n=15)	337	86	251	40	36.9	1.8	680	144.3	9174.5
Std Dev Before (n=15)	*35*	*35*	*0*	*29*	*4.2*	*0.9*	*680*	*23*	*1088.7*
Average After (n=13)	288	37	251	23	43.2	0.8	680	116.8	7625.2
Std Dev After (n=13)	*35*	*35*	*0*	*29*	*4.8*	*0.8*	*680*	*18.3*	*977.9*
Difference	-49	-49	0	-17	6.3	-1	680	-27.5	-1549.3
Std Dev Difference	*50*	*50*	*0*	*41*	*6.4*	*1.2*	*680*	*29.4*	*1463.5*
% Difference	-14%	-57%	0%	-43%	17.10%	-53.00%	680	-19.10%	-16.90%

Cumulative Summary of runs Westbound from Old Trenton Rd (CR 535) (#6)

15 Before-type runs, 10 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 11/23/21, over day(s) Tue, with starting times during 3

18 After-type runs, collected Tuesday 04/05/22 to Tuesday 04/12/22, over day(s) Tue, Wed, with starting times during 2:53:00 PM to 5:55:15

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to Clarksville Grovers Mill Rd (CR 638) (#1)									
Average Before (n=15)	341	90	251	43	36.4	1.8	463	100.9	6523.1
Std Dev Before (n=15)	*29*	*29*	*0*	*29*	*3*	*0.9*	*463*	*17.8*	*743.4*
Average After (n=18)	289	38	251	25	43	0.9	463	87.7	5670.1
Std Dev After (n=18)	*34*	*34*	*0*	*27*	*4.9*	*0.8*	*463*	*13.4*	*659.2*
Difference	-51	-51	0	-18	6.6	-0.9	463	-13.2	-852.9
Std Dev Difference	*45*	*45*	*0*	*40*	*5.7*	*1.2*	*463*	*22.3*	*993.6*
% Difference	-15%	-57%	0%	-42%	18.20%	-47.50%	463	-13.00%	-13.10%

Cumulative Summary of all runs, either direction through artery

30 Before-type runs, 20 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 11/23/21, over day(s) Tue, with starting times during 3

31 After-type runs, collected Tuesday 04/05/22 to Tuesday 04/12/22, over day(s) Tue, Wed, with starting times during 2:57:28 PM to 5:59:14

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to End of Artery									
Average Before (n=30)	339	88	251	41	36.7	1.8	1143	122.6	7848.8
Std Dev Before (n=30)	*32*	*32*	*0*	*29*	*3.6*	*0.9*	*1143*	*29.9*	*1630.1*
Average After (n=31)	289	38	251	24	43.1	0.9	1143	99.9	6490
Std Dev After (n=31)	*34*	*34*	*0*	*27*	*4.8*	*0.8*	*1143*	*21.2*	*1261.2*
Difference	-50	-50	0	-17	6.4	-0.9	1143	-22.7	-1358.8
Std Dev Difference	*47*	*47*	*0*	*40*	*6*	*1.2*	*1143*	*36.6*	*2061*
% Difference	-15%	-57%	0%	-42%	17.60%	-49.80%	1143	-18.50%	-17.30%

Summary of runs Eastbound from Clarksville Grovers Mill Rd (CR 638) (#1)

15 Before-type runs, 10 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 11/23/21, over day(s) Tue, with starting times during 3:10:52 PM to 6:00:45 PM

13 After-type runs, collected Tuesday 04/05/22 to Tuesday 04/12/22, over day(s) Tue, Wed, with starting times during 2:54:40 PM to 5:34:52 PM

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE

to S Mill Rd (#2)											
Average Before (n=15)	51	2658	11	40	3	36.5	45	0.2	984	22.4	1517.6
Std Dev Before (n=15)	*10*	*0*	*10*	*0*	*8*	*6.1*	*0*	*0.4*	*984*	*10.7*	*484.2*
Average After (n=13)	43	2658	2	40	0	42.8	45	0	984	17.1	1221.4
Std Dev After (n=13)	*4*	*0*	*4*	*0*	*0*	*3.4*	*0*	*0*	*984*	*0.1*	*52.8*
Difference	-9	0	-9	0	-3	6.3	0	-0.2	984	-5.3	-296.2
Std Dev Difference	*11*	*0*	*11*	*0*	*8*	*6.9*	*0*	*0.4*	*984*	*10.7*	*487.1*
% Difference	-17%	0%	-78%	0%	-100%	17.10%	0%	-100.00%	984	-23.50%	-19.50%
to Bernt Midland Blvd/Slayback Dr (#3)											
Average Before (n=15)	88	1701	24	63	9	35.3	50	0.6	943	44.9	2814.3
Std Dev Before (n=15)	*18*	*0*	*18*	*0*	*11*	*6.8*	*0*	*0.7*	*943*	*20.6*	*945.4*
Average After (n=13)	68	1701	4	63	0	44.1	50	0	943	27.8	1958.1
Std Dev After (n=13)	*5*	*0*	*5*	*0*	*0*	*2.7*	*0*	*0*	*943*	*0.1*	*63.4*
Difference	-20	0	-20	0	-9	8.8	0	-0.6	943	-17.1	-856.2
Std Dev Difference	*19*	*0*	*19*	*0*	*11*	*7.3*	*0*	*0.7*	*943*	*20.6*	*947.5*
% Difference	-23%	0%	-83%	0%	-100%	24.90%	0%	-100.00%	943	-38.00%	-30.40%
to Rabbit Hill Rd/Lanwin Blvd (#4)											
Average Before (n=15)	150	3612	37	113	11	37.3	50	0.9	918	74.6	4712.5
Std Dev Before (n=15)	*24*	*0*	*24*	*0*	*13*	*5.9*	*0*	*1*	*918*	*28*	*1250.2*
Average After (n=13)	118	3612	6	113	0	46.1	50	0	918	49.9	3445.7
Std Dev After (n=13)	*6*	*0*	*6*	*0*	*0*	*2.2*	*0*	*0*	*918*	*0.1*	*78.6*
Difference	-31	0	-31	0	-11	8.8	0	-0.9	918	-24.7	-1266.8
Std Dev Difference	*25*	*0*	*25*	*0*	*13*	*6.3*	*0*	*1*	*918*	*28*	*1252.6*
% Difference	-21%	0%	-85%	0%	-100%	23.60%	0%	-100.00%	918	-33.20%	-26.90%
to Southfield Rd (#5)											
Average Before (n=15)	229	3899	63	166	27	35.9	50	1.3	783	106.3	6742.9
Std Dev Before (n=15)	*28*	*0*	*28*	*0*	*20*	*4.9*	*0*	*0.8*	*783*	*23.1*	*1043.1*
Average After (n=13)	182	3899	16	166	9	45.1	50	0.2	783	75.7	5101.7
Std Dev After (n=13)	*24*	*0*	*24*	*0*	*18*	*5.2*	*0*	*0.4*	*783*	*10.9*	*634.8*
Difference	-47	0	-47	0	-18	9.2	0	-1.1	783	-30.6	-1641.2
Std Dev Difference	*36*	*0*	*36*	*0*	*27*	*7.1*	*0*	*0.9*	*783*	*25.6*	*1221.1*
% Difference	-21%	0%	-75%	0%	-66%	25.70%	0%	-82.70%	783	-28.80%	-24.30%
to Old Trenton Rd (CR 535) (#6)											
Average Before (n=15)	337	6237	86	251	40	36.9	50	1.8	680	144.3	9174.5
Std Dev Before (n=15)	*35*	*0*	*35*	*0*	*29*	*4.2*	*0*	*0.9*	*680*	*23*	*1088.7*
Average After (n=13)	288	6237	37	251	23	43.2	50	0.8	680	116.8	7625.2
Std Dev After (n=13)	*35*	*0*	*35*	*0*	*29*	*4.8*	*0*	*0.8*	*680*	*18.3*	*977.9*
Difference	-49	0	-49	0	-17	6.3	0	-1	680	-27.5	-1549.3
Std Dev Difference	*50*	*0*	*50*	*0*	*41*	*6.4*	*0*	*1.2*	*680*	*29.4*	*1463.5*
% Difference	-14%	0%	-57%	0%	-43%	17.10%	0%	-53.00%	680	-19.10%	-16.90%

Summary of runs Westbound from Old Trenton Rd (CR 535) (#6)

15 Before-type runs, 10 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 11/23/21, over day(s) Tue, with starting times during 3:01:51 PM to 5:51:16 PM

18 After-type runs, collected Tuesday 04/05/22 to Tuesday 04/12/22, over day(s) Tue, Wed, with starting times during 2:53:00 PM to 5:55:15 PM

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to Southfield Rd (#5)											
Average Before (n=15)	105	6237	20	85	10	41	50	0.4	561	30.2	1943
Std Dev Before (n=15)	*15*	*0*	*15*	*0*	*15*	*5*	*0*	*0.5*	*561*	*8.9*	*406.6*
Average After (n=18)	100	6237	15	85	10	43.4	50	0.4	561	29.9	1894.8
Std Dev After (n=18)	*18*	*0*	*18*	*0*	*15*	*6.9*	*0*	*0.5*	*561*	*8.8*	*430.3*
Difference	-5	0	-5	0	0	2.5	0	0	561	-0.3	-48.2
Std Dev Difference	*23*	*0*	*23*	*0*	*21*	*8.5*	*0*	*0.7*	*561*	*12.5*	*592*
% Difference	-5%	0%	-25%	0%	-2%	6.00%	0%	-2.80%	561	-0.80%	-2.50%
to Rabbit Hill Rd/Lanwin Blvd (#4)											
Average Before (n=15)	168	3899	30	138	11	41.1	50	0.5	668	50.2	3284.5

Std Dev Before (n=15)	*13*	*0*	*13*	*0*	*14*	*2.9*	*0*	*0.5*	*668*	*9.5*	*393.1*
Average After (n=18)	155	3899	17	138	10	44.9	50	0.4	668	48.3	3102.3
Std Dev After (n=18)	*19*	*0*	*19*	*0*	*15*	*5.2*	*0*	*0.6*	*668*	*11.3*	*520.1*
Difference	-13	0	-13	0	-1	3.9	0	-0.1	668	-1.9	-182.3
Std Dev Difference	*23*	*0*	*23*	*0*	*21*	*6*	*0*	*0.8*	*668*	*14.7*	*651.9*
% Difference	-8%	0%	-44%	0%	-8%	9.40%	0%	-16.70%	668	-3.80%	-5.50%
to Bernt Midland Blvd/Slayback Dr (#3)											
Average Before (n=15)	232	3612	44	187	14	40.4	50	0.8	654	71.4	4647.2
Std Dev Before (n=15)	*14*	*0*	*14*	*0*	*16*	*2.3*	*0*	*0.8*	*654*	*15.3*	*620.2*
Average After (n=18)	207	3612	19	187	10	45.5	50	0.4	654	64	4166.4
Std Dev After (n=18)	*21*	*0*	*21*	*0*	*15*	*4.4*	*0*	*0.6*	*654*	*11.3*	*528.3*
Difference	-25	0	-25	0	-4	5.1	0	-0.4	654	-7.4	-480.8
Std Dev Difference	*26*	*0*	*26*	*0*	*22*	*5*	*0*	*1*	*654*	*19*	*814.7*
% Difference	-11%	0%	-57%	0%	-26%	12.70%	0%	-44.40%	654	-10.40%	-10.30%
to S Mill Rd (#2)											
Average Before (n=15)	261	1701	51	211	15	40.3	50	0.9	744	81.4	5331
Std Dev Before (n=15)	*17*	*0*	*17*	*0*	*16*	*2.5*	*0*	*0.8*	*744*	*16.7*	*693.9*
Average After (n=18)	233	1701	22	211	12	45.3	50	0.6	744	74.9	4849.4
Std Dev After (n=18)	*21*	*0*	*21*	*0*	*15*	*3.9*	*0*	*0.6*	*744*	*11.8*	*539*
Difference	-28	0	-28	0	-3	5	0	-0.3	744	-6.5	-481.6
Std Dev Difference	*27*	*0*	*27*	*0*	*22*	*4.6*	*0*	*1*	*744*	*20.4*	*878.6*
% Difference	-11%	0%	-56%	0%	-20%	12.40%	0%	-35.90%	744	-7.90%	-9.00%
to Clarksville Grovers Mill Rd (CR 638) (#1)											
Average Before (n=15)	341	2658	90	251	43	36.4	45	1.8	463	100.9	6523.1
Std Dev Before (n=15)	*29*	*0*	*29*	*0*	*29*	*3*	*0*	*0.9*	*463*	*17.8*	*743.4*
Average After (n=18)	289	2658	38	251	25	43	45	0.9	463	87.7	5670.1
Std Dev After (n=18)	*34*	*0*	*34*	*0*	*27*	*4.9*	*0*	*0.8*	*463*	*13.4*	*659.2*
Difference	-51	0	-51	0	-18	6.6	0	-0.9	463	-13.2	-852.9
Std Dev Difference	*45*	*0*	*45*	*0*	*40*	*5.7*	*0*	*1.2*	*463*	*22.3*	*993.6*
% Difference	-15%	0%	-57%	0%	-42%	18.20%	0%	-47.50%	463	-13.00%	-13.10%

Travel Time & Delay Report for Princeton-Hightstown Rd (CR 571) - Weekend MD Peak

Legend:

CTT:
Summarized Cumulative Travel Time since beginning of Run (seconds)

CPLSD:
Summarized Cumulative Posted Speed Limit Delay since beginning of Run (seconds)

CPLRT:
Summarized Cumulative Posted Speed Limit Running Time, or Travel Time since beginning of Run if maintaining Posted Speed Limit (seconds) = accumulation of DL/PLS since beginning of Run

CStopD:
Summarized Cumulative Stopped Delay since beginning of Run (seconds). The "Stopped Delay" is counted from when the speed drops below 5 mph after exceeding 15 mph until it exceeds 15 mph once again

CAS:
Summarized Cumulative Actual Average Speed since beginning of Run (mph) = CTL/CTT

CStops:
Summarized Cumulative number of Stops in Run. A "Stop" is counted when the speed drops below 5 mph after exceeding 15 mph

TV:
Summarized Through Volume (vph)

CPUFC:
Summarized Cumulative Fuel Consumption, from Penic & Upchurch model with TRANSYT7F-10 default coefficients (gal/hr) (= Cumulative (TL/5280*(0.51242*exp(0.024609*DS)/DS) + Delay/3600*(0.0468) + Stops*(3.8424*DS^1.657 + 1.681*DS^1.48922)/1.0E5)*TV)

CUFCOE:
Summarized Cumulative Carbon Monoxide Emissions using Synchro 7 formula (from unpublished Oak Ridge National Labs letter to Federal Highway Administration) and University of Florida model for Fuel Consumption (g/hr) (= Cumulative UFFC*69.9)

Cumulative Summary of runs Eastbound from Clarksville Grovers Mill Rd (CR 638) (#1)

8 Before-type runs, 8 of unverifiable origin, collected Saturday 10/02/21 to Saturday 10/02/21, over day(s) Sat, with starting times during 11:1

5 After-type runs, collected Saturday 04/02/22 to Saturday 04/02/22, over day(s) Sat, with starting times during 12:23:14 PM to 4:36:49 PM

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to Old Trenton Rd (CR 535) (#6)									
Average Before (n=8)	330	79	251	37	37.7	1.9	574	107	6727.1
Std Dev Before (n=8)	*31*	*31*	*0*	*18*	*3.7*	*1*	*574*	*18.2*	*788.2*
Average After (n=5)	288	37	251	17	42.8	1	574	91	5825.2
Std Dev After (n=5)	*15*	*15*	*0*	*11*	*2.4*	*0.7*	*574*	*13.5*	*588.8*
Difference	-42	-42	0	-20	5.1	-0.9	574	-16	-901.9
Std Dev Difference	*35*	*35*	*0*	*21*	*4.4*	*1.2*	*574*	*22.7*	*983.8*
% Difference	-13%	-53%	0%	-53%	13.60%	-46.70%	574	-14.90%	-13.40%

Cumulative Summary of runs Westbound from Old Trenton Rd (CR 535) (#6)

8 Before-type runs, 8 of unverifiable origin, collected Saturday 10/02/21 to Saturday 10/02/21, over day(s) Sat, with starting times during 11:0

7 After-type runs, collected Saturday 04/02/22 to Saturday 04/09/22, over day(s) Sat, with starting times during 12:27:34 PM to 4:42:52 PM

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to Clarksville Grovers Mill Rd (CR 638) (#1)									
Average Before (n=8)	360	109	251	56	34.4	2.1	522	125.7	8041
Std Dev Before (n=8)	*34*	*34*	*0*	*34*	*2.9*	*0.8*	*522*	*16.7*	*776.1*
Average After (n=7)	293	42	251	15	42.2	1.1	522	103.2	6639.4
Std Dev After (n=7)	*26*	*26*	*0*	*14*	*3.8*	*0.9*	*522*	*16.2*	*768.8*
Difference	-67	-67	0	-41	7.8	-1	522	-22.5	-1401.6
Std Dev Difference	*43*	*43*	*0*	*37*	*4.8*	*1.2*	*522*	*23.2*	*1092.5*
% Difference	-19%	-61%	0%	-73%	22.60%	-46.20%	522	-17.90%	-17.40%

Cumulative Summary of all runs, either direction through artery

16 Before-type runs, 16 of unverifiable origin, collected Saturday 10/02/21 to Saturday 10/02/21, over day(s) Sat, with starting times during 1

12 After-type runs, collected Saturday 04/02/22 to Saturday 04/09/22, over day(s) Sat, with starting times during 12:26:30 PM to 4:46:43 PM

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to End of Artery									
Average Before (n=16)	345	94	251	47	36.1	2	1096	116.4	7384
Std Dev Before (n=16)	*35*	*35*	*0*	*28*	*3.6*	*0.9*	*1096*	*19.4*	*1015.6*
Average After (n=12)	291	40	251	16	42.5	1.1	1096	98.2	6300.1
Std Dev After (n=12)	*22*	*22*	*0*	*12*	*3.2*	*0.8*	*1096*	*15.8*	*790.1*
Difference	-54	-54	0	-30	6.4	-0.9	1096	-18.2	-1083.9
Std Dev Difference	*41*	*41*	*0*	*31*	*4.8*	*1.2*	*1096*	*25*	*1286.7*
% Difference	-16%	-57%	0%	-65%	17.80%	-45.80%	1096	-15.60%	-14.70%

Summary of runs Eastbound from Clarksville Grovers Mill Rd (CR 638) (#1)

8 Before-type runs, 8 of unverifiable origin, collected Saturday 10/02/21 to Saturday 10/02/21, over day(s) Sat, with starting times during 11:14:08 AM to 2:05:32 PM

5 After-type runs, collected Saturday 04/02/22 to Saturday 04/02/22, over day(s) Sat, with starting times during 12:23:14 PM to 4:36:49 PM

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to S Mill Rd (#2)											
Average Before (n=8)	53	2658	13	40	4	36.3	45	0.4	671	18.3	1157.4
Std Dev Before (n=8)	*15*	*0*	*15*	*0*	*5*	*9.4*	*0*	*0.5*	*671*	*9.2*	*435*
Average After (n=5)	41	2658	1	40	0	43.8	45	0	671	11.7	820.8
Std Dev After (n=5)	*2*	*0*	*2*	*0*	*0*	*1.6*	*0*	*0*	*671*	*0*	*14.7*
Difference	-12	0	-12	0	-4	7.5	0	-0.4	671	-6.7	-336.5
Std Dev Difference	*15*	*0*	*15*	*0*	*5*	*9.6*	*0*	*0.5*	*671*	*9.2*	*435.2*
% Difference	-23%	0%	-91%	0%	-100%	20.60%	0%	-100.00%	671	-36.40%	-29.10%
to Bernt Midland Blvd/Slayback Dr (#3)											
Average Before (n=8)	86	1701	23	63	6	35.9	50	0.6	657	30.9	1921.5
Std Dev Before (n=8)	*19*	*0*	*19*	*0*	*7*	*7.5*	*0*	*0.7*	*657*	*14.1*	*632.3*
Average After (n=5)	72	1701	9	63	4	41.8	50	0.2	657	23.2	1527.5
Std Dev After (n=5)	*10*	*0*	*10*	*0*	*8*	*4.9*	*0*	*0.4*	*657*	*9.1*	*406.8*
Difference	-14	0	-14	0	-2	5.8	0	-0.4	657	-7.7	-394
Std Dev Difference	*21*	*0*	*21*	*0*	*11*	*9*	*0*	*0.9*	*657*	*16.8*	*751.8*
% Difference	-16%	0%	-62%	0%	-38%	16.30%	0%	-68.00%	657	-25.00%	-20.50%
to Rabbit Hill Rd/Lanwin Blvd (#4)											
Average Before (n=8)	147	3612	34	113	8	37.6	50	0.8	655	49.3	3166.8
Std Dev Before (n=8)	*19*	*0*	*19*	*0*	*7*	*5.2*	*0*	*0.7*	*655*	*13.4*	*569.9*
Average After (n=5)	127	3612	14	113	4	43.1	50	0.2	655	38.9	2626.3
Std Dev After (n=5)	*10*	*0*	*10*	*0*	*8*	*3.3*	*0*	*0.4*	*655*	*9.1*	*400.7*
Difference	-20	0	-20	0	-4	5.4	0	-0.6	655	-10.3	-540.5
Std Dev Difference	*22*	*0*	*22*	*0*	*11*	*6.1*	*0*	*0.8*	*655*	*16.2*	*696.7*
% Difference	-14%	0%	-59%	0%	-51%	14.40%	0%	-73.30%	655	-21.00%	-17.10%
to Southfield Rd (#5)											
Average Before (n=8)	222	3899	57	166	22	36.8	50	1.3	551	72.2	4584.3
Std Dev Before (n=8)	*25*	*0*	*25*	*0*	*20*	*3.8*	*0*	*1*	*551*	*18.9*	*809.2*
Average After (n=5)	183	3899	17	166	4	44.2	50	0.2	551	53.2	3596.2
Std Dev After (n=5)	*9*	*0*	*9*	*0*	*8*	*2.2*	*0*	*0.4*	*551*	*9.1*	*386*
Difference	-39	0	-39	0	-19	7.4	0	-1.1	551	-19	-988.1
Std Dev Difference	*26*	*0*	*26*	*0*	*21*	*4.3*	*0*	*1.1*	*551*	*20.9*	*896.6*
% Difference	-18%	0%	-70%	0%	-83%	20.30%	0%	-84.00%	551	-26.30%	-21.60%
to Old Trenton Rd (CR 535) (#6)											
Average Before (n=8)	330	6237	79	251	37	37.7	50	1.9	574	107	6727.1
Std Dev Before (n=8)	*31*	*0*	*31*	*0*	*18*	*3.7*	*0*	*1*	*574*	*18.2*	*788.2*
Average After (n=5)	288	6237	37	251	17	42.8	50	1	574	91	5825.2
Std Dev After (n=5)	*15*	*0*	*15*	*0*	*11*	*2.4*	*0*	*0.7*	*574*	*13.5*	*588.8*
Difference	-42	0	-42	0	-20	5.1	0	-0.9	574	-16	-901.9
Std Dev Difference	*35*	*0*	*35*	*0*	*21*	*4.4*	*0*	*1.2*	*574*	*22.7*	*983.8*
% Difference	-13%	0%	-53%	0%	-53%	13.60%	0%	-46.70%	574	-14.90%	-13.40%

Summary of runs Westbound from Old Trenton Rd (CR 535) (#6)

8 Before-type runs, 8 of unverifiable origin, collected Saturday 10/02/21 to Saturday 10/02/21, over day(s) Sat, with starting times during 11:02:41 AM to 1:57:32 PM

7 After-type runs, collected Saturday 04/02/22 to Saturday 04/09/22, over day(s) Sat, with starting times during 12:27:34 PM to 4:42:52 PM

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to Southfield Rd (#5)											
Average Before (n=8)	125	6237	40	85	25	34.8	50	0.8	654	42.4	2702.4
Std Dev Before (n=8)	*23*	*0*	*23*	*0*	*23*	*6.4*	*0*	*0.5*	*654*	*9.5*	*506.2*
Average After (n=7)	99	6237	14	85	5	43.1	50	0.4	654	35.7	2228.2
Std Dev After (n=7)	*12*	*0*	*12*	*0*	*6*	*4.8*	*0*	*0.5*	*654*	*10.9*	*474.2*
Difference	-26	0	-26	0	-21	8.3	0	-0.3	654	-6.7	-474.2
Std Dev Difference	*26*	*0*	*26*	*0*	*24*	*8*	*0*	*0.7*	*654*	*14.4*	*693.6*

% Difference	-21%	0%	-65%	0%	-82%	24.00%	0%	-42.90%	654	-15.90%	-17.50%
to Rabbit Hill Rd/Lanwin Blvd (#4)											
Average Before (n=8)	193	3899	55	138	30	36.2	50	1	781	68.7	4419.7
Std Dev Before (n=8)	*29*	*0*	*29*	*0*	*28*	*4.9*	*0*	*0.5*	*781*	*12.1*	*660.2*
Average After (n=7)	159	3899	21	138	8	43.4	50	0.6	781	59.3	3765.3
Std Dev After (n=7)	*13*	*0*	*13*	*0*	*8*	*3.7*	*0*	*0.5*	*781*	*11.5*	*521.8*
Difference	-34	0	-34	0	-23	7.2	0	-0.4	781	-9.4	-654.4
Std Dev Difference	*32*	*0*	*32*	*0*	*29*	*6.1*	*0*	*0.8*	*781*	*16.7*	*841.5*
% Difference	-18%	0%	-62%	0%	-75%	20.00%	0%	-42.90%	781	-13.70%	-14.80%
to Bernt Midland Blvd/Slayback Dr (#3)											
Average Before (n=8)	253	3612	65	187	33	37.3	50	1.1	760	89.9	5845.3
Std Dev Before (n=8)	*28*	*0*	*28*	*0*	*26*	*3.9*	*0*	*0.6*	*760*	*15.4*	*746.9*
Average After (n=7)	213	3612	26	187	8	43.9	50	0.6	760	77.5	5030.4
Std Dev After (n=7)	*15*	*0*	*15*	*0*	*8*	*3.2*	*0*	*0.5*	*760*	*11.5*	*540.6*
Difference	-40	0	-40	0	-26	6.6	0	-0.6	760	-12.4	-814.9
Std Dev Difference	*32*	*0*	*32*	*0*	*28*	*5*	*0*	*0.8*	*760*	*19.2*	*922*
% Difference	-16%	0%	-61%	0%	-77%	17.70%	0%	-49.20%	760	-13.80%	-13.90%
to S Mill Rd (#2)											
Average Before (n=8)	289	1701	79	211	39	36.5	50	1.5	780	107.9	6896.9
Std Dev Before (n=8)	*24*	*0*	*24*	*0*	*21*	*2.8*	*0*	*0.5*	*780*	*13*	*579.4*
Average After (n=7)	239	1701	29	211	8	44	50	0.6	780	86.3	5649.6
Std Dev After (n=7)	*17*	*0*	*17*	*0*	*8*	*3*	*0*	*0.5*	*780*	*11.5*	*547.7*
Difference	-50	0	-50	0	-32	7.5	0	-0.9	780	-21.6	-1247.2
Std Dev Difference	*29*	*0*	*29*	*0*	*22*	*4.1*	*0*	*0.8*	*780*	*17.3*	*797.3*
% Difference	-17%	0%	-64%	0%	-81%	20.60%	0%	-61.90%	780	-20.00%	-18.10%
to Clarksville Grovers Mill Rd (CR 638) (#1)											
Average Before (n=8)	360	2658	109	251	56	34.4	45	2.1	522	125.7	8041
Std Dev Before (n=8)	*34*	*0*	*34*	*0*	*34*	*2.9*	*0*	*0.8*	*522*	*16.7*	*776.1*
Average After (n=7)	293	2658	42	251	15	42.2	45	1.1	522	103.2	6639.4
Std Dev After (n=7)	*26*	*0*	*26*	*0*	*14*	*3.8*	*0*	*0.9*	*522*	*16.2*	*768.8*
Difference	-67	0	-67	0	-41	7.8	0	-1	522	-22.5	-1401.6
Std Dev Difference	*43*	*0*	*43*	*0*	*37*	*4.8*	*0*	*1.2*	*522*	*23.2*	*1092.5*
% Difference	-19%	0%	-61%	0%	-73%	22.60%	0%	-46.20%	522	-17.90%	-17.40%

Appendix B

Princeton-Hightstown Road (C.R.571) and Clarksville Road (C.R.638)
West Windsor Township, Mercer County, New Jersey
Equipment ID SG00680

CONTROLLER TIMING

PHASE	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8	Ø 9	OVLP B
MINIMUM	7	15	7	7	6	15	7	7		
EXTENSION	2.0	3.5	2.0	2.0	2.0	3.5	2.0	2.0		
MAX (Plan 1)	31	21	17	31	10	49	17	31		
MAX (Plan 2)	12	35	17	36	14	33	17	36		
MAX (Plan 3)	19	50	11	24	19	50	11	24		
PED WALK									7	
PED CLEAR									14	
YELLOW	3.0	5.0	3.0	4.0	3.0	5.0	3.0	4.0	3.0	
RED		2.0		2.0		2.0		2.0		
MIN RECALL	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
PED RECAL	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
MAX RECALL	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
MEMORY	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
SOFT RECALL	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	
FLASH		**Y**		**R**		**Y**		**R**		

Ø 1	Princeton-Hightstown Road WB Lead Left
Ø 2	Princeton-Hightstown Road EB R.O.W.
Ø 3	Clarksville Road SB Lead Left
Ø 4	Clarksville Road NB R.O.W.
Ø 5	Princeton-Hightstown Road EB Lead Left
Ø 6	Princeton-Hightstown Road WB R.O.W.
Ø 7	Clarksville Road NB Lead Left
Ø 8	Clarksville Road SB R.O.W.
Ø 9	Exclusive Pedestrian Phase
OVLP B	Clarksville Road NB Right Turn

Princeton-Hightstown Road (C.R.571) and Clarksville Road (C.R.638)
West Windsor Township, Mercer County, New Jersey

WEEKLY PROGRAM CHART
DAY PLAN 1

EVENT	DAY	TIME	PLAN	REMARKS
1	SMTWTFS	00:00	2	OFF PEAK
2	SMTWTFS	06:30	1	A.M. PEAK
3	SMTWTFS	09:30	2	OFF PEAK
4	SMTWTFS	16:45	3	P.M. PEAK
5	SMTWTFS	21:30	2	OFF PEAK

CONTROLLER NOTES:

1) All phases shall be actuated.
2) The memory circuits shall be off.
3) Signal shall rest in phases 2 and 6 green, soft recall.
4) Phase 1 and/or 5 shall only follow phases 4 and 8.
5) Princeton-Hightstown R.O.W. 2+6 must follow phase 1 and/or 5.
6) Phase 3 and/or 7 shall only follow phases 2 and 6.
7) Clarksville Road R.O.W. 4+8 must follow phase 3 and/or 7.
8) The exclusive pedestrian phase, when actuated shall follow the Princeton-Hightsown R.O.W. 2 and 6.

Traffic Signal Timing Directive Directive # _____

Princeton-Hightstown Road (C.R.571) and Clarksville Road (C.R.638)

West Windsor Township, Mercer County, New Jersey

INDICATIONS

PHASE		1,2, 5,6	3	7, 8, 10, 11	4	9	P1 - P8	PLAN 1	PLAN 2	PLAN 3
A.	**CR.571 EB/WB LEAD LEFT**	←G/R	R	R	R	R/G→	H	7-10 (EB)/7-31 (WB)	7-14 (EB)/7-12 (WB)	7-19
1 & 5	Change	←Y/R	R	R	R	R/Y→	H	3	3	3
	Clearance	R	R	R	R	R	H	2	2	2
B.	**CR.571 EB/WB R.O.W.**	G	G	R	R	R	H	15-21 (EB)/15-49 (WB)	15-35 (EB)/15-33 (WB)	15-50
2 & 6	Change	Y	Y	R	R	R	H	5	5	5
	Clearance	R	R	R	R	R	H	2	2	2
C.	**CR.638 NB/SB LEAD LEFT**	R	R	←G/R	R	R	H	7-17	7-17	7-11
3 & 7	Change	R	R	←Y/R	R	R	H	3	3	3
D.	**CR.638 NB/SB R.O.W.**	R	R	G	G	G	H	7-31	7-36	7-24
4 & 8	Change	R	R	Y	Y	Y/G→	H	4	4	4
	Clearance	R	R	R	R	R/G→	H	2	2	2
E.	**EXCLUSIVE PEDESTRIAN**	R	R	R	R	R	M	7	7	7
9	Ped Clearance	R	R	R	R	R	FH	14	14	14
	Clearance	R	R	R	R	R	H	3	3	3
	Emergency Flash	**Y**	**Y**	**R**	**R**	**R**	**DARK**	50-60 FPM		

1) All phases shall be actuated.
2) Plan 1 shall be in effect from 6:30 A.M. to 9:30 A.M., Monday through Friday.
   Plan 3 shall be in effect from 4:45 P.M. to 9:30 P.M., Monday through Friday.
   Plan 2 in effect during all other times.
3) Vehicle Extension shall be set at 2 seconds for Phases A, C and D, and 3.5 seconds for Phase B.
4) The memory circuits shall be off.
5) Signal shall rest in Phase B green, soft recall.
6) Phase B omits Phase A. Phase D omits Phase C.
7) Detector switching shall be employed so that Phase A detectors shall extend Phase B.
8) Phase E, when actuated, follows Phase B.
9) The Princeton-Hightstown Road left-turn slots (Phase A) are to be separate phases but concurrently timed if actuation occurs in both slots. Each left-turn slot shall have the capability of terminating or extending independently of each other, thereby reverting the timing to the non-conflicting Phase B movement.
10) The Clarksville Road left-turn slots (Phase C) are to be separate phases but concurrently timed if actuation occurs in both slots. Each left-turn slot shall have the capability of terminating or extending independently of each other, thereby reverting the timing to the non-conflicting Phase D movement.

South Mill Road (C.R.526) and Princeton-Hightstown Road (C.R.571)
West Windsor Township, Mercer County, New Jersey
Equipment ID SG00090

CONTROLLER TIMING

PHASE	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
MINIMUM		45	8			45		
EXTENSION			2.0					
MAX I		45	20			45		
MAX II						20		
PED WALK				8				
PED CLEAR				18				
YELLOW		5.0	4.0	3.0		5.0		
RED		3.0	3.0			3.0		
MIN RECALL		OFF	OFF	OFF		OFF		
PED RECAL		OFF	OFF	OFF		OFF		
MAX RECALL		ON	OFF	OFF		ON		
MEMORY		OFF	OFF	OFF		OFF		
FLASH		**Y**	**R**			**Y**		

Ø 2 Princeton-Hightstown Road EB
Ø 3 South Mill Road
Ø 4 Exclusive Pedestrian Phase

Ø 6 Princeton-Hightstown Road WB

CONTROLLER NOTES:

1) The memory circuits shall be off.
2) Signal shall rest in phase 2 green.
3) The exclusive pedestrian phase, when actuated shall precede phase 2.

PRE-EMPTION NOTES:

1) Upon detection of an emergency preemption signal, controller shall proceed through all minimun change and clearance intervals

a) For Princeton-Hightstown Rd emergency vehicle preemption the controller shall dwell in phase A for 20 seconds and then resume normal operation

b) For South Mill Rd emergency vehicle preemption the controller shall dwell in phase B for 20 seconds and then resume normal operation

c) Subsequent preemption signal detection during preemption phase (R.O.W.) shall extend preemption (R.O.W.) for 10 sec.

d) If the controller recieves simultaneous preemption signals the preference will be given to the Princeton-Hightstown Rd emergency vehicle

Directive # _____

Traffic Signal Timing Directive

South Mill Road (C.R.526) and Princeton-Hightstown Road (C.R.571)

Township of West Windsor, Mercer County, New Jersey

VARIABLE CYCLE LENGTH

VEHICLE ACTUATION **INDICATIONS**

Phase		1,2,3,4,5,6	7,8,9	10,11	TIMING
A. 2 & 6	**Princeton-Hightstown Rd**	G	R	H	45
	Change	Y	R	H	5
	Clear	R	R	H	3
B. 3	**South Mill Rd**	R	G	H	8-20
	Change	R	Y	H	4
	Clear	R	R	H	3
EMERGENCY FLASH		**Y**	**R**	**DARK**	

NOTES:

1) The memory circuits are to be disconnected.
2) The vehicle extension shall be set at 2.0 seconds
3) The manual control is to be disconnected.
4) The signal shall rest in Phase A green.
5) Upon detection of an emergency preemption signal, controller shall proceed through all minimun change and clearance intervals to preemption phase noted below:

a) For Princeton-Hightstown Rd emergency vehicle preemption the controller shall dwell in phase A for 20 seconds and then resume normal operation

b) For South Mill Rd emergency vehicle preemption the controller shall dwell in phase B for 20 seconds and then resume normal operation

c) Subsequent preemption signal detection during preemption phase (R.O.W.) shall extend preemption (R.O.W.) for 10 sec.

d) If the controller recieves simultaneous preemption signals the preference will be given to the Princeton-Hightstown Rd emergency vehicle

Directive # _____

Traffic Signal Timing Directive

South Mill Road (C.R.526) and Princeton-Hightstown Road (C.R.571)

Township of West Windsor, Mercer County, New Jersey

VARIABLE CYCLE LENGTH

PEDESTRIAN ACTUATION

INDICATIONS

Phase		1,2,3,4,5,6	7,8,9	10,11	TIMING
A.	**Princeton-Hightstown Rd**	G	R	H	45
2 & 6	Change	Y	R	H	5
	Clear	R	R	H	3
B.	**South Mill Rd**	R	G	H	8-20
3	Change	R	Y	H	4
	Clear	R	R	H	3
C.	**Pedestrian Crossing**	R	R	M	8
4	Ped Clearance	R	R	FH	18
	Change	R	R	H	3
EMERGENCY FLASH		**Y**	**R**	**DARK**	

Princeton-Hightstown Road (C.R.571) and Slayback Drive/Bernt Midland Boulevard
West Windsor Township, Mercer County, New Jersey
Equipment ID SG00670

CONTROLLER TIMING

PHASE	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
MINIMUM	5	20		6	5	20		
EXTENSION	2.0			2.0	2.0			
MAX I	9	50		15	9	50		
MAX II								
PED WALK				7				
PED CLEAR				23				
YELLOW	3.0	5.0		4.0	3.0	5.0		
RED		2.0		2.0		2.0		
MIN RECALL	OFF	OFF		OFF	OFF	OFF		
PED RECAL	OFF	OFF		OFF	OFF	OFF		
MAX RECALL	OFF	ON		OFF	OFF	ON		
MEMORY	OFF	OFF		OFF	OFF	OFF		
FLASH		**Y**		**R**		**Y**		

Ø 1 Princeton-Hightstown Road EB Lead Left
Ø 2 Princeton-Hightstown Road WB R.O.W.

Ø 4 Slayback Drive/Bernt Midland Boulevard
Ø 5 Princeton-Hightstown Road WB Lead Left
Ø 6 Princeton-Hightstown Road EB R.O.W.

CONTROLLER NOTES:

1) The manual control shall be disconnected.
2) Signal shall rest in phases 2 and 6 green.
3) Lead left phase 1 and/or 5 shall only follow phase 4 and 8.
4) Princeton-Hightstown Road R.O.W. (2 and 6) must follow phases 1 and/or 5.

Princeton-Hightstown Road (C.R.571) and Rabbit Hill Road/Lanwin Boulevard
West Windsor Township, Mercer County, New Jersey
Equipment ID SG00660

CONTROLLER TIMING

PHASE	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
MINIMUM	6	50		9	6	50		9
EXTENSION	2.0			2.0	2.0			2.0
MAX I	12	50		23	12	50		23
MAX II								
PED WALK				5				
PED CLEAR				19				
YELLOW	3.0	5.0		4.0	3.0	5.0		4.0
RED		2.0		2.0		2.0		2.0
MIN RECALL	OFF	OFF		OFF	OFF	OFF		OFF
PED RECAL	OFF	ON		OFF	OFF	ON		OFF
MAX RECALL	OFF	OFF		OFF	OFF	OFF		OFF
MEMORY	OFF	OFF		OFF	OFF	OFF		OFF
FLASH		**Y**		**R**		**Y**		**R**

Ø 1 Princeton-Hightstown Road EB Lead Left
Ø 2 Princeton-Hightstown Road WB R.O.W.

Ø 4 Rabbit Hill Road
Ø 5 Princeton-Hightstown Road WB Lead Left
Ø 6 Princeton-Hightstown Road EB R.O.W.

Ø 8 Lanwin Boulevard

CONTROLLER NOTES:

1) The manual control shall be disconnected.
2) Signal shall rest in phases 2 and 6 walk.
3) Lead left phase 1 and/or 5 shall only follow phase 4 and 8.
4) Princeton-Hightstown Road R.O.W. (2 and 6) must follow phases 1 and/or 5.

Princeton-Hightstown Road (C.R.571) and Southfield Road
West Windsor Township, Mercer County, New Jersey
Equipment ID SG00650

CONTROLLER TIMING

PHASE	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
MINIMUM	5	19		6	5	19	6	6
EXTENSION	2.0			2.0	2.0		2.0	2.0
MAX I	15	40		18	9	40	15	18
MAX II								
PED WALK				5				5
PED CLEAR				22				22
YELLOW	3.0	5.0		5.0	3.0	5.0	3.0	5.0
RED		2.0		2.0		2.0		2.0
MIN RECALL	OFF	OFF		OFF	OFF	OFF	OFF	OFF
PED RECAL	OFF	OFF		OFF	OFF	OFF	OFF	OFF
MAX RECALL	OFF	ON		OFF	OFF	ON	OFF	OFF
MEMORY	OFF	OFF		OFF	OFF	OFF	OFF	OFF
FLASH		**Y**		**R**		**Y**		**R**

Ø 1 Princeton-Hightstown Road EB Lead Left
Ø 2 Princeton-Hightstown Road WB R.O.W.

Ø 4 Southfield Road SB R.O.W.
Ø 5 Princeton-Hightstown Road WB Lead Left
Ø 6 Princeton-Hightstown Road EB R.O.W.
Ø 7 Southfield Road SB Lead Left
Ø 8 Southfield Road NB R.O.W.

CONTROLLER NOTES:

1) The manual control shall be disconnected.
2) Signal shall rest in phases 2 and 6 green.
3) Lead left phase 1 and/or 5 shall only follow phase 4 and 8.
4) Princeton-Hightstown Road R.O.W. (2 and 6) must follow phases 1 and/or 5.

Old Trenton Road (C.R.535) and Princeton-Hightstown Road (C.R.571)
East Windsor Township, Mercer County, New Jersey
Equipment ID SG00470

CONTROLLER TIMING

PHASE	**Ø 1**	**Ø 2**	**Ø 3**	**Ø 4**	**Ø 5**	**Ø 6**	**Ø 7**	**Ø 8**
MINIMUM	6	40	6	8	6	40	6	8
EXTENSION	2.0		2.0	2.0	2.0		2.0	2.0
MAX I	12	40	12	16	12	40	12	16
MAX II								
PED WALK								
PED CLEAR								
YELLOW	3.0	5.0	3.0	5.0	3.0	5.0	3.0	5.0
RED		2.0		2.0		2.0		2.0
MIN RECALL	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
PED RECAL	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
MAX RECALL	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
MEMORY	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
FLASH		**Y**		**R**		**Y**		**R**

Ø 1 Princeton-Hightstown Road WB Lead Left
Ø 2 Princeton-Hightstown Road EB R.O.W
Ø 3 Old Trenton Road NB Lead Left
Ø 4 Old Trenton Road SB R.O.W.
Ø 5 Princeton-Hightstown Road EB Lead Left
Ø 6 Princeton-Hightstown Road WB R.O.W
Ø 7 Old Trenton Road SB Lead Left
Ø 8 Old Trenton Road NB R.O.W.

Old Trenton Road (C.R.535) and Princeton-Hightstown Road (C.R.571)
East Windsor Township, Mercer County, New Jersey

CONTROLLER NOTES:

1) The memory circuits shall be off.
2) The manual control shall be disconnected.
3) Signal shall rest in phases 2 and 6 green.
3) Lead left phase 1 and/or 5 shall only follow Old Trenton Road R.O.W.phase (4 + 8).
4) Princeton-Hightstown Road R.O.W. (2+6) must follow phases 1 and/or 5.
5) Lead left phase 3 and/or 7 shall only follow Princeton-Hightstown Road R.O.W.(2 + 6).
6) Old Trenton Road R.O.W. (4+8) must follow phases 3 and/or 7.

Appendix C

Implemented Timings

New Jersey Traffic Signal Retiming Initiative

Princeton-Hightstown Rd (CR 571)
Mercer County, New Jersey

Prepared for:
Delaware Valley Regional Planning Commission (DVRPC)

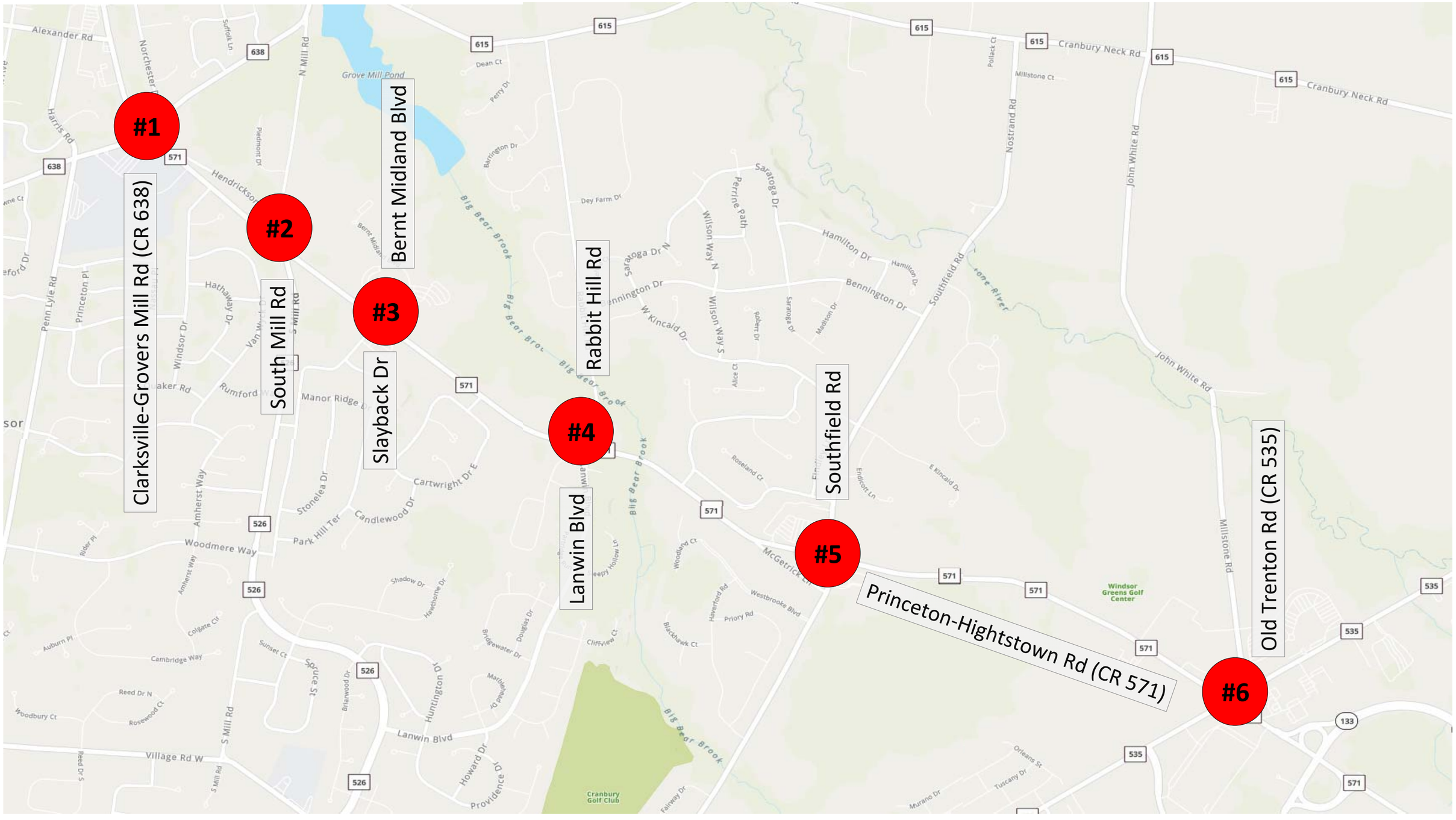
and

Mercer County, NJ

Prepared by:

Subcontracted with:

April 2022



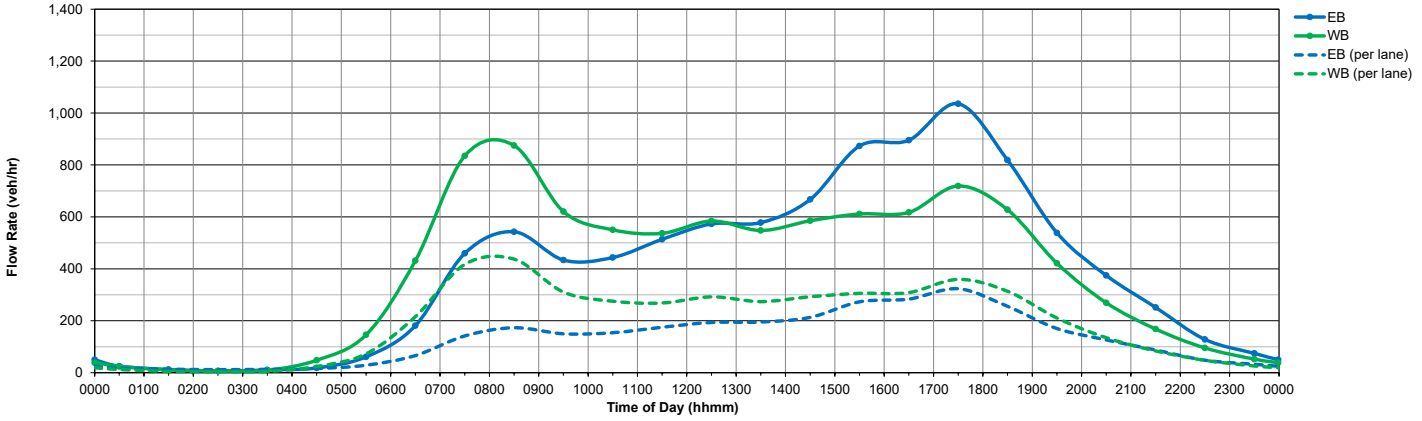
Project Intersection:

Figure 1
Traffic Signal Locations
Princeton-Hightstown Rd (CR 571)

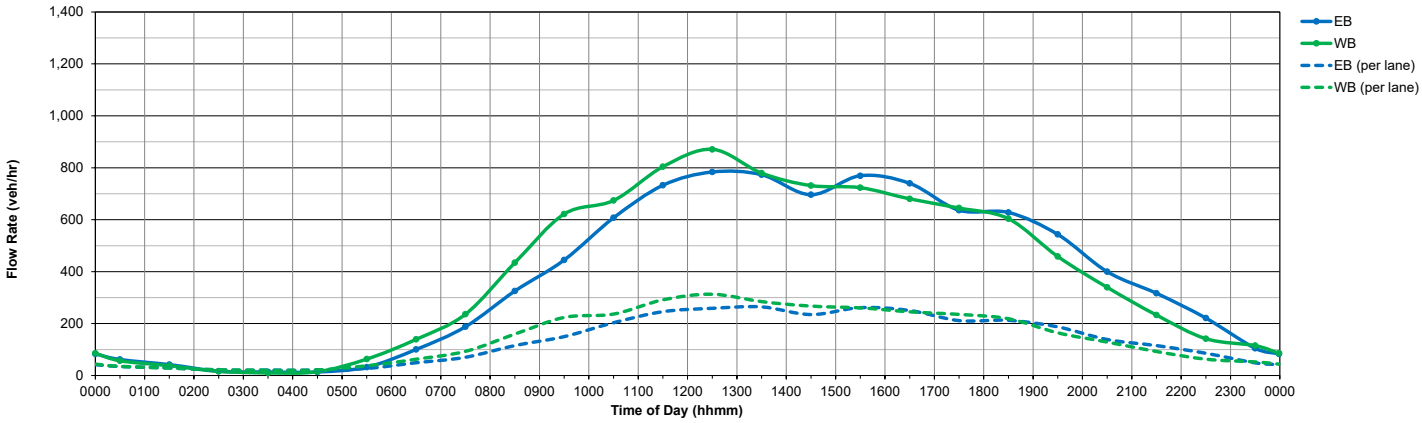
Hourly Volumes - Average for Count Locations on Princeton-Hightstown Rd between West of Windsor Dr and West of Old Trenton Rd

From	To	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Avg. Weekday		Avg. Weekend	
		EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
0000	0100	25	28	22	18	27	26	23	24	28	26	62	57	63	52	25	24	62	54
0100	0200	13	11	9	7	8	11	18	10	15	13	42	37	33	33	12	11	38	35
0200	0300	3	8	6	7	6	4	8	7	13	10	17	16	17	17	7	7	17	17
0300	0400	8	8	16	9	12	14	9	7	8	12	14	10	15	11	11	10	14	11
0400	0500	19	50	18	44	16	57	23	43	19	48	13	15	12	11	19	48	13	13
0500	0600	58	145	62	158	71	147	52	146	62	132	32	63	31	32	61	146	32	48
0600	0700	182	431	175	467	182	439	178	424	190	395	100	139	69	78	181	431	85	109
0700	0800	463	853	473	856	464	863	455	837	445	765	188	236	101	130	460	835	144	183
0800	0900	557	875	554	916	535	925	544	900	525	759	326	434	205	262	543	875	266	348
0900	1000	407	611	471	667	471	614	414	613	406	599	445	622	338	363	434	621	391	492
1000	1100	419	562	484	560	445	597	439	503	429	531	607	674	418	553	443	550	513	613
1100	1200	501	500	572	547	510	542	494	541	495	554	733	804	559	643	514	537	646	723
1200	1300	525	575	673	586	540	566	527	591	600	604	784	871	640	749	573	584	712	810
1300	1400	535	520	632	602	547	499	536	513	641	605	773	779	600	688	578	548	687	734
1400	1500	614	550	727	604	603	556	664	563	728	653	696	731	673	700	667	585	685	716
1500	1600	861	570	867	597	847	604	853	623	938	664	769	723	638	657	873	612	704	690
1600	1700	897	618	884	581	876	614	909	581	910	692	740	680	628	597	895	617	684	639
1700	1800	995	649	1,067	747	1,024	733	1,111	720	982	746	637	645	640	617	1,036	719	638	631
1800	1900	777	578	834	601	823	648	853	611	809	700	628	604	564	486	819	628	596	545
1900	2000	437	355	490	396	573	398	557	453	636	505	543	458	446	413	539	421	495	436
2000	2100	337	223	319	229	373	280	405	284	440	332	400	340	295	250	375	270	347	295
2100	2200	196	131	209	149	258	145	259	159	334	257	317	233	166	143	251	168	241	188
2200	2300	89	73	112	73	118	77	109	93	212	160	221	142	80	77	128	95	150	110
2300	0000	50	37	53	39	67	42	66	54	136	90	105	115	49	37	74	52	77	76
	Sub-total	8,967	8,960	9,727	9,462	9,396	9,401	9,506	9,299	10,002	9,851	9,191	9,430	7,280	7,598	9,520	9,395	8,236	8,514
	Total	17,927		19,189		18,797		18,805		19,853		18,621		14,878		18,914		16,750	

Weekday Average Hourly Volumes



Saturday Hourly Volumes



Hourly Volumes by Day

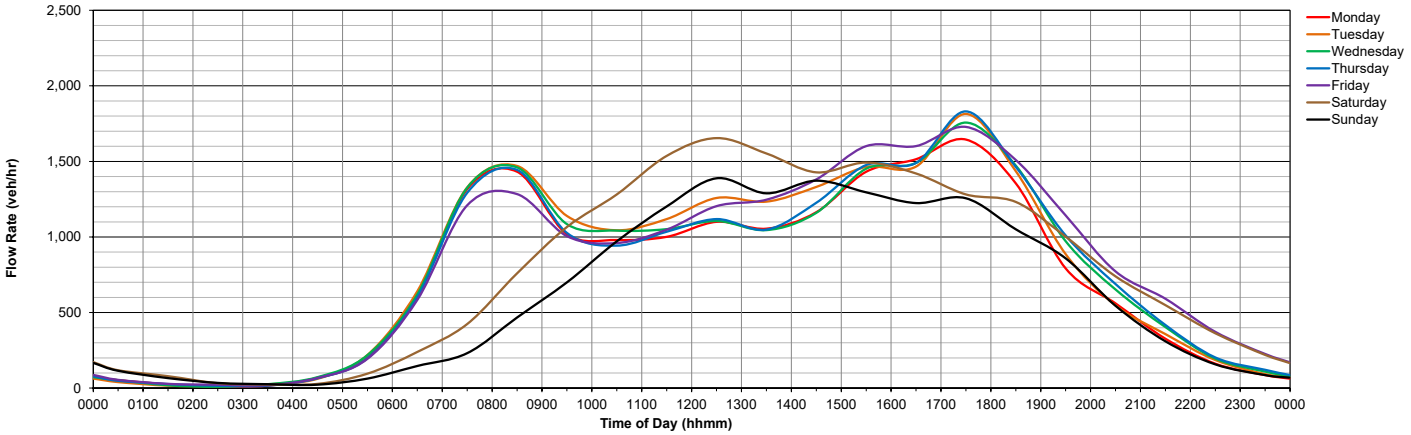
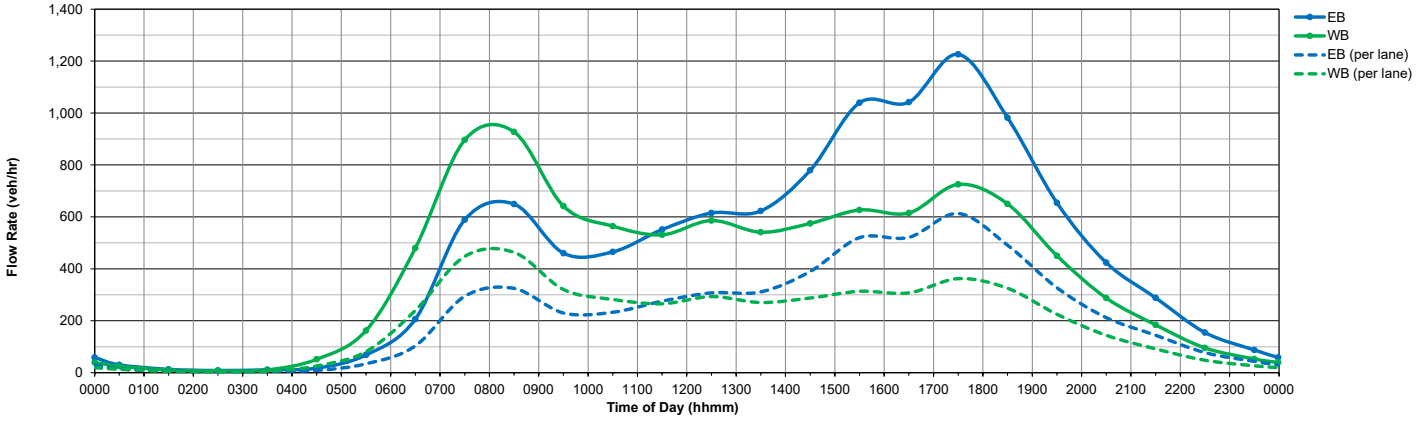


Figure 2
7-Day, 24-Hour Volumes
Average for Count Locations on Princeton-Hightstown Rd between West of Windsor Dr and West of Old Trenton Rd

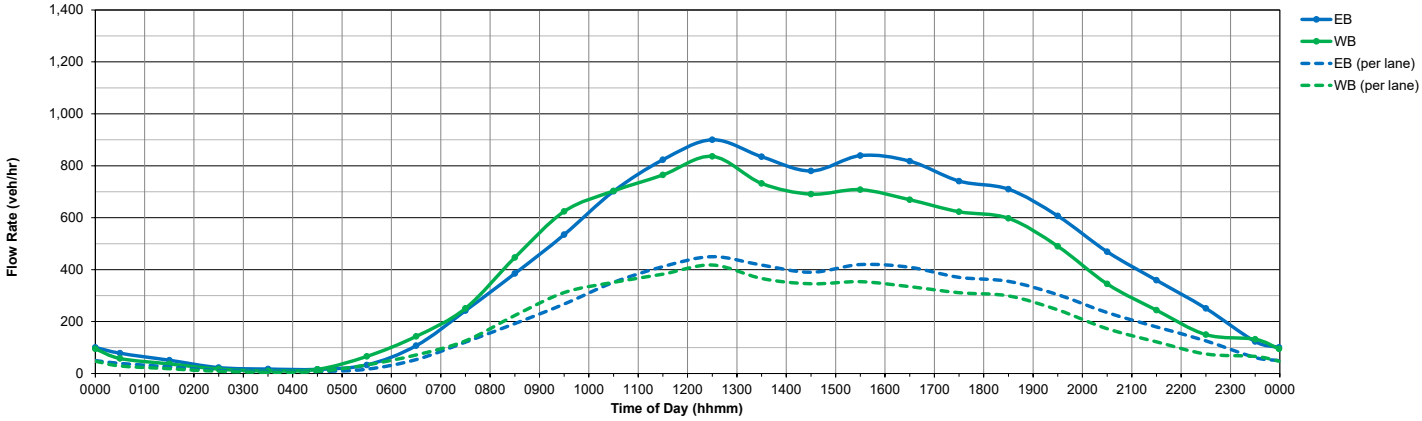
Hourly Volumes - Princeton-Hightstown Rd West of Windsor Dr

From	To	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Avg. Weekday		Avg. Weekend	
		EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
0000	0100	32	29	26	20	31	26	24	24	38	29	78	58	74	52	30	26	76	55
0100	0200	14	12	10	9	8	12	20	9	14	9	51	37	34	29	13	10	43	33
0200	0300	3	10	9	8	6	3	9	9	15	8	23	17	21	21	8	8	22	19
0300	0400	9	9	18	12	13	14	8	7	9	14	17	10	16	13	11	11	17	12
0400	0500	17	54	18	45	13	59	23	48	18	54	16	16	14	12	18	52	15	14
0500	0600	69	154	66	174	78	170	59	163	71	151	33	66	32	32	69	162	33	49
0600	0700	202	491	202	523	216	483	206	467	207	435	107	143	80	79	207	480	94	111
0700	0800	592	903	585	931	604	916	590	891	574	841	242	251	113	139	589	896	178	195
0800	0900	684	924	656	999	628	963	653	946	625	805	385	447	245	265	649	927	315	356
0900	1000	461	641	455	678	459	648	480	642	446	597	535	624	397	350	460	641	466	487
1000	1100	455	582	461	583	436	584	484	515	491	559	702	703	452	562	465	565	577	633
1100	1200	564	489	536	544	556	544	555	539	546	539	823	765	614	614	551	531	719	690
1200	1300	558	594	643	593	618	561	591	587	665	596	900	836	704	710	615	586	802	773
1300	1400	592	513	628	593	611	514	594	506	690	579	835	732	669	628	623	541	752	680
1400	1500	743	555	793	600	705	564	812	546	846	610	780	691	756	662	780	575	768	677
1500	1600	1,059	577	1,013	627	1,015	628	1,008	640	1,103	662	839	708	699	633	1,040	627	769	671
1600	1700	1,061	615	1,048	593	1,009	609	1,051	582	1,042	677	818	669	690	565	1,042	615	754	617
1700	1800	1,158	647	1,270	784	1,216	752	1,342	709	1,145	733	741	623	710	609	1,226	725	726	616
1800	1900	918	571	1,051	635	986	671	1,021	625	935	750	710	598	628	497	982	650	669	548
1900	2000	555	365	601	469	685	422	681	474	751	521	607	490	504	428	655	450	556	459
2000	2100	405	249	313	204	442	315	456	320	505	352	469	345	342	254	424	288	406	300
2100	2200	231	144	235	181	295	166	285	165	397	264	359	244	189	159	289	184	274	202
2200	2300	99	71	135	71	137	72	140	95	263	170	251	150	95	75	155	96	173	113
2300	0000	60	36	60	41	81	42	75	52	161	94	123	132	56	32	87	53	90	82
	Sub-total	10,541	9,235	10,832	9,917	10,848	9,738	11,167	9,561	11,557	10,049	10,444	9,355	8,134	7,420	10,989	9,700	9,289	8,388
	Total	19,776		20,749		20,586		20,728		21,606		19,799		15,554		20,689		17,677	

Weekday Average Hourly Volumes



Saturday Hourly Volumes



Hourly Volumes by Day

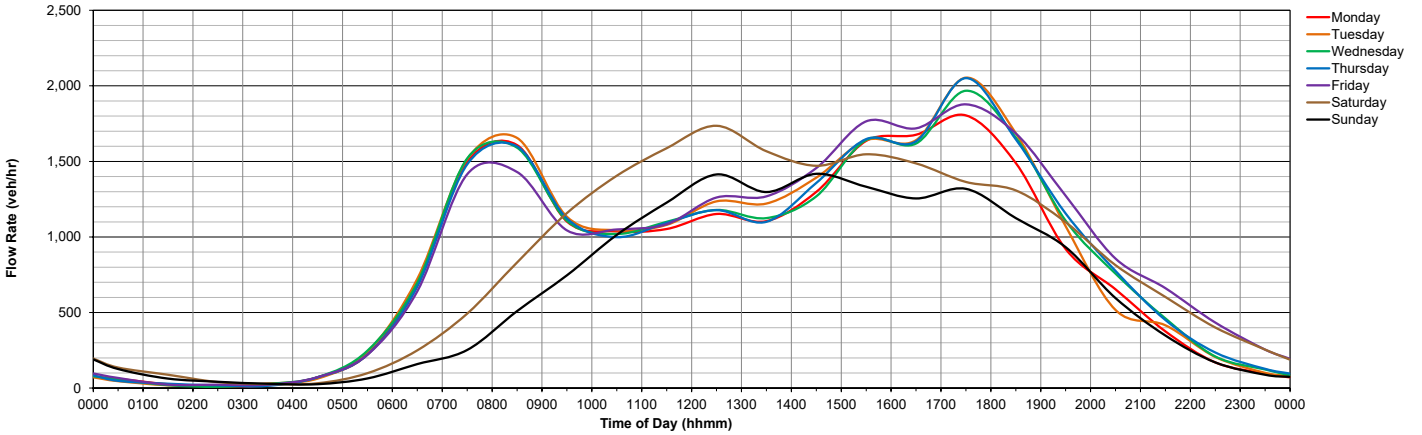
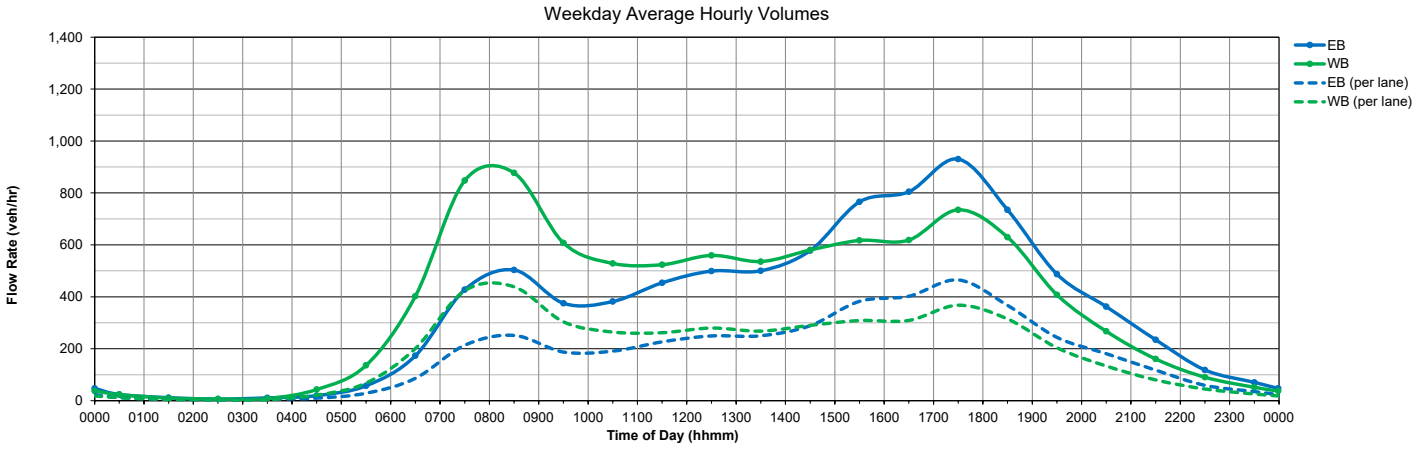
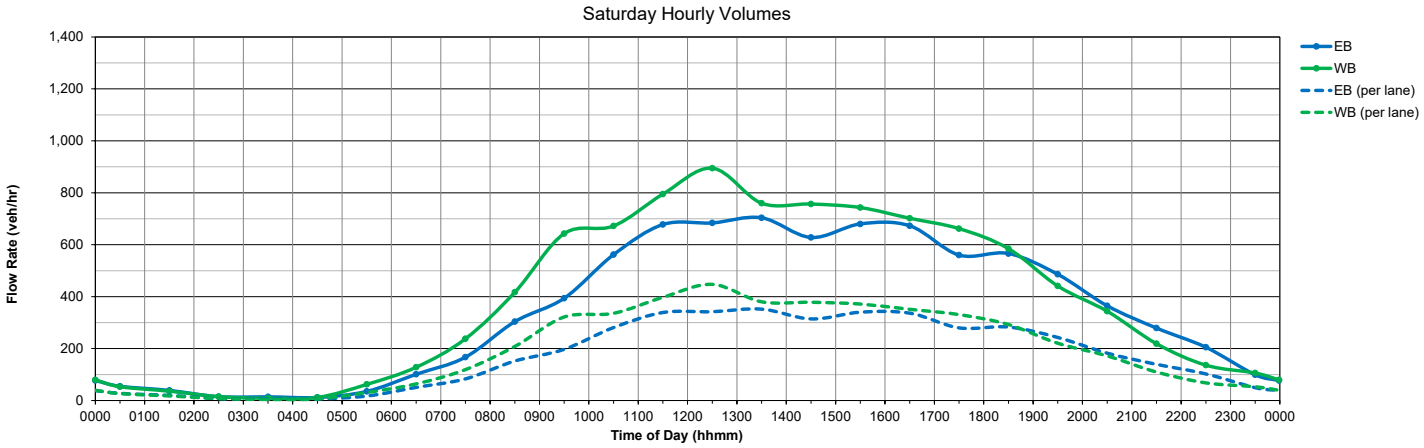


Figure 3
7-Day, 24-Hour Volumes
Princeton-Hightstown Rd West of Windsor Dr

Hourly Volumes - Princeton-Hightstown Rd West of Bentley Dr

From	To	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Avg. Weekday		Avg. Weekend	
		EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
0000	0100	22	26	19	18	26	26	23	23	29	25	55	53	61	51	24	24	58	52
0100	0200	13	11	8	7	7	11	16	9	14	13	39	36	35	33	12	10	37	35
0200	0300	2	6	5	8	6	3	6	7	12	10	15	15	16	16	6	7	16	16
0300	0400	9	7	16	7	13	12	9	7	8	11	14	9	15	10	11	9	15	10
0400	0500	19	48	19	39	17	52	25	38	19	40	12	12	12	10	20	43	12	11
0500	0600	53	135	58	151	66	139	53	135	58	120	35	62	31	30	58	136	33	46
0600	0700	174	398	167	432	172	418	170	404	182	359	101	128	66	72	173	402	84	100
0700	0800	420	892	439	863	436	885	423	846	420	754	167	238	95	116	428	848	131	177
0800	0900	521	890	501	901	492	946	514	891	489	760	304	417	173	248	503	878	239	333
0900	1000	382	590	372	668	377	598	376	592	369	591	394	643	296	358	375	608	345	501
1000	1100	374	544	358	515	357	575	421	499	399	512	562	672	366	535	382	529	464	604
1100	1200	463	511	471	506	438	520	453	530	445	552	678	795	516	616	454	524	597	706
1200	1300	489	543	503	555	480	542	483	560	542	599	684	895	580	731	499	560	632	813
1300	1400	469	509	486	589	487	484	491	495	569	602	704	760	530	695	500	536	617	728
1400	1500	529	554	591	584	548	541	574	571	649	653	628	757	582	672	578	581	605	715
1500	1600	777	594	737	595	734	604	752	648	829	645	680	743	567	651	766	617	624	697
1600	1700	821	630	813	586	780	608	802	575	809	694	673	702	562	604	805	619	618	653
1700	1800	916	673	940	754	922	743	1,006	750	868	757	560	662	574	638	930	735	567	650
1800	1900	692	586	739	620	734	643	762	618	748	683	566	585	525	492	735	630	546	539
1900	2000	393	345	465	342	525	407	481	446	574	500	486	441	393	414	488	408	440	428
2000	2100	307	224	324	250	364	273	411	272	406	318	365	344	266	257	362	267	316	301
2100	2200	186	123	200	136	241	129	244	155	304	261	279	219	156	130	235	161	218	175
2200	2300	87	69	106	66	109	74	96	87	195	156	205	136	77	75	119	90	141	106
2300	0000	48	37	48	38	64	42	68	54	125	87	99	106	46	33	71	52	73	70
	Sub-total	8,166	8,945	8,385	9,230	8,395	9,275	8,659	9,212	9,062	9,702	8,305	9,430	6,540	7,487	8,533	9,273	7,423	8,459
	Total	17,111		17,615		17,670		17,871		18,764		17,735		14,027		17,806		15,881	





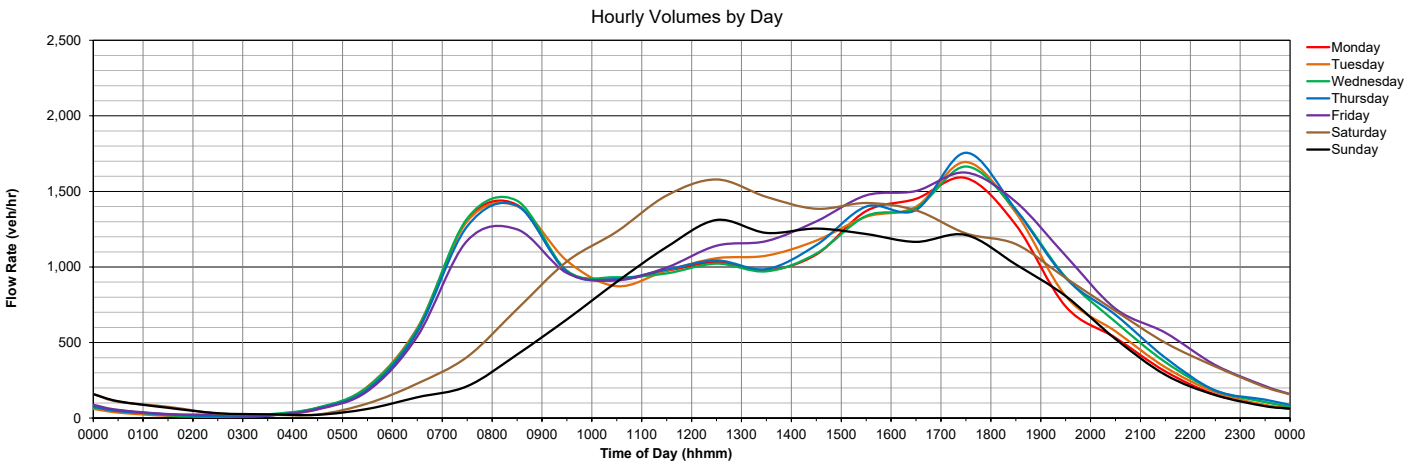
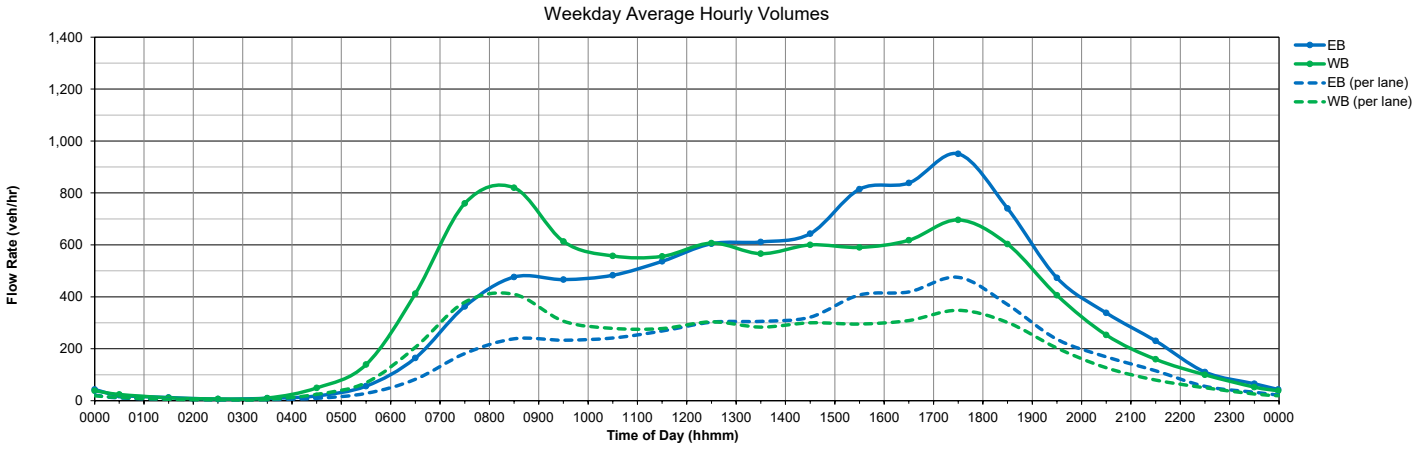
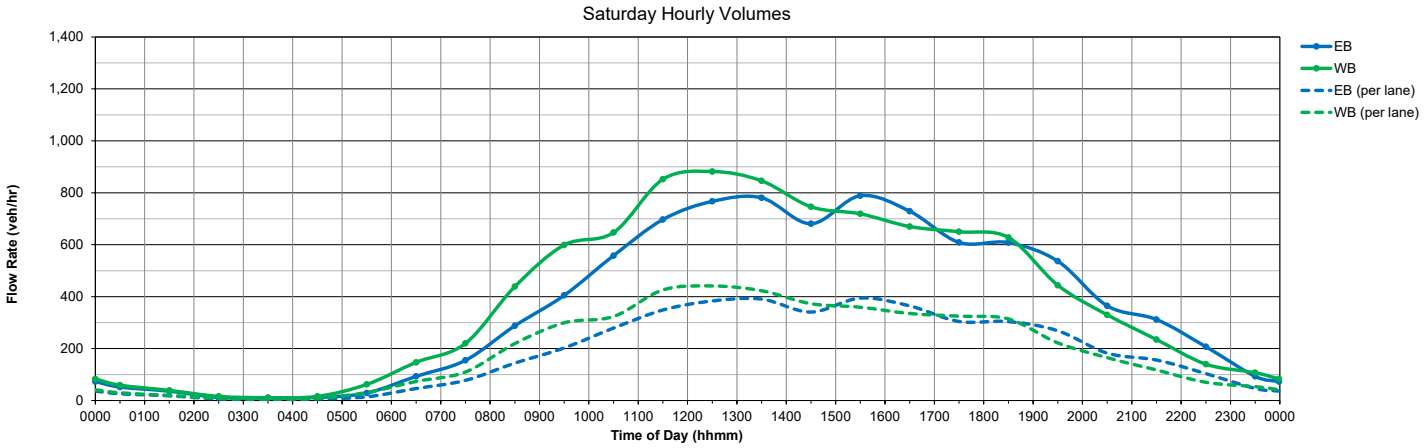


Figure 4
7-Day, 24-Hour Volumes
Princeton-Hightstown Rd West of Bentley Dr

Hourly Volumes - Princeton-Hightstown Rd West of Old Trenton Rd

From	To	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Avg. Weekday		Avg. Weekend	
		EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
0000	0100	21	28	20	17	23	25	23	26	18	25	52	59	53	52	21	24	53	56
0100	0200	13	11	8	6	8	11	17	11	17	17	36	39	31	37	13	11	34	38
0200	0300	3	7	5	6	5	5	8	6	11	11	12	16	14	14	6	7	13	15
0300	0400	6	9	14	9	9	16	10	7	7	10	10	11	14	10	9	10	12	11
0400	0500	21	49	16	48	17	59	20	42	20	49	12	16	9	10	19	49	11	13
0500	0600	51	146	61	150	69	133	45	140	56	126	29	62	31	34	56	139	30	48
0600	0700	169	404	156	447	159	416	158	402	181	391	93	147	61	83	165	412	77	115
0700	0800	376	765	394	774	351	787	353	773	341	699	155	220	94	136	363	760	125	178
0800	0900	467	811	504	848	485	867	465	863	462	711	288	439	198	272	477	820	243	356
0900	1000	379	601	587	655	576	596	386	604	404	609	405	599	320	380	466	613	363	490
1000	1100	427	559	634	581	543	631	413	495	398	521	558	647	437	561	483	557	498	604
1100	1200	475	501	708	592	536	562	473	554	493	570	697	852	548	698	537	556	623	775
1200	1300	529	587	872	610	522	595	506	627	594	616	767	882	635	807	605	607	701	845
1300	1400	545	537	783	623	542	498	522	539	665	635	781	846	602	742	611	566	692	794
1400	1500	569	541	797	628	557	564	605	571	689	696	681	746	682	765	643	600	682	756
1500	1600	748	540	850	568	793	581	800	580	882	684	789	719	649	688	815	591	719	704
1600	1700	808	609	792	565	840	625	874	586	878	705	729	670	632	621	838	618	681	646
1700	1800	911	628	990	703	933	704	985	700	934	747	609	650	636	603	951	696	623	627
1800	1900	720	576	712	549	750	631	775	591	745	668	608	628	539	470	740	603	574	549
1900	2000	362	355	403	377	510	365	508	438	584	495	537	444	440	396	473	406	489	420
2000	2100	300	197	321	233	313	251	349	259	408	327	365	330	276	240	338	253	321	285
2100	2200	172	125	191	129	239	141	248	156	302	246	312	235	153	141	230	159	233	188
2200	2300	81	78	95	83	108	85	92	98	177	155	207	140	67	81	111	100	137	111
2300	0000	41	37	51	39	57	41	56	57	122	88	93	107	44	47	65	52	69	77
	Sub-total	8,194	8,701	9,964	9,240	8,945	9,189	8,691	9,125	9,388	9,801	8,825	9,504	7,165	7,888	9,036	9,211	7,995	8,696
	Total	16,895		19,204		18,134		17,816		19,189		18,329		15,053		18,248		16,691	





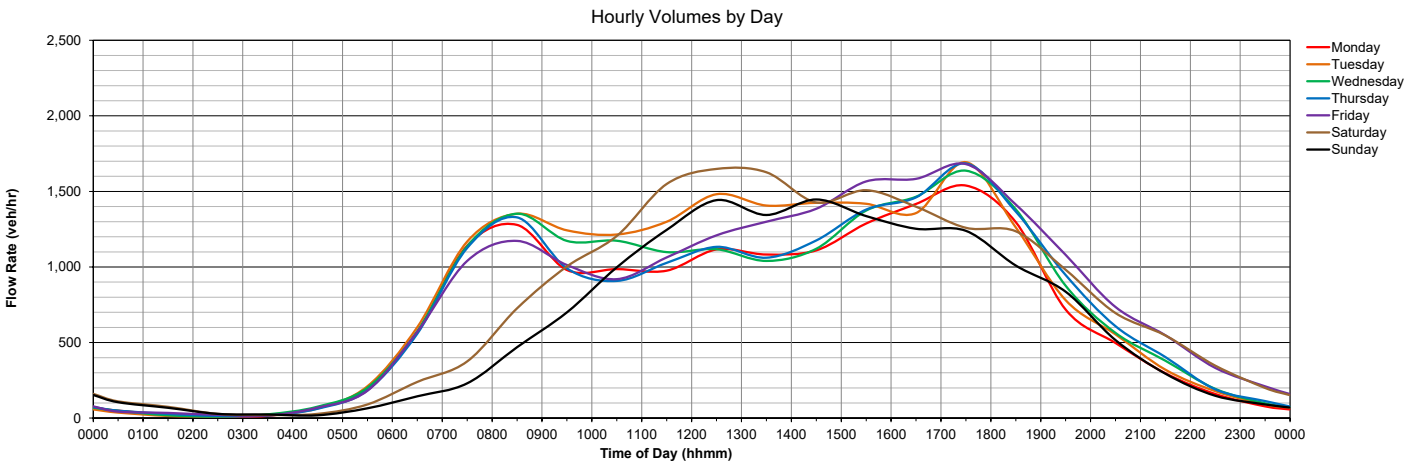


Figure 5
7-Day, 24-Hour Volumes
Princeton-Hightstown Rd West of Old Trenton Rd

EXISTING SCHEDULES
Princeton-Hightstown Rd (CR 571)
Monday-Friday

	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
1 Clarksville Grovers Mill Rd (CR 571)	254 [Free][2]							254 [Free][1]			254 [Free][2]									254 [Free][3]				254 [Free][2]	
2 S Mill Rd	254 [Free]																								
3 Slayback Dr/ Brent Midland Blvd	0 [Free]																								
4 Lanwin Blvd/Rabbit Hill Rd	0 [Free]																								
5 Southfield Rd	0 [Free]																								
6 Old Trenton Rd (CR 535)	0 [Free]																								

Notes: 1 - Timing Plan 1, 2 - Timing Plan 2, 3 - Timing Plan 3 used (different MAX times in use by time of day)

IMPLEMENTED SCHEDULES
Princeton-Hightstown Rd (CR 571)
Monday-Friday

	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
1 Clarksville Grovers Mill Rd (CR 571)	254 [Free]								11	1 [100]	2 [80]					13	3[100]			4 [80]	[FREE]				
2 S Mill Rd	254 [Free]								1 [100]		2 [80]						3[100]			4 [80]	[FREE]				
3 Slayback Dr/ Brent Midland Blvd	254 [Free]								1 [100]		2 [80]						3[100]			4 [80]	[FREE]				
4 Lanwin Blvd/Rabbit Hill Rd	254 [Free]								1 [100]		2 [80]						3[100]			4 [80]	[FREE]				
5 Southfield Rd	254 [Free]								1 [100]		2 [80]						3[100]			4 [80]	[FREE]				
6 Old Trenton Rd (CR 535)	254 [Free w/ Max 1]								254 [Free w/ Max 2]		254 [Free w/ Max 1]					254 [Free w/ Max 3]				254 [Free w/ Max 1]					

Notes:
At Clarksville Grovers Mill Rd (CR 571), there is unique programming to better service school traffic:
Timing Plan 1 - Used for free-operation late night and overnight
Timing Plan 2 - Used for AM School time between 7:00 AM and 8:00 AM, utilized MAX II times (Pattern 11, FREE)
Timing Plan 3 - Used for PM School time between 2:30 PM and 3:15 PM, utilizes MAX III times (Pattern 13, FREE)
Timing Plan 4 - Used for all coordinated patterns other than PM, utilized MAX I times
The Minimum Green, Extention vary between the timing plans. The programing varies throughout the day plan schedule to better address the impacts of school traffic and the exclusive pedestrian phase.

EXISTING SCHEDULES
Princeton-Hightstown Rd (CR 571)
Saturday

	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
1 Clarksville Grovers Mill Rd (CR 571)	0 [Free]																								
2 S Mill Rd	0 [Free]																								
3 Slayback Dr/ Brent Midland Blvd	0 [Free]																								
4 Lanwin Blvd/Rabbit Hill Rd	0 [Free]																								
5 Southfield Rd	0 [Free]																								
6 Old Trenton Rd (CR 535)	0 [Free]																								

Notes:

IMPLEMENTED SCHEDULES
Princeton-Hightstown Rd (CR 571)
Saturday

	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
1 Clarksville Grovers Mill Rd (CR 571)	254 [Free]										5 [80]			6 [90]				5 [80]			254 [FREE]				
2 S Mill Rd	254 [Free]										5 [80]			6 [90]				5 [80]			254 [FREE]				
3 Slayback Dr/ Brent Midland Blvd	254 [Free]										5 [80]			6 [90]				5 [80]			254 [FREE]				
4 Lanwin Blvd/Rabbit Hill Rd	254 [Free]										5 [80]			6 [90]				5 [80]			254 [FREE]				
5 Southfield Rd	254 [Free]										5 [80]			6 [90]				5 [80]			254 [FREE]				
6 Old Trenton Rd (CR 535)	254 [Free w/ Max 1]																								

Notes:

EXISTING SCHEDULES
Princeton-Hightstown Rd (CR 571)
Sunday

	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
1 Clarksville Grovers Mill Rd (CR 571)	0 [Free]																								
2 S Mill Rd	0 [Free]																								
3 Slayback Dr/ Brent Midland Blvd	0 [Free]																								
4 Lanwin Blvd/Rabbit Hill Rd	0 [Free]																								
5 Southfield Rd	0 [Free]																								
6 Old Trenton Rd (CR 535)	0 [Free]																								

Notes:

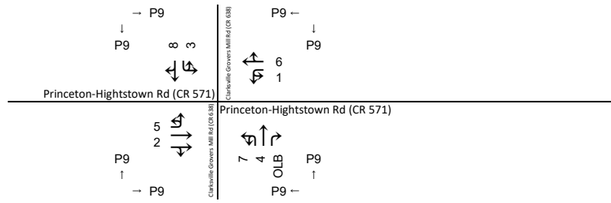
IMPLEMENTED SCHEDULES
Princeton-Hightstown Rd (CR 571)
Sunday

	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
1 Clarksville Grovers Mill Rd (CR 571)	254 [Free]										5 [80]			6 [90]				5 [80]			254 [FREE]				
2 S Mill Rd	254 [Free]										5 [80]			6 [90]				5 [80]			254 [FREE]				
3 Slayback Dr/ Brent Midland Blvd	254 [Free]										5 [80]			6 [90]				5 [80]			254 [FREE]				
4 Lanwin Blvd/Rabbit Hill Rd	254 [Free]										5 [80]			6 [90]				5 [80]			254 [FREE]				
5 Southfield Rd	254 [Free]										5 [80]			6 [90]				5 [80]			254 [FREE]				
6 Old Trenton Rd (CR 535)	254 [Free w/ Max 1]																								

Notes:

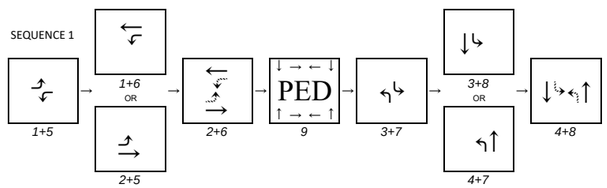
LEGEND
A white box indicates FREE operation, a shaded box indicates coordinated operation.
The first number specifies the pattern, the second number [in brackets] is the cycle length (s).
Darker shades represent a longer cycle length.

Figure 6
Day Plan Schedules
Princeton-Hightstown Rd (CR 571)



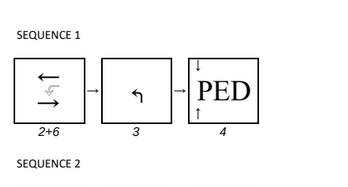
Sequences — Signal ID: 1

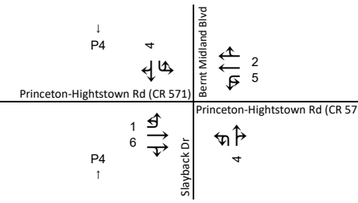
	AM	MD	PM	PO	WA	WM
Per						
Ex	1	1	1	1	1	1
Imp	1	1	1	1	1	1



Sequences — Signal ID: 2

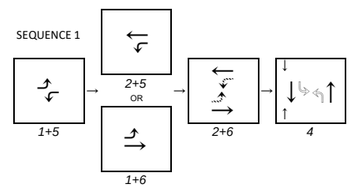
	AM	MD	PM	PO	WA	WM
Per						
Ex	1	1	1	1	1	1
Imp	2	2	2	2	2	2





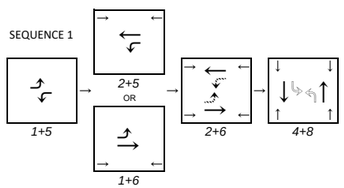
Sequences — Signal ID: 3

	AM	MD	PM	PO	WA	WM
Per						
Ex	1	1	1	1	1	1
Imp	1	1	1	1	1	1



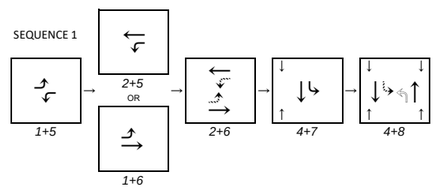
Sequences — Signal ID: 4

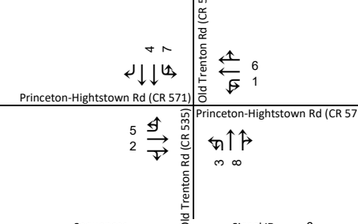
	AM	MD	PM	PO	WA	WM
Per						
Ex	1	1	1	1	1	1
Imp	1	1	1	1	1	1



Sequences — Signal ID: 5

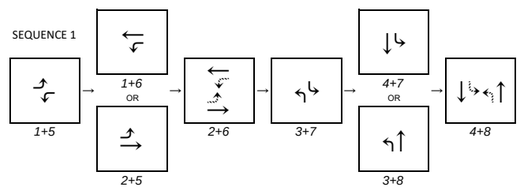
	AM	MD	PM	PO	WA	WM
Per						
Ex	1	1	1	1	1	1
Imp	1	1	1	1	1	1





Sequences — Signal ID: 6

	AM	MD	PM	PO	WA	WM
Per						
Ex	1	1	1	1	1	1
Imp	1	1	1	1	1	1



Phase Diagrams

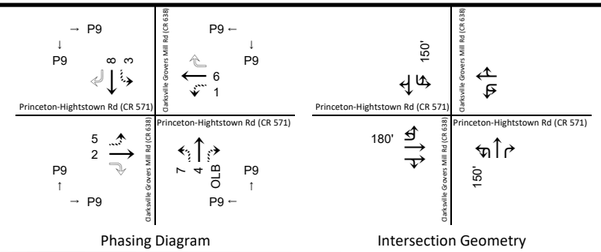
- Permissive Movement
- Protected + Permissive Movement
- Protected-Only Movement

N
NTS

Figure 7

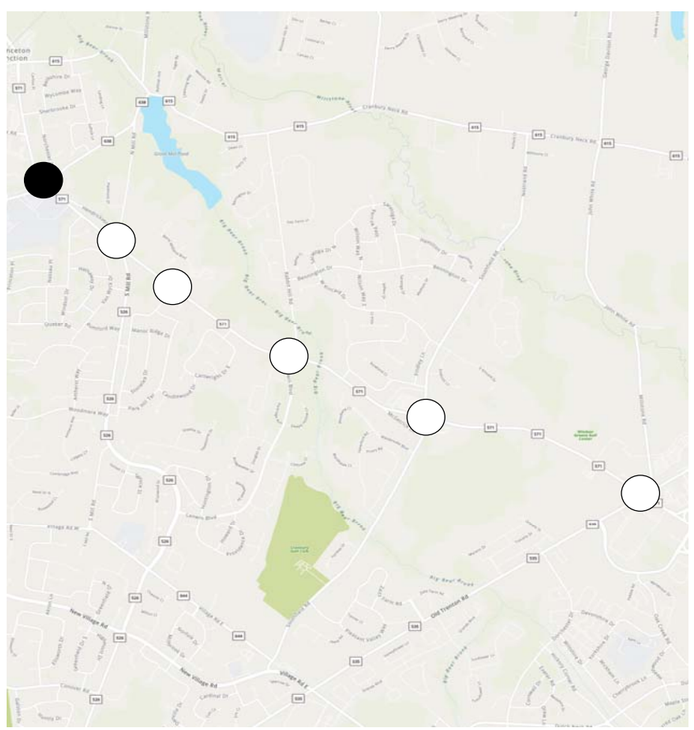
Phase Sequence Diagrams

Princeton-Hightstown Rd (CR 571)



Phasing Diagram

Intersection Geometry

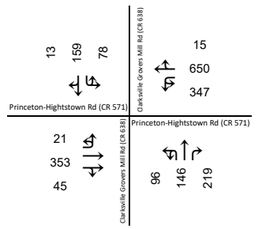


N

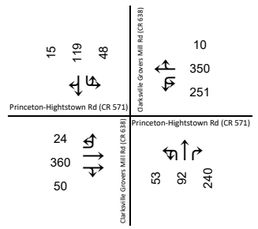
NTS

Hourly Volumes

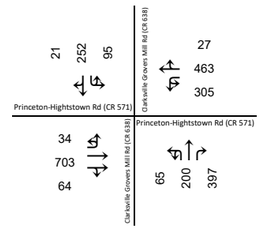
AM Peak



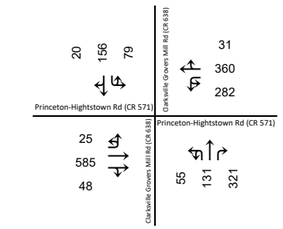
MD Peak



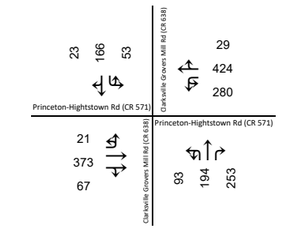
PM Peak



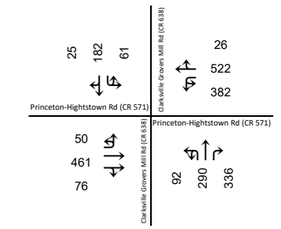
PM Off-peak



Weekend AM Peak

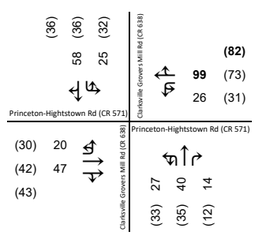


Weekend MD Peak



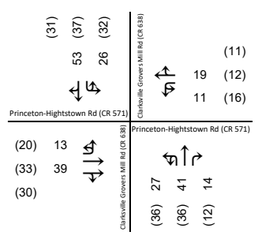
Existing Operations

AM Peak



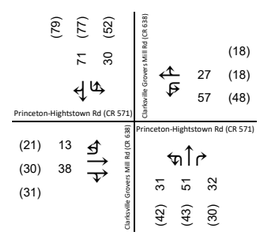
Summary				
Timing Pattern	Free	Syn Delay	56	E
Actuated Cycle	108.5	Sim Delay	(47)	
Max v/C	1.12	ICU	85%	E

MD Peak



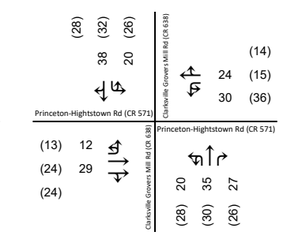
Summary				
Timing Pattern	Free	Syn Delay	27	C
Actuated Cycle	94.6	Sim Delay	(22)	
Max v/C	0.68	ICU	66%	C

PM Peak



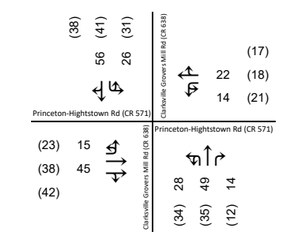
Summary				
Timing Pattern	Free	Syn Delay	42	D
Actuated Cycle	110.6	Sim Delay	(36)	
Max v/C	0.93	ICU	89%	E

PM Off-peak



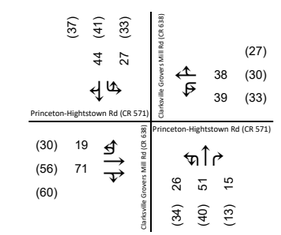
Summary				
Timing Pattern	Free	Syn Delay	28	C
Actuated Cycle	82.3	Sim Delay	(25)	
Max v/C	0.81	ICU	79%	D

Weekend AM Peak



Summary				
Timing Pattern	Free	Syn Delay	32	C
Actuated Cycle	102.3	Sim Delay	(27)	
Max v/C	0.75	ICU	69%	C

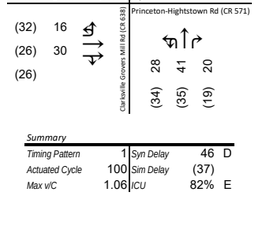
Weekend MD Peak



Summary				
Timing Pattern	Free	Syn Delay	44	D
Actuated Cycle	115.7	Sim Delay	(36)	
Max v/C	0.96	ICU	83%	E

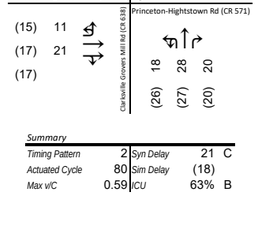
Implemented Operations

AM Peak



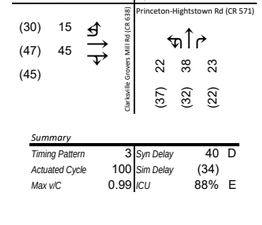
Summary				
Timing Pattern	1	Syn Delay	46	D
Actuated Cycle	100	Sim Delay	(37)	
Max v/C	1.06	ICU	82%	E

MD Peak



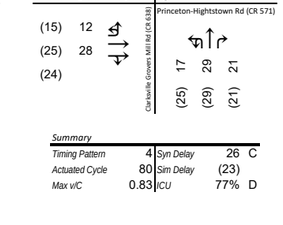
Summary				
Timing Pattern	2	Syn Delay	21	C
Actuated Cycle	80	Sim Delay	(18)	
Max v/C	0.59	ICU	63%	B

PM Peak



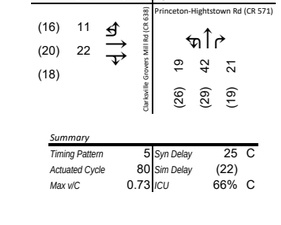
Summary				
Timing Pattern	3	Syn Delay	40	D
Actuated Cycle	100	Sim Delay	(34)	
Max v/C	0.99	ICU	88%	E

PM Off-peak



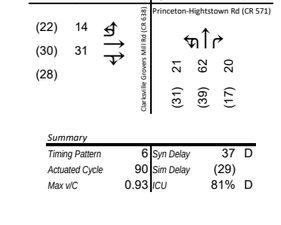
Summary				
Timing Pattern	4	Syn Delay	26	C
Actuated Cycle	80	Sim Delay	(23)	
Max v/C	0.83	ICU	77%	D

Weekend AM Peak



Summary				
Timing Pattern	5	Syn Delay	25	C
Actuated Cycle	80	Sim Delay	(22)	
Max v/C	0.73	ICU	66%	C

Weekend MD Peak



Summary				
Timing Pattern	6	Syn Delay	37	D
Actuated Cycle	90	Sim Delay	(29)	
Max v/C	0.93	ICU	81%	D

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

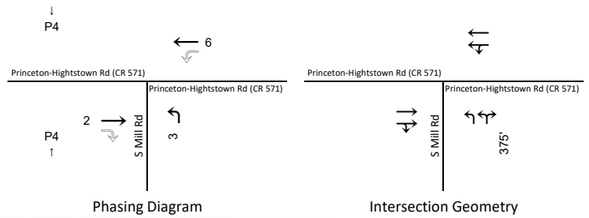
stop bar geometry

turning movement volume

Figure 8

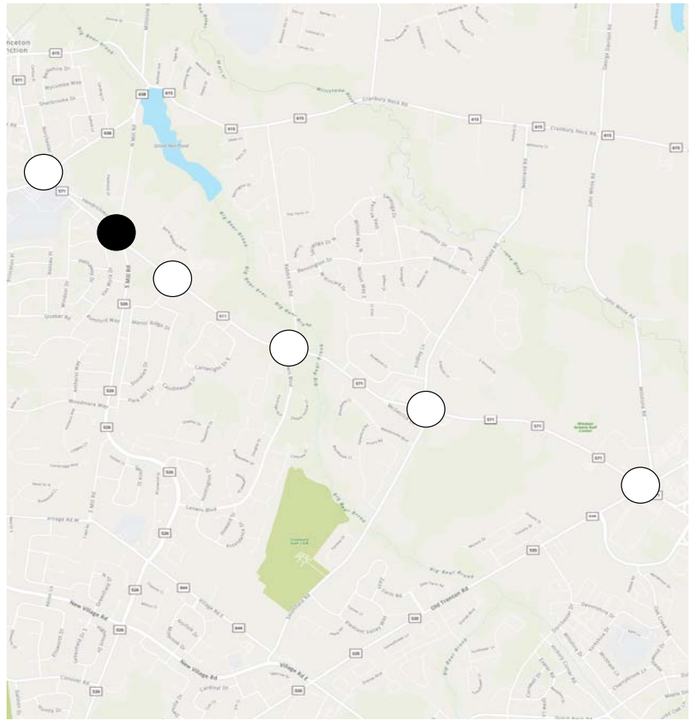
Traffic Operations Analysis

Princeton-Hightstown Rd (CR 571) & Clarksville Grovers Mill Rd (CR 638)



Phasing Diagram

Intersection Geometry



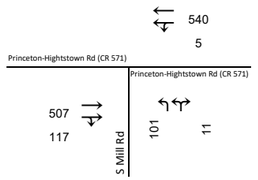
N

NTS

Hourly Volumes

AM Peak

MD Peak

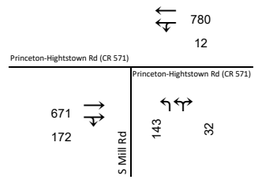


PM Peak

PM Off-peak

Weekend AM Peak

Weekend MD Peak



Existing Operations

AM Peak

Summary				
Timing Pattern	Free	Syn Delay	10	B
Actuated Cycle	69.9	Sim Delay	(12)	
Max v/C	0.55	ICU	57%	B

MD Peak

Summary				
Timing Pattern	Free	Syn Delay	8	A
Actuated Cycle	68.2	Sim Delay	(9)	
Max v/C	0.36	ICU	57%	B

PM Peak

Summary				
Timing Pattern	Free	Syn Delay	9	A
Actuated Cycle	68.7	Sim Delay	(14)	
Max v/C	0.62	ICU	57%	B

PM Off-peak

Summary				
Timing Pattern	Free	Syn Delay	9	A
Actuated Cycle	68.5	Sim Delay	(12)	
Max v/C	0.54	ICU	57%	B

Weekend AM Peak

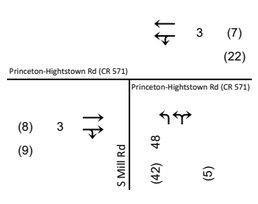
Summary				
Timing Pattern	Free	Syn Delay	9	A
Actuated Cycle	69	Sim Delay	(10)	
Max v/C	0.49	ICU	57%	B

Weekend MD Peak

Summary				
Timing Pattern	Free	Syn Delay	9	A
Actuated Cycle	68.8	Sim Delay	(12)	
Max v/C	0.49	ICU	57%	B

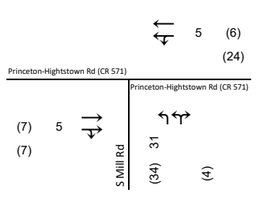
Implemented Operations

AM Peak



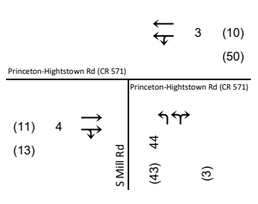
Summary				
Timing Pattern	1	Syn Delay	8	A
Actuated Cycle	100	Sim Delay	(11)	
Max v/C	0.65	ICU	49%	A

MD Peak



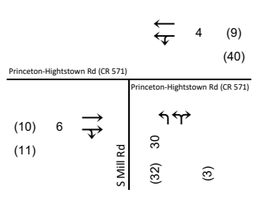
Summary				
Timing Pattern	2	Syn Delay	7	A
Actuated Cycle	80	Sim Delay	(9)	
Max v/C	0.40	ICU	39%	A

PM Peak



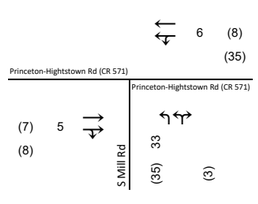
Summary				
Timing Pattern	3	Syn Delay	7	A
Actuated Cycle	100	Sim Delay	(13)	
Max v/C	0.57	ICU	57%	B

PM Off-peak



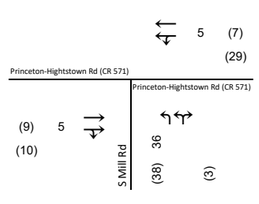
Summary				
Timing Pattern	4	Syn Delay	7	A
Actuated Cycle	80	Sim Delay	(12)	
Max v/C	0.52	ICU	50%	A

Weekend AM Peak



Summary				
Timing Pattern	5	Syn Delay	9	A
Actuated Cycle	80	Sim Delay	(10)	
Max v/C	0.53	ICU	44%	A

Weekend MD Peak



Summary				
Timing Pattern	6	Syn Delay	8	A
Actuated Cycle	90	Sim Delay	(11)	
Max v/C	0.56	ICU	52%	A

Operations with Improvements

No operational improvements recommended at this time.

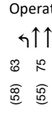
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

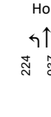


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



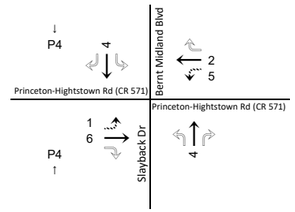
stop bar geometry

turning movement volume

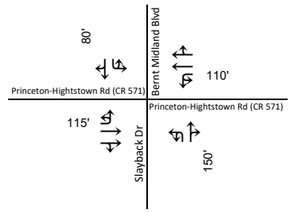
Figure 9

Traffic Operations Analysis

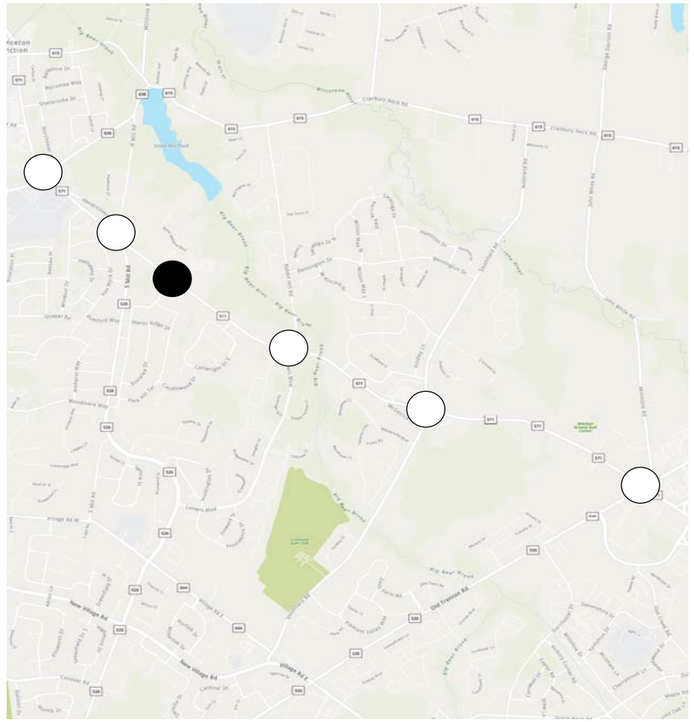
Princeton-Hightstown Rd (CR 571) & S Mill Rd



Phasing Diagram



Intersection Geometry

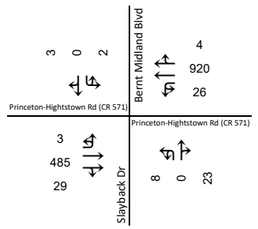


N

NTS

Hourly Volumes

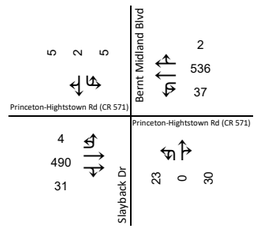
AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	4	A
Actuated Cycle	74.4	*Sim Delay*	(7)	
Max v/C	0.37	*ICU*	45%	A

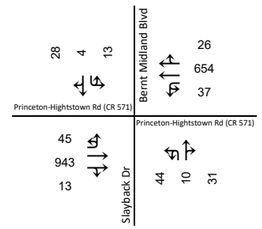
MD Peak



Summary

Timing Pattern	Free	*Syn Delay*	6	A
Actuated Cycle	75.7	*Sim Delay*	(7)	
Max v/C	0.28	*ICU*	43%	A

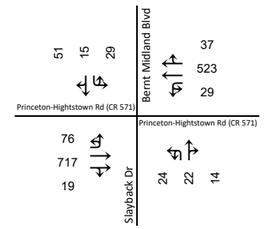
PM Peak



Summary

Timing Pattern	Free	*Syn Delay*	10	B
Actuated Cycle	80.8	*Sim Delay*	(10)	
Max v/C	0.55	*ICU*	55%	B

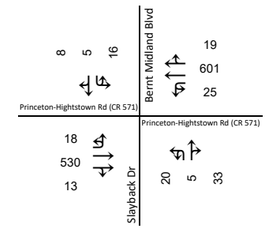
PM Off-peak



Summary

Timing Pattern	Free	*Syn Delay*	11	B
Actuated Cycle	81.6	*Sim Delay*	(10)	
Max v/C	0.51	*ICU*	48%	A

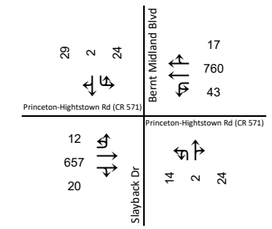
Weekend AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	7	A
Actuated Cycle	73.5	*Sim Delay*	(7)	
Max v/C	0.30	*ICU*	41%	A

Weekend MD Peak

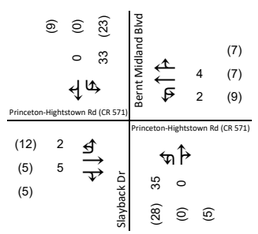


Summary

Timing Pattern	Free	*Syn Delay*	7	A
Actuated Cycle	75.6	*Sim Delay*	(8)	
Max v/C	0.33	*ICU*	49%	A

Existing Operations

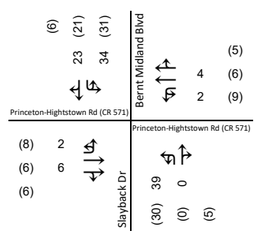
AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	4	A
Actuated Cycle	74.4	*Sim Delay*	(7)	
Max v/C	0.37	*ICU*	45%	A

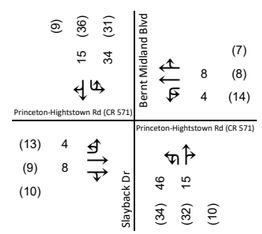
MD Peak



Summary

Timing Pattern	Free	*Syn Delay*	6	A
Actuated Cycle	75.7	*Sim Delay*	(7)	
Max v/C	0.28	*ICU*	43%	A

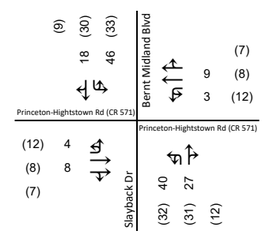
PM Peak



Summary

Timing Pattern	Free	*Syn Delay*	10	B
Actuated Cycle	80.8	*Sim Delay*	(10)	
Max v/C	0.55	*ICU*	55%	B

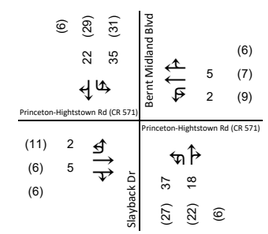
PM Off-peak



Summary

Timing Pattern	Free	*Syn Delay*	11	B
Actuated Cycle	81.6	*Sim Delay*	(10)	
Max v/C	0.51	*ICU*	48%	A

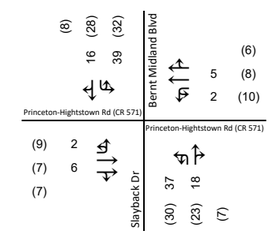
Weekend AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	7	A
Actuated Cycle	73.5	*Sim Delay*	(7)	
Max v/C	0.30	*ICU*	41%	A

Weekend MD Peak

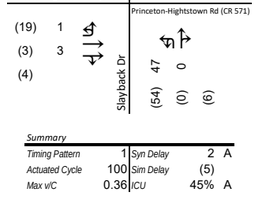


Summary

Timing Pattern	Free	*Syn Delay*	7	A
Actuated Cycle	75.6	*Sim Delay*	(8)	
Max v/C	0.33	*ICU*	49%	A

Implemented Operations

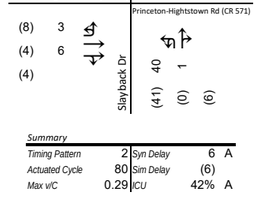
AM Peak



Summary

Timing Pattern	1	*Syn Delay*	2	A
Actuated Cycle	100	*Sim Delay*	(5)	
Max v/C	0.36	*ICU*	45%	A

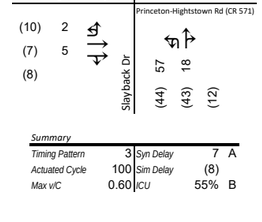
MD Peak



Summary

Timing Pattern	2	*Syn Delay*	6	A
Actuated Cycle	80	*Sim Delay*	(6)	
Max v/C	0.29	*ICU*	42%	A

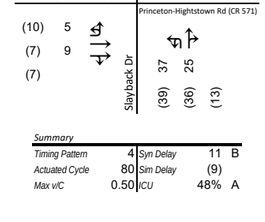
PM Peak



Summary

Timing Pattern	3	*Syn Delay*	7	A
Actuated Cycle	100	*Sim Delay*	(8)	
Max v/C	0.60	*ICU*	55%	B

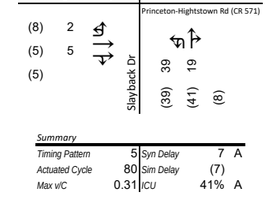
PM Off-peak



Summary

Timing Pattern	4	*Syn Delay*	11	B
Actuated Cycle	80	*Sim Delay*	(9)	
Max v/C	0.50	*ICU*	48%	A

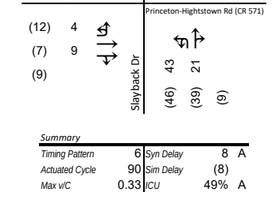
Weekend AM Peak



Summary

Timing Pattern	5	*Syn Delay*	7	A
Actuated Cycle	80	*Sim Delay*	(7)	
Max v/C	0.31	*ICU*	41%	A

Weekend MD Peak



Summary

Timing Pattern	6	*Syn Delay*	8	A
Actuated Cycle	90	*Sim Delay*	(8)	
Max v/C	0.33	*ICU*	49%	A

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

63 75 21
(58) (55) (12)

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

224 937 118

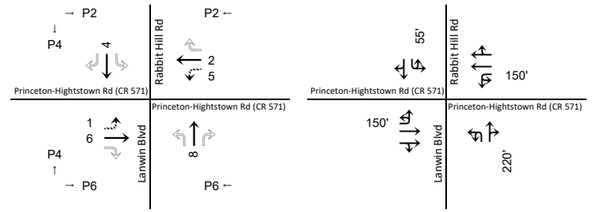
stop bar geometry

turning movement volume

Figure 10

Traffic Operations Analysis

Princeton-Hightstown Rd (CR 571) & Bernt Midland Blvd/Slayback Dr

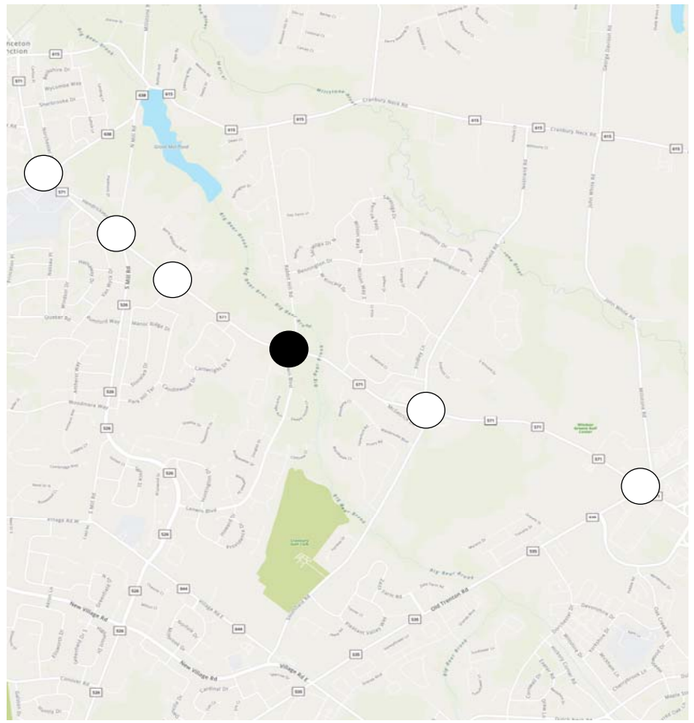


Phasing Diagram

Intersection Geometry

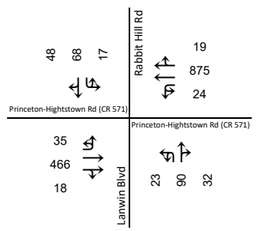
N

NTS



Hourly Volumes

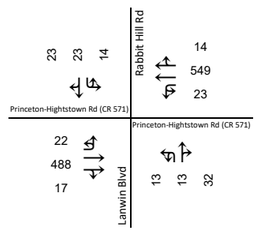
AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	20	B
Actuated Cycle	86.1	*Sim Delay*	(16)	
Max v/c	0.76	*ICU*	58%	B

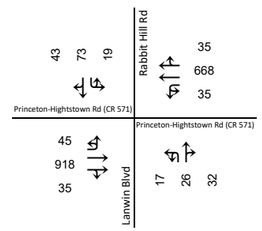
MD Peak



Summary

Timing Pattern	Free	*Syn Delay*	10	B
Actuated Cycle	78.5	*Sim Delay*	(10)	
Max v/c	0.38	*ICU*	39%	A

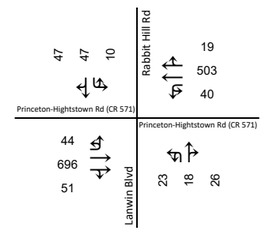
PM Peak



Summary

Timing Pattern	Free	*Syn Delay*	14	B
Actuated Cycle	82.9	*Sim Delay*	(15)	
Max v/c	0.60	*ICU*	55%	A

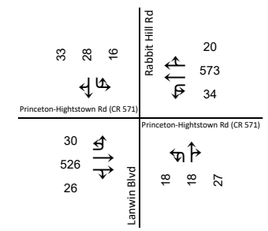
PM Off-peak



Summary

Timing Pattern	Free	*Syn Delay*	14	B
Actuated Cycle	83.6	*Sim Delay*	(13)	
Max v/c	0.61	*ICU*	49%	A

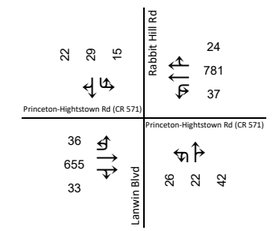
Weekend AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	10	B
Actuated Cycle	78.8	*Sim Delay*	(11)	
Max v/c	0.40	*ICU*	44%	A

Weekend MD Peak

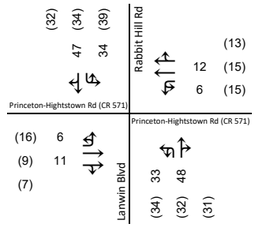


Summary

Timing Pattern	Free	*Syn Delay*	10	B
Actuated Cycle	78.8	*Sim Delay*	(13)	
Max v/c	0.43	*ICU*	51%	A

Existing Operations

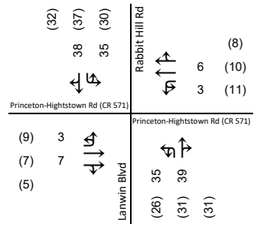
AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	20	B
Actuated Cycle	86.1	*Sim Delay*	(16)	
Max v/c	0.76	*ICU*	58%	B

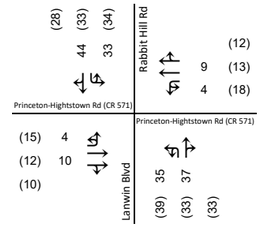
MD Peak



Summary

Timing Pattern	Free	*Syn Delay*	10	B
Actuated Cycle	78.5	*Sim Delay*	(10)	
Max v/c	0.38	*ICU*	39%	A

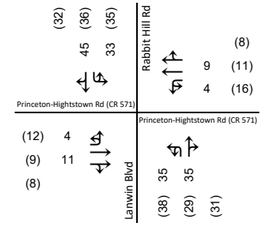
PM Peak



Summary

Timing Pattern	Free	*Syn Delay*	14	B
Actuated Cycle	82.9	*Sim Delay*	(15)	
Max v/c	0.60	*ICU*	55%	A

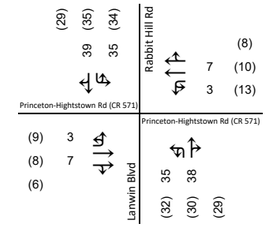
PM Off-peak



Summary

Timing Pattern	Free	*Syn Delay*	14	B
Actuated Cycle	83.6	*Sim Delay*	(13)	
Max v/c	0.61	*ICU*	49%	A

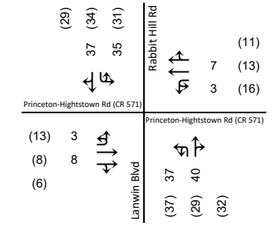
Weekend AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	10	B
Actuated Cycle	78.8	*Sim Delay*	(11)	
Max v/c	0.40	*ICU*	44%	A

Weekend MD Peak

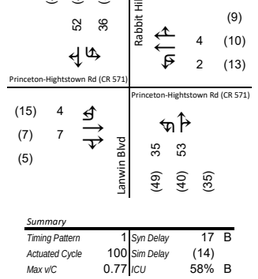


Summary

Timing Pattern	Free	*Syn Delay*	10	B
Actuated Cycle	78.8	*Sim Delay*	(13)	
Max v/c	0.43	*ICU*	51%	A

Implemented Operations

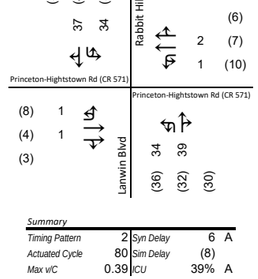
AM Peak



Summary

Timing Pattern	1	*Syn Delay*	17	B
Actuated Cycle	100	*Sim Delay*	(14)	
Max v/c	0.77	*ICU*	58%	B

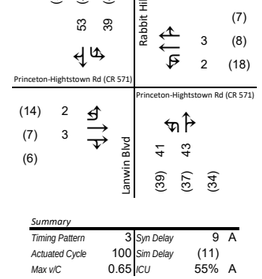
MD Peak



Summary

Timing Pattern	2	*Syn Delay*	6	A
Actuated Cycle	80	*Sim Delay*	(8)	
Max v/c	0.39	*ICU*	39%	A

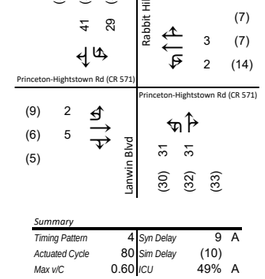
PM Peak



Summary

Timing Pattern	3	*Syn Delay*	9	A
Actuated Cycle	100	*Sim Delay*	(11)	
Max v/c	0.65	*ICU*	55%	A

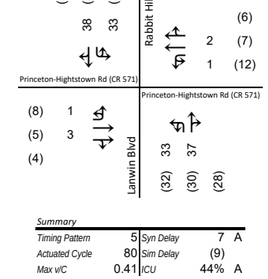
PM Off-peak



Summary

Timing Pattern	4	*Syn Delay*	9	A
Actuated Cycle	80	*Sim Delay*	(10)	
Max v/c	0.60	*ICU*	49%	A

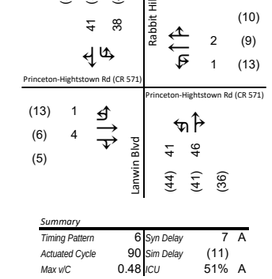
Weekend AM Peak



Summary

Timing Pattern	5	*Syn Delay*	7	A
Actuated Cycle	80	*Sim Delay*	(9)	
Max v/c	0.41	*ICU*	44%	A

Weekend MD Peak



Summary

Timing Pattern	6	*Syn Delay*	7	A
Actuated Cycle	90	*Sim Delay*	(11)	
Max v/c	0.48	*ICU*	51%	A

Operations with Improvements

No operational improvements recommended at this time.

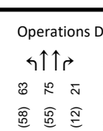
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

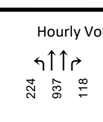


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



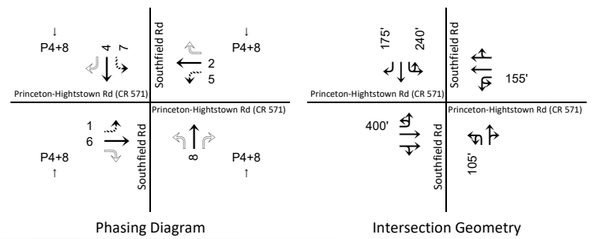
stop bar geometry

turning movement volume

Figure 11

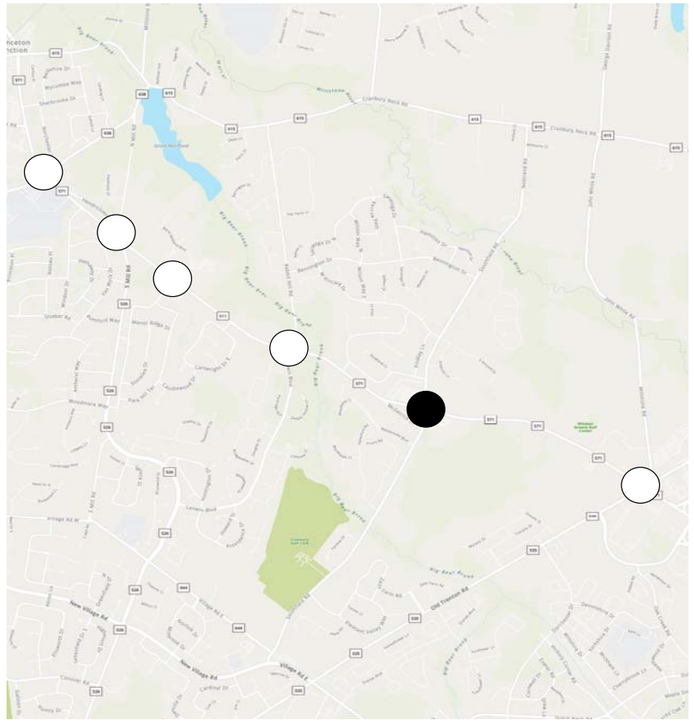
Traffic Operations Analysis

Princeton-Hightstown Rd (CR 571) & Rabbit Hill Rd/Lanwin Blvd



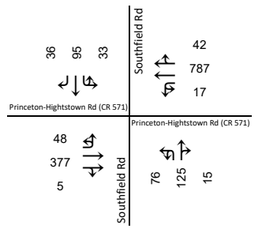
Phasing Diagram

Intersection Geometry

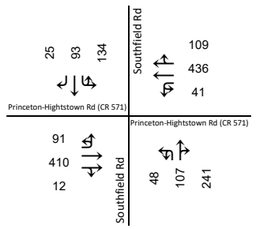


Hourly Volumes

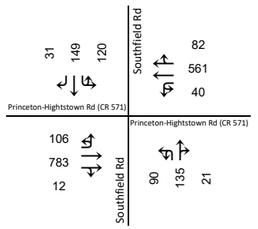
AM Peak



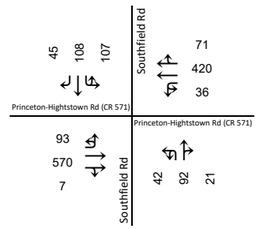
MD Peak



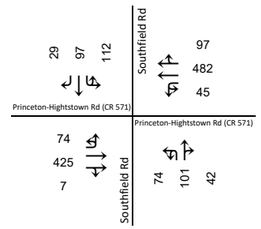
PM Peak



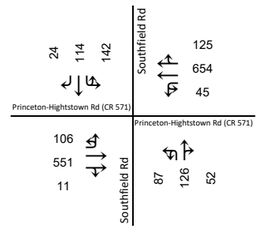
PM Off-peak



Weekend AM Peak

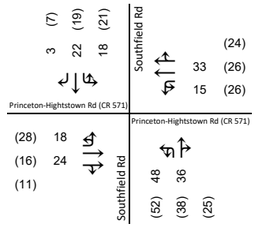


Weekend MD Peak



Existing Operations

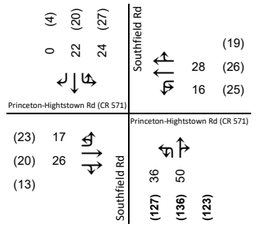
AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	30	C
Actuated Cycle	107.3	*Sim Delay*	(24)	
Max v/C	0.72	*ICU*	59%	B

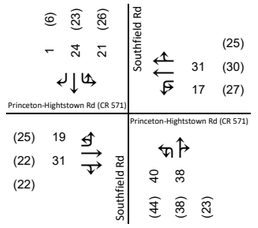
MD Peak



Summary

Timing Pattern	Free	*Syn Delay*	30	C
Actuated Cycle	110.4	*Sim Delay*	(46)	
Max v/C	0.85	*ICU*	69%	C

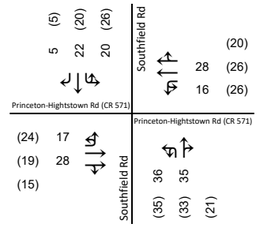
PM Peak



Summary

Timing Pattern	Free	*Syn Delay*	29	C
Actuated Cycle	110.9	*Sim Delay*	(27)	
Max v/C	0.66	*ICU*	61%	B

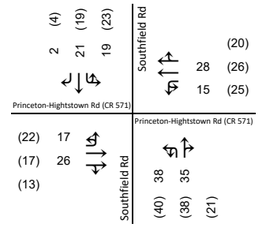
PM Off-peak



Summary

Timing Pattern	Free	*Syn Delay*	26	C
Actuated Cycle	110.2	*Sim Delay*	(22)	
Max v/C	0.52	*ICU*	52%	A

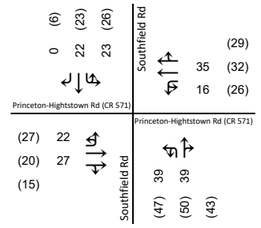
Weekend AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	26	C
Actuated Cycle	107.8	*Sim Delay*	(23)	
Max v/C	0.55	*ICU*	54%	A

Weekend MD Peak

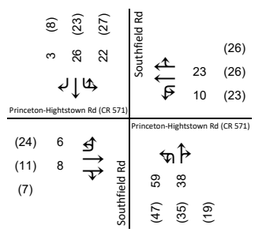


Summary

Timing Pattern	Free	*Syn Delay*	30	C
Actuated Cycle	110.7	*Sim Delay*	(29)	
Max v/C	0.74	*ICU*	66%	C

Implemented Operations

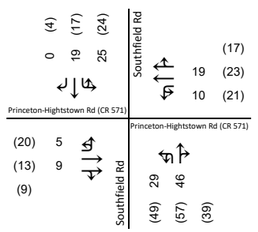
AM Peak



Summary

Timing Pattern	1	*Syn Delay*	22	C
Actuated Cycle	100	*Sim Delay*	(23)	
Max v/C	0.76	*ICU*	59%	B

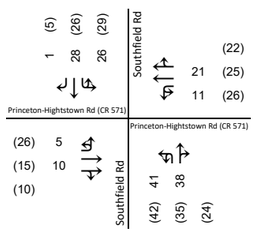
MD Peak



Summary

Timing Pattern	2	*Syn Delay*	21	C
Actuated Cycle	80	*Sim Delay*	(24)	
Max v/C	0.89	*ICU*	68%	C

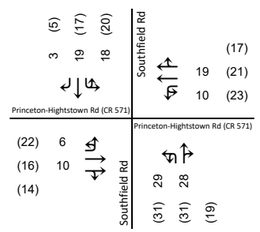
PM Peak



Summary

Timing Pattern	3	*Syn Delay*	19	B
Actuated Cycle	100	*Sim Delay*	(22)	
Max v/C	0.56	*ICU*	61%	B

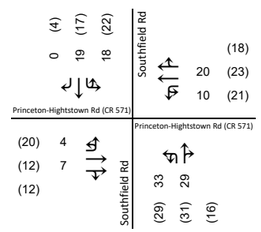
PM Off-peak



Summary

Timing Pattern	4	*Syn Delay*	16	B
Actuated Cycle	80	*Sim Delay*	(19)	
Max v/C	0.49	*ICU*	51%	A

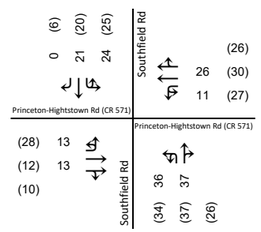
Weekend AM Peak



Summary

Timing Pattern	5	*Syn Delay*	16	B
Actuated Cycle	80	*Sim Delay*	(19)	
Max v/C	0.52	*ICU*	54%	A

Weekend MD Peak



Summary

Timing Pattern	6	*Syn Delay*	22	C
Actuated Cycle	90	*Sim Delay*	(24)	
Max v/C	0.70	*ICU*	65%	C

Operations with Improvements

No operational improvements recommended at this time.

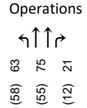
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams



stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

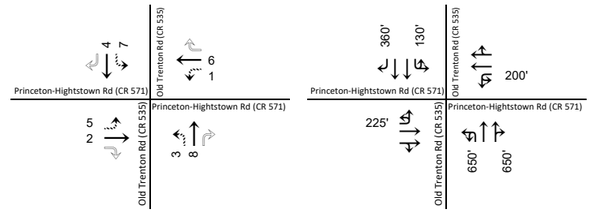
stop bar geometry

turning movement volume

Figure 12

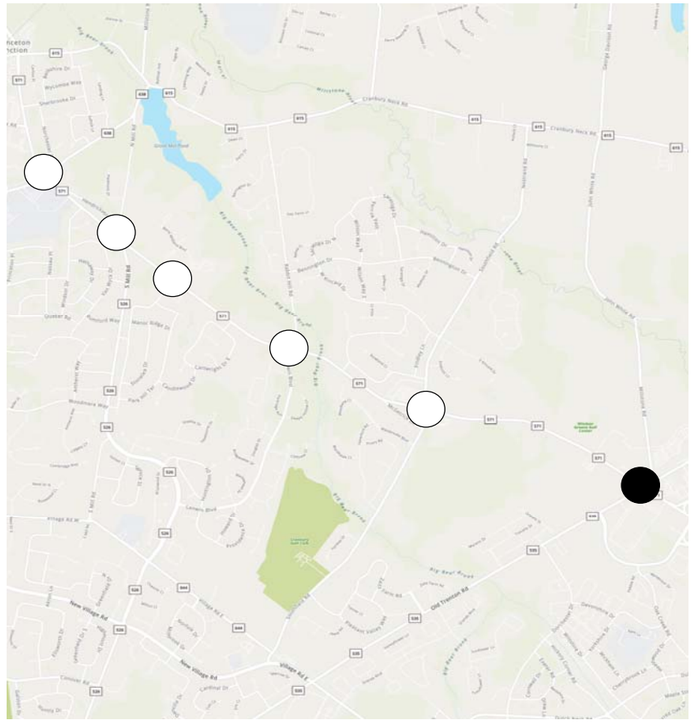
Traffic Operations Analysis

Princeton-Hightstown Rd (CR 571) & Southfield Rd



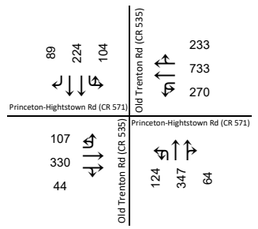
Phasing Diagram

Intersection Geometry

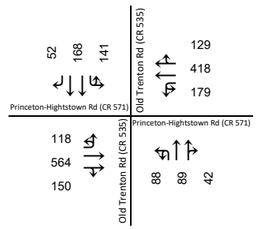


Hourly Volumes

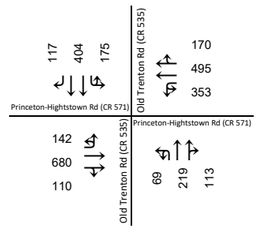
AM Peak



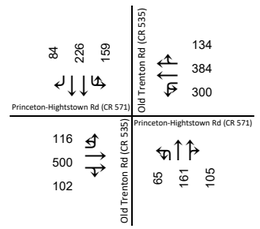
MD Peak



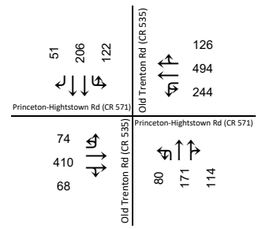
PM Peak



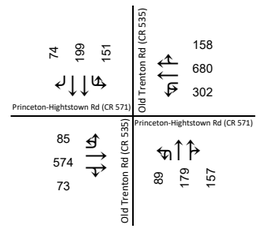
PM Off-peak



Weekend AM Peak

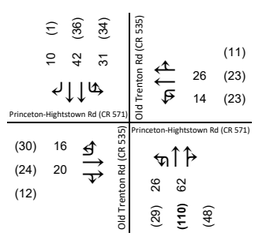


Weekend MD Peak



Existing Operations

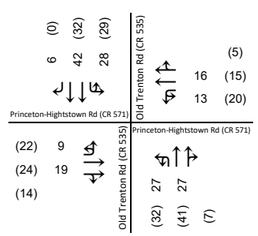
AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	30	C
Actuated Cycle	97.1	*Sim Delay*	(35)	
Max v/C	0.92	*ICU*	85%	E

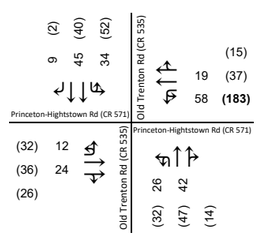
MD Peak



Summary

Timing Pattern	Free	*Syn Delay*	20	C
Actuated Cycle	88.9	*Sim Delay*	(21)	
Max v/C	0.55	*ICU*	77%	D

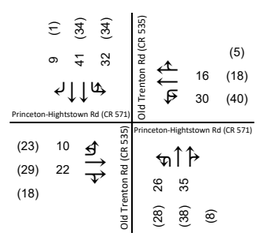
PM Peak



Summary

Timing Pattern	Free	*Syn Delay*	31	C
Actuated Cycle	96.3	*Sim Delay*	(52)	
Max v/C	0.98	*ICU*	**92%**	F

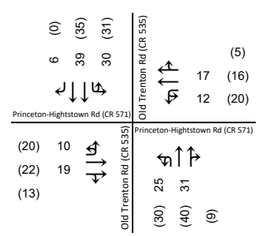
PM Off-peak



Summary

Timing Pattern	Free	*Syn Delay*	25	C
Actuated Cycle	94.3	*Sim Delay*	(26)	
Max v/C	0.85	*ICU*	86%	E

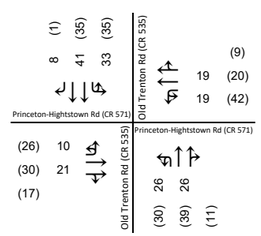
Weekend AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	21	C
Actuated Cycle	91.5	*Sim Delay*	(21)	
Max v/C	0.70	*ICU*	82%	D

Weekend MD Peak

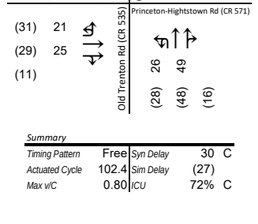


Summary

Timing Pattern	Free	*Syn Delay*	23	C
Actuated Cycle	92.4	*Sim Delay*	(27)	
Max v/C	0.72	*ICU*	88%	E

Implemented Operations

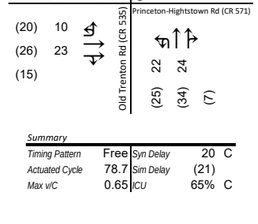
AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	30	C
Actuated Cycle	102.4	*Sim Delay*	(27)	
Max v/C	0.80	*ICU*	72%	C

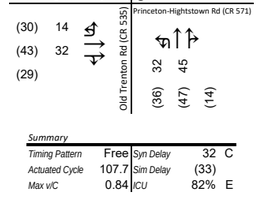
MD Peak



Summary

Timing Pattern	Free	*Syn Delay*	20	C
Actuated Cycle	78.7	*Sim Delay*	(21)	
Max v/C	0.65	*ICU*	65%	C

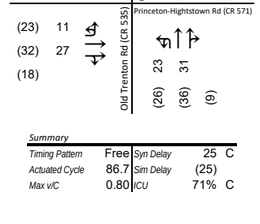
PM Peak



Summary

Timing Pattern	Free	*Syn Delay*	32	C
Actuated Cycle	107.7	*Sim Delay*	(33)	
Max v/C	0.84	*ICU*	82%	E

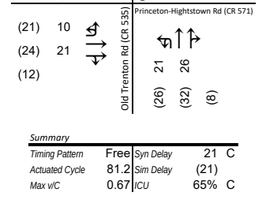
PM Off-peak



Summary

Timing Pattern	Free	*Syn Delay*	25	C
Actuated Cycle	86.7	*Sim Delay*	(25)	
Max v/C	0.80	*ICU*	71%	C

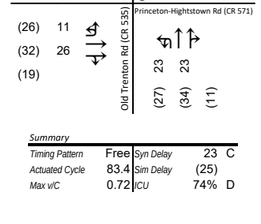
Weekend AM Peak



Summary

Timing Pattern	Free	*Syn Delay*	21	C
Actuated Cycle	81.2	*Sim Delay*	(21)	
Max v/C	0.67	*ICU*	65%	C

Weekend MD Peak



Summary

Timing Pattern	Free	*Syn Delay*	23	C
Actuated Cycle	83.4	*Sim Delay*	(25)	
Max v/C	0.72	*ICU*	74%	D

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

stop bar geometry

turning movement volume

Figure 13

Traffic Operations Analysis

Princeton-Hightstown Rd (CR 571) & Old Trention Rd (CR 535)

AM Peak	Existing	Implemented	Difference
Total Delay (hr)	76	64	-15.8%
Total Stops	7,278	6,016	-17.3%
Total Travel Time (hr)	208	196	-5.8%
Fuel Consumed (gal)	360	333	-7.5%
MD Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	48	38	-20.8%
Total Stops	5,203	4,677	-10.1%
Total Travel Time (hr)	160	149	-6.9%
Fuel Consumed (gal)	280	264	-5.7%
PM Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	95	80	-15.8%
Total Stops	8,958	7,272	-18.8%
Total Travel Time (hr)	255	240	-5.9%
Fuel Consumed (gal)	438	402	-8.2%
PM Off-peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	61	52	-14.8%
Total Stops	6,698	6,232	-7.0%
Total Travel Time (hr)	186	177	-4.8%
Fuel Consumed (gal)	330	316	-4.2%
Weekend AM Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	53	42	-20.8%
Total Stops	5,727	5,236	-8.6%
Total Travel Time (hr)	167	156	-6.6%
Fuel Consumed (gal)	292	276	-5.5%
Weekend MD Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	79	68	-13.9%
Total Stops	7,642	7,297	-4.5%
Total Travel Time (hr)	225	214	-4.9%
Fuel Consumed (gal)	388	374	-3.6%
AM School Peak Hour	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	134	108	-19.4%
Total Stops	7,537	6,484	-14.0%
Total Travel Time (hr)	269	243	-9.7%
Fuel Consumed (gal)	411	375	-8.8%
PM School Peak Hour	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	172	144	-16.3%
Total Stops	9,373	8,215	-12.4%
Total Travel Time (hr)	334	306	-8.4%
Fuel Consumed (gal)	501	462	-7.8%

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Figure 14

Synchro Network Measure of Effectiveness

Princeton-Hightstown Rd (CR 571)

Synchro Intersection Delay Summary:

Number of intersections where:	AM	MD	PM	PO	WA	WM
delay decreased	6	5	5	6	5	4
delay increased ≤ 5 sec/veh	0	1	1	0	1	2
delay increased > 5 sec/veh	0	0	0	0	0	0

Intersection Delay and LOS Summary

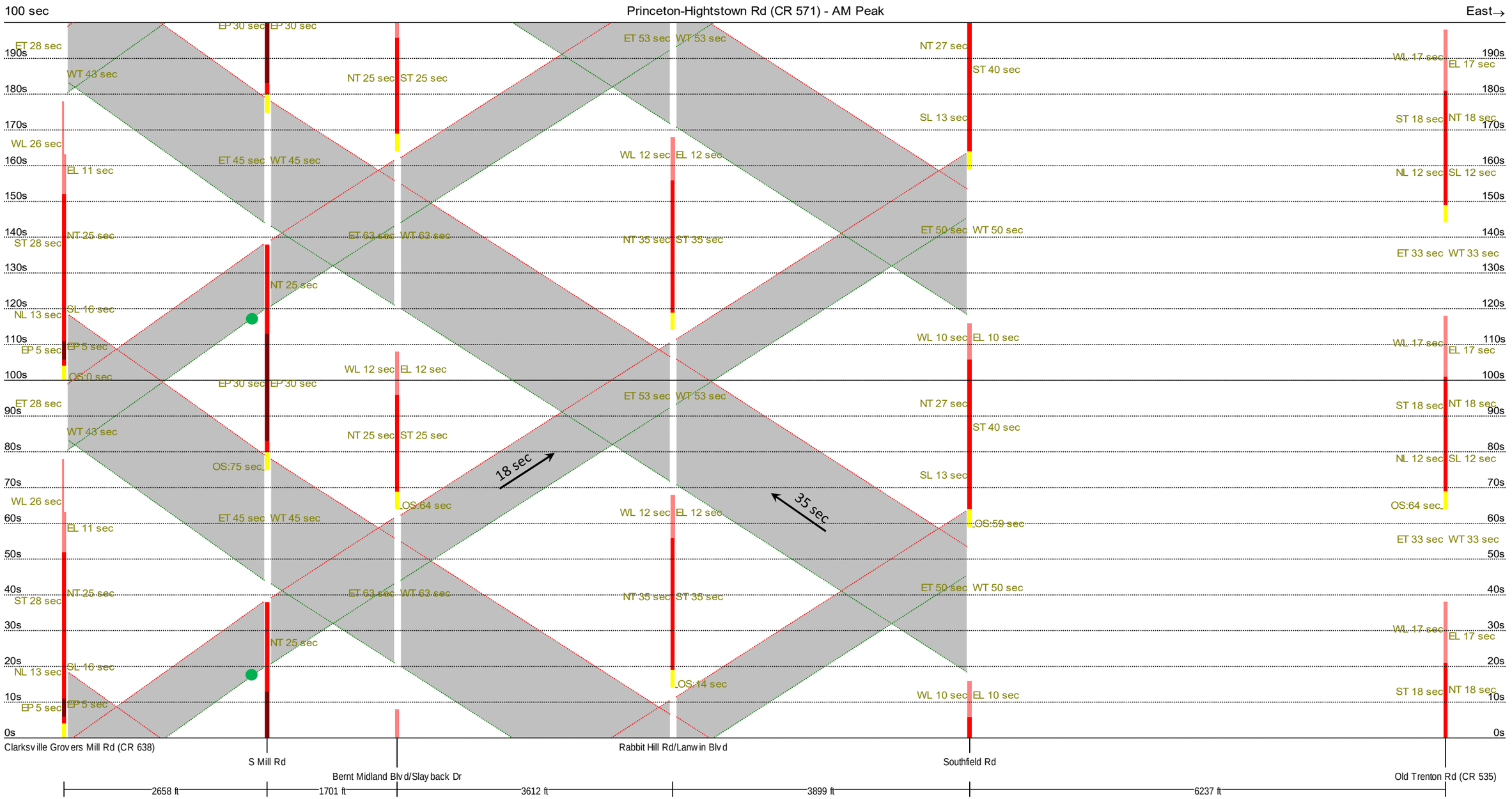
Int. ID	Side Street	AM				MD				PM				PO				WA				WM			
		Delay (hr)		Int. LOS		Delay (hr)		Int. LOS		Delay (hr)		Int. LOS		Delay (hr)		Int. LOS		Delay (hr)		Int. LOS		Delay (hr)		Int. LOS	
		Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp
1	Clarksville Grovers Mill Rd (CR 638)	56	46	E	D	27	21	C	C	42	40	D	D	28	26	C	C	32	25	C	C	44	37	D	D
2	S Mill Rd	10	8	B	A	8	7	A	A	9	7	A	A	9	7	A	A	9	9	A	A	9	8	A	A
3	Slayback Dr/Bernt Midland Blvd	4	2	A	A	6	6	A	A	10	7	B	A	11	11	B	B	7	7	A	A	7	8	A	A
4	Lanwin Blvd/Rabbit Hill Rd	20	17	B	B	10	6	B	A	14	9	B	A	14	9	B	A	10	7	B	A	10	7	B	A
5	Southfield Rd	30	22	C	C	30	21	C	C	29	19	C	B	26	16	C	B	26	16	C	B	30	22	C	C
6	Old Trenton Rd (CR 535)	30	30	C	C	20	20	C	C	31	32	C	C	25	25	C	C	21	21	C	C	23	23	C	C

Figure 15

Synchro Intersection Measure of Effectiveness

Princeton-Hightstown Rd (CR 571)

AM Peak	Existing	Implemented	Difference
Total Delay (hr)	96	72	-24.8%
Total Stops	6,728	5,561	-17.3%
Total Travel Time (hr)	270	242	-10.4%
Fuel Consumed (gal)	262	248	-5.5%
MD Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	61	46	-25.2%
Total Stops	4,645	4,432	-4.6%
Total Travel Time (hr)	204	189	-7.4%
Fuel Consumed (gal)	211	205	-2.5%
PM Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	121	104	-13.8%
Total Stops	8,035	7,380	-8.2%
Total Travel Time (hr)	327	311	-4.9%
Fuel Consumed (gal)	313	306	-2.1%
PM Off-peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	65	59	-9.2%
Total Stops	5,773	5,495	-4.8%
Total Travel Time (hr)	229	222	-3.0%
Fuel Consumed (gal)	240	236	-1.6%
Weekend AM Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	56	48	-14.3%
Total Stops	4,925	4,616	-6.3%
Total Travel Time (hr)	205	197	-3.9%
Fuel Consumed (gal)	217	212	-2.2%
Weekend MD Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	88	77	-12.9%
Total Stops	6,767	6,454	-4.6%
Total Travel Time (hr)	278	265	-4.9%
Fuel Consumed (gal)	282	274	-3.0%
AM School Peak Hour	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	215	123	-42.7%
Total Stops	9,070	6,937	-23.5%
Total Travel Time (hr)	392	301	-23.2%
Fuel Consumed (gal)	289	266	-7.8%
PM School Peak Hour	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	290	227	-21.6%
Total Stops	10,355	8,959	-13.5%
Total Travel Time (hr)	509	437	-14.1%
Fuel Consumed (gal)	358	337	-5.8%



Signal Timing
Cycle Length (see upper left)
Splits (labeled next to signal indications)
Offset (labeled at reference point)
Planned Early Release

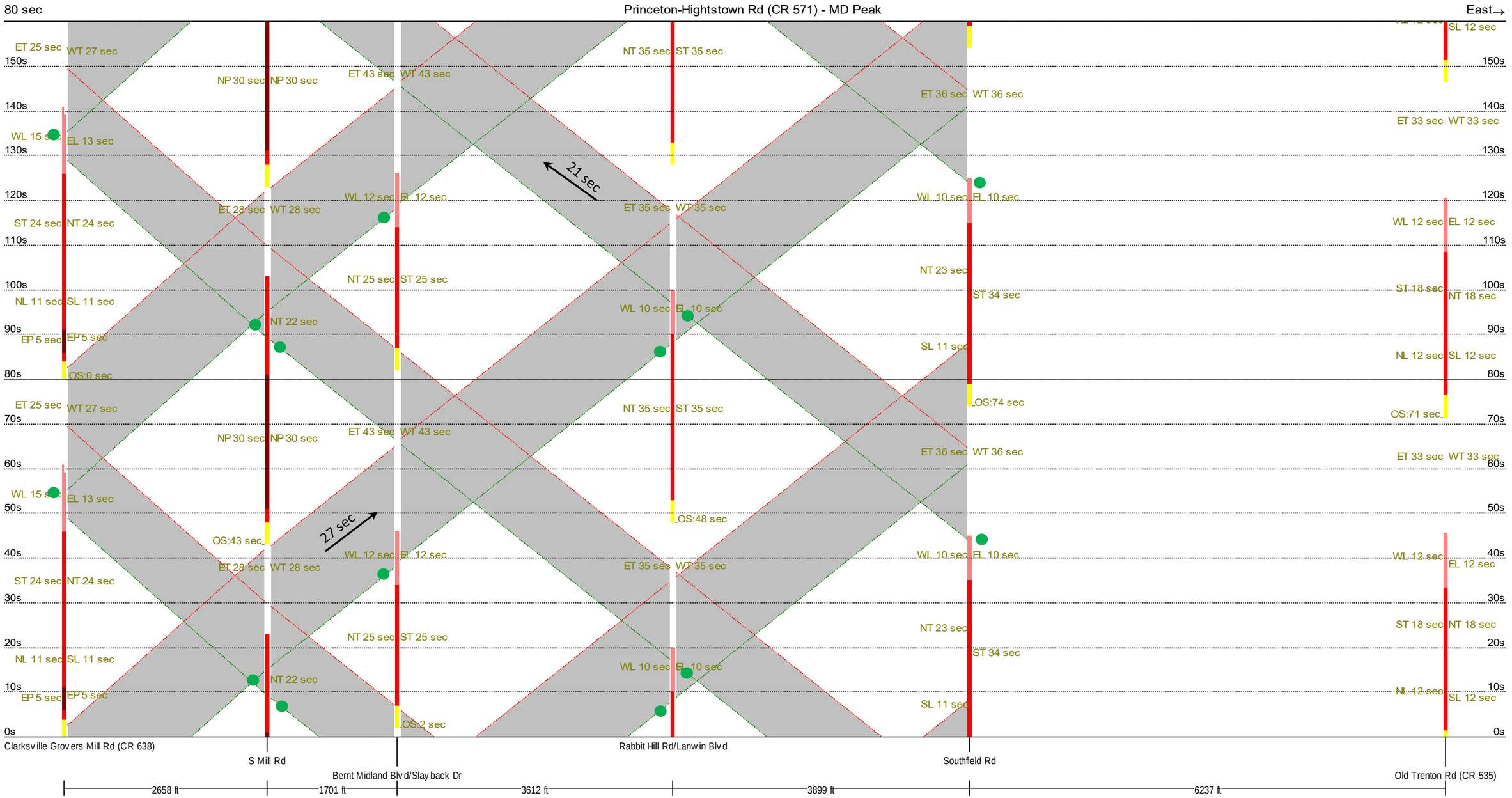
Movements with Green Indications
major street left turns
cross street movements
major street throughs

Bandwidth

Figure 17

Time-Space Diagram

Princeton-Hightstown Rd (CR 571) - AM Peak Period



Signal Timing
Cycle Length (see upper left)
Splits (labeled next to signal indications)
Offset (labeled at reference point)
Planned Early Release

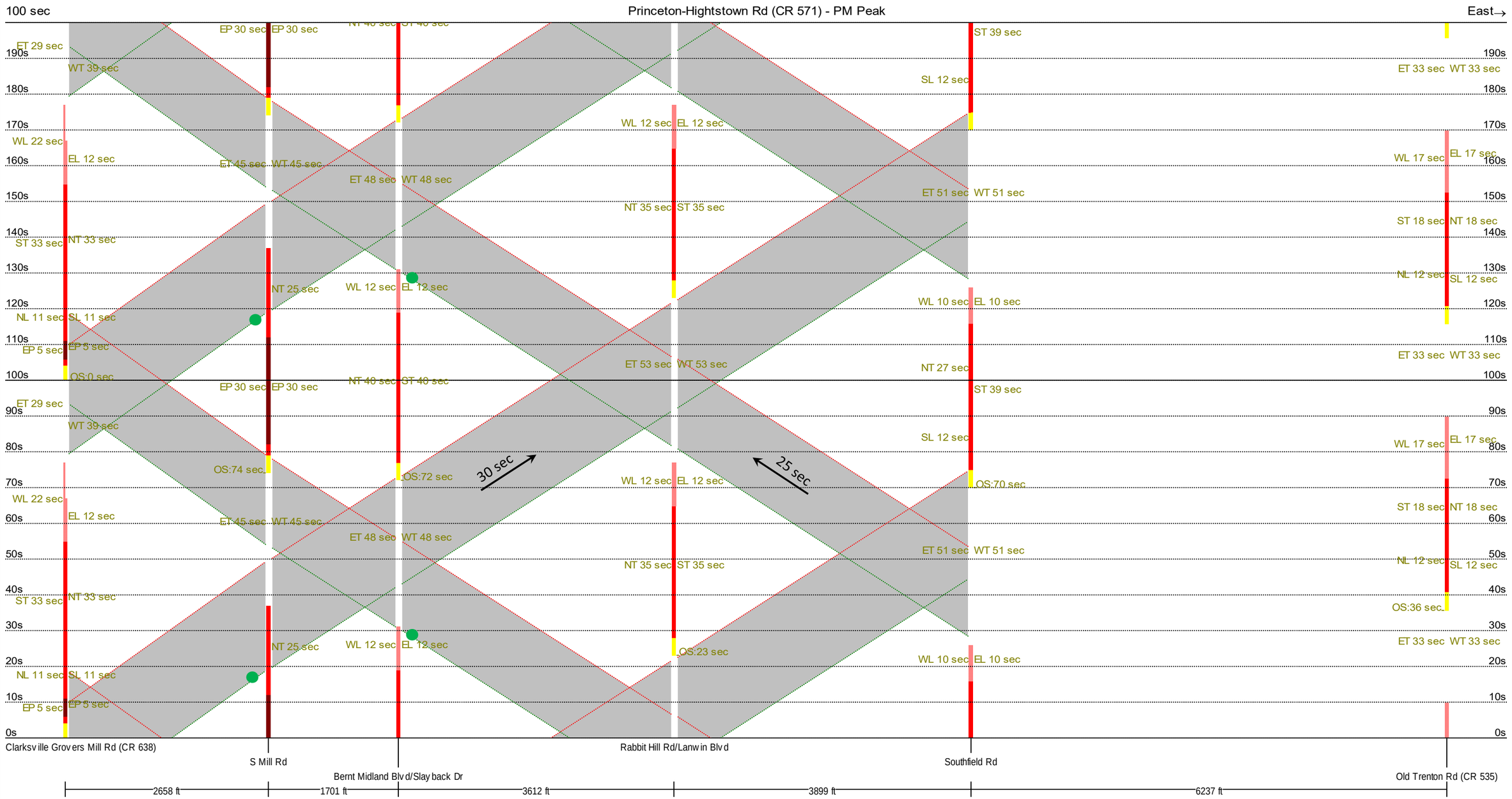
Movements with Green Indications
major street left turns
cross street movements
major street throughs

Bandwidth

Figure 18

Time-Space Diagram

Princeton-Hightstown Rd (CR 571) - MD Peak Period



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Signal Timing
Cycle Length (see upper left)
Splits (labeled next to signal indications)
Offset (labeled at reference point)
Planned Early Release

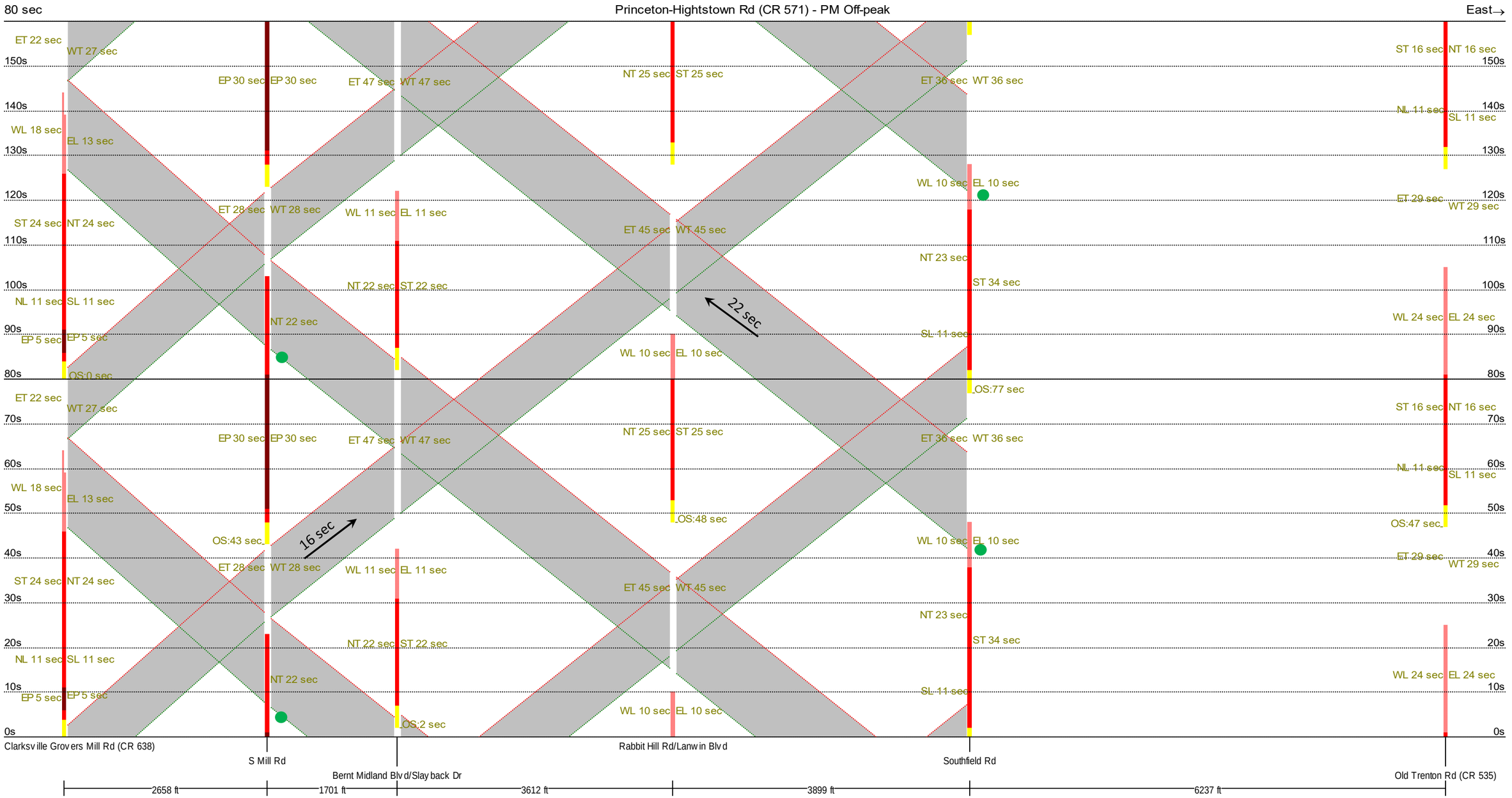
Movements with Green Indications
major street left turns
cross street movements
major street throughs

Bandwidth

Figure 19

Time-Space Diagram

Princeton-Hightstown Rd (CR 571) - PM Peak Period



Signal Timing
Cycle Length (see upper left)
Splits (labeled next to signal indications)
Offset (labeled at reference point)
Planned Early Release

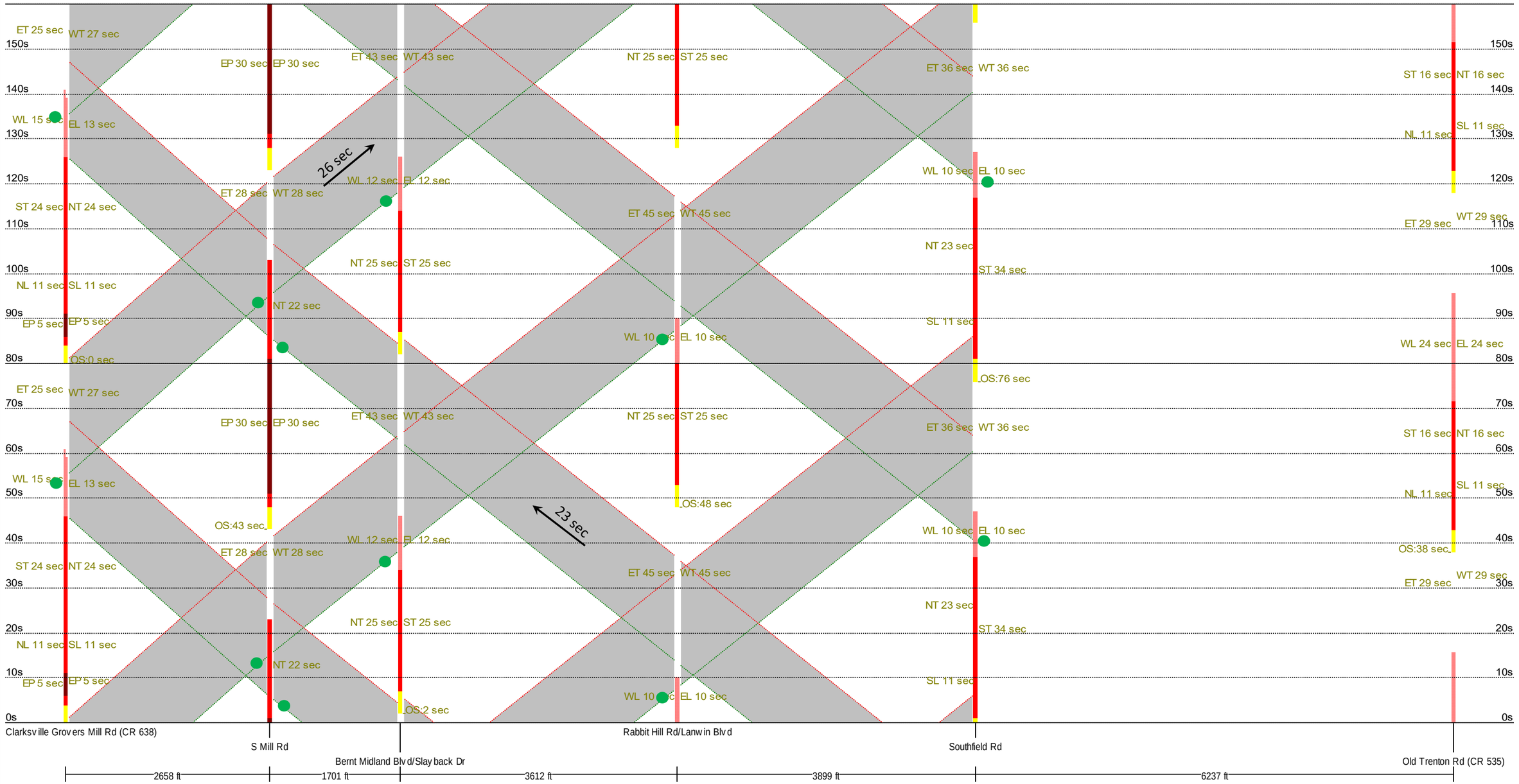
Movements with Green Indications
major street left turns
cross street movements
major street throughs

Bandwidth

Figure 20

Time-Space Diagram

Princeton-Hightstown Rd (CR 571) - PM Off-peak Period



Signal Timing
Cycle Length (see upper left)
Splits (labeled next to signal indications)
Offset (labeled at reference point)
Planned Early Release

Movements with Green Indications
major street left turns
cross street movements
major street throughs

Bandwidth

Figure 21

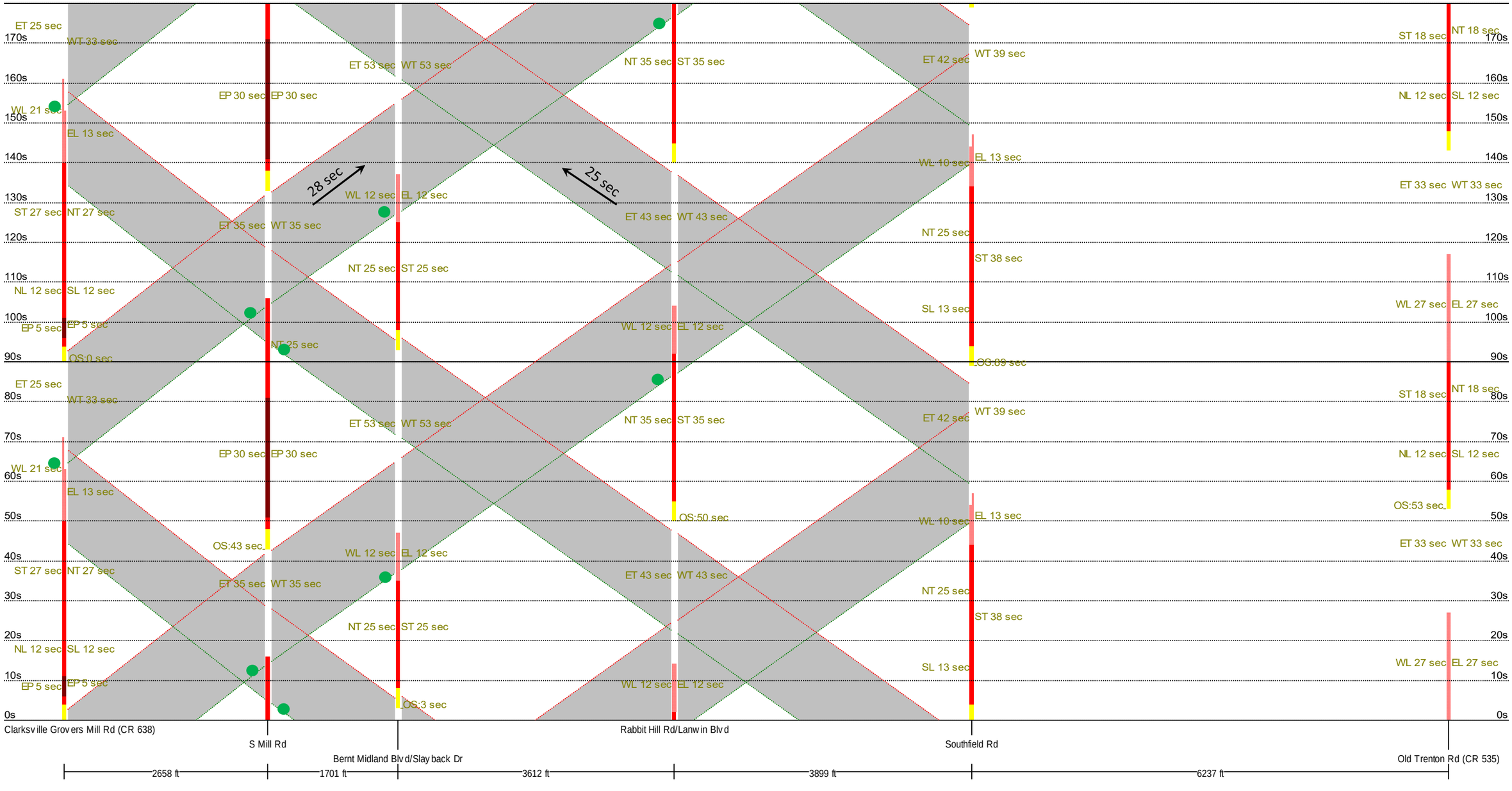
Time-Space Diagram

Princeton-Hightstown Rd (CR 571) - Weekend AM Peak Period

90 sec

Princeton-Hightstown Rd (CR 571) - Weekend MD Peak

East→



Signal Timing
Cycle Length (see upper left)
Splits (labeled next to signal indications)
Offset (labeled at reference point)
Planned Early Release

Movements with Green Indications
major street left turns
cross street movements
major street throughs

Bandwidth

Figure 22

Time-Space Diagram

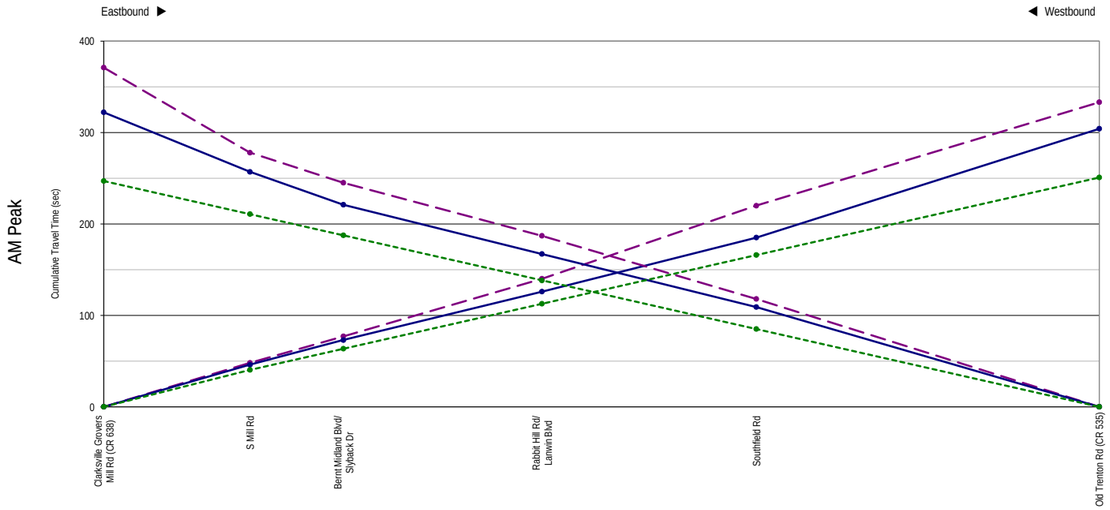
Princeton-Hightstown Rd (CR 571) - Weekend MD Peak Period

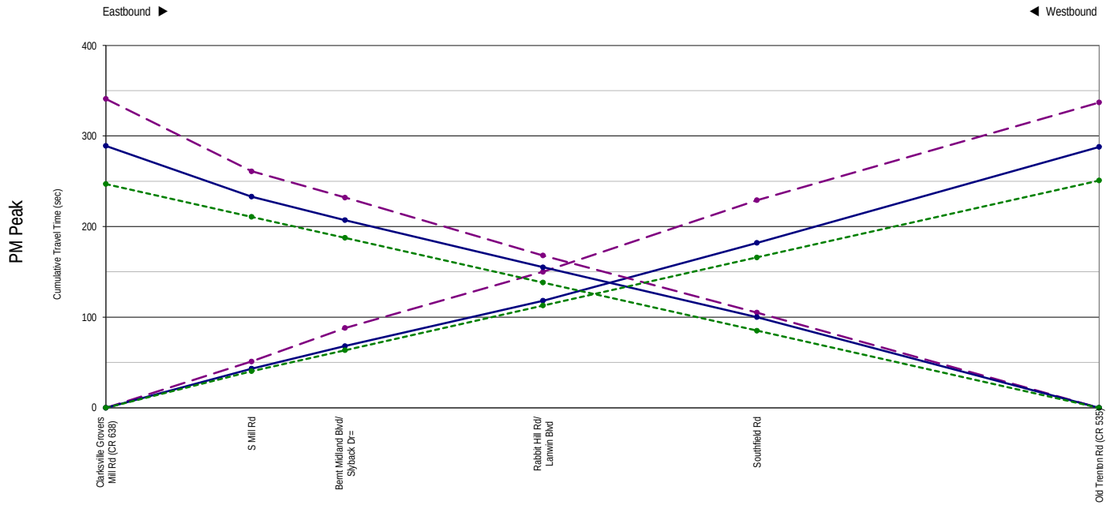
Average Total Travel Time & Delay

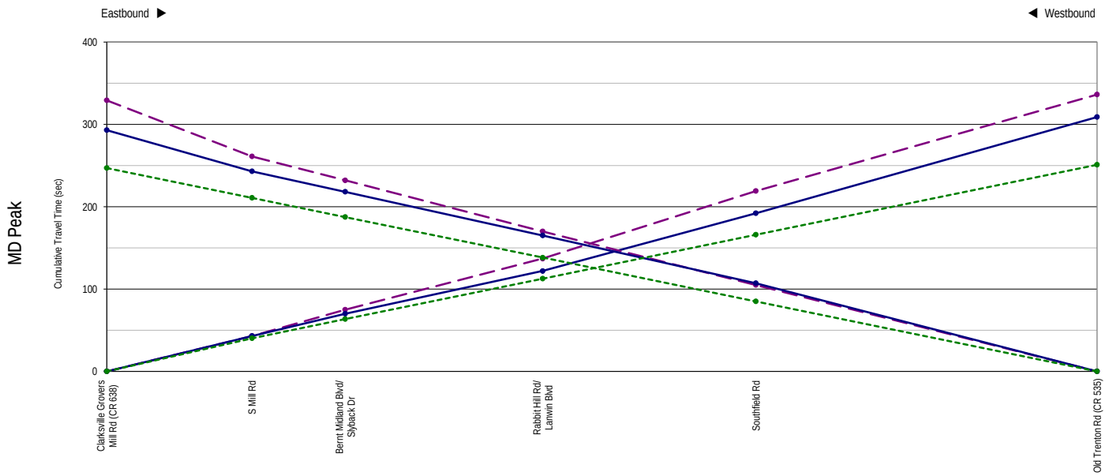
Princeton-Hightstown Rd (CR 571): 3.4 miles

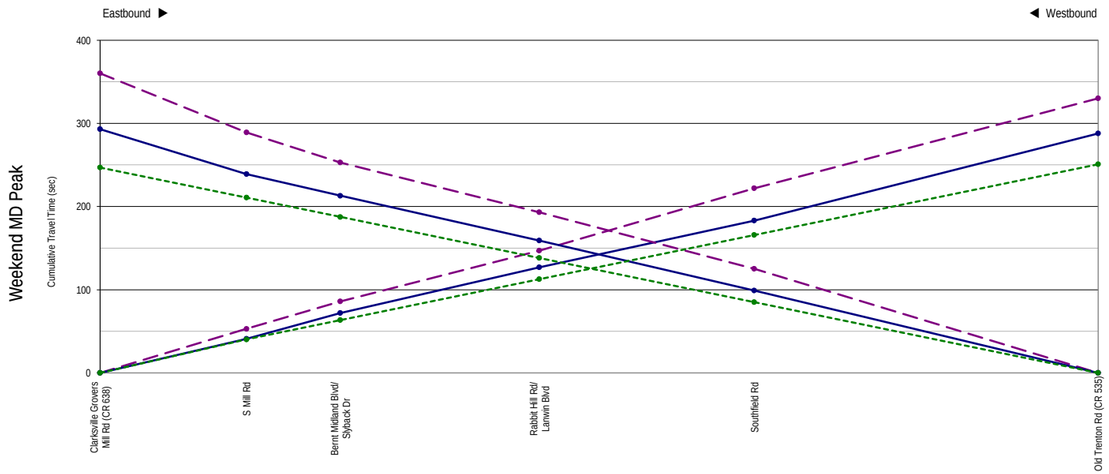
		AM Peak		MD Peak		PM Peak		Weekend MD Peak	
		Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)
Eastbound	Existing	333	83	336	85	337	86	330	79
	Implemented	304	53	309	58	288	37	288	37
	Difference	-29		-27		-49		-42	
	% Difference	-8.7%	-34.9%	-8.0%	-31.8%	-14.5%	-57.0%	-12.7%	-53.2%
Westbound	Existing	371	120	329	78	341	90	360	109
	Implemented	322	71	293	42	289	38	293	42
	Difference	-49		-36		-52		-67	
	% Difference	-13.2%	-40.8%	-10.9%	-46.2%	-15.2%	-57.8%	-18.6%	-61.5%

Eastbound : Clarksville Grovers Mill Rd (CR 638) to Old Trenton Rd (CR 535)
Westbound : Old Trenton Rd (CR 535) to Clarksville Grovers Mill Rd (CR 638)









Existing
Implemented
Free Flow

Figure 23
Average Travel Time & Delay
Princeton-Hightstown Rd (CR 571)

Mercer County, NJ - Princeton-Hightstown Rd (CR 571) Detection/Observation Summary				
ID	**Intersection**	**Controller Type**	**Communication Type & Controller Date/Time Status (Time Status as of 11/23/21)**	**Notes/Issue Summary from Initial Field Notes and Implementation**
1	Princeton-Hightstown Rd (CR 571) & Clarksville-Grovers Mill Rd (CR 638)	Econolite ASC/3	GPS in cabinet but not plugged in, so not functioning. Date read 12/24/1971 on 11/23/2021. Time read ~1550 at 0950.	Constant vehicle detection calls on Ø1 (WBLT) and Ø6 (WB) (video detection). This was addressed prior to implementation, so all vehicle detection was working properly during implementation and fine-tuning. Northbound right-turn overlap wiring creates a yellow trap situation for the southbound left-turn movement termination. When the permissive portion of the southbound left-turn terminates, drivers may assume the northbound right-turn would be doing the same but the green arrow comes on with the yellow of Ø4 (NB). This is not necessarily a problem, just pointing out it does create a yellow-trap situation. To address, would recommend rewiring/reprogramming overlap to begin with Ø1 (WBLT) green. There is a GPS in cabinet but not functional. The existing programming included time of day plans but the clock was significantly off, so the intended timings were not functional under existing conditions.
2	Princeton-Hightstown Rd (CR 571) & S Mill Rd (CR 526)	Econolite ASC/3	No GPS or comm. Date OK. Clock 1 min, 39 seconds slow.	UPS beeping constantly and status showing 'OFF' during field notes. Ø2 (EB) and Ø6 (WB) have no detection and showing constant call on both in controller. This does not create an issue but adding main street detection would improved free operation and would reduce off-peak side street delays. Pedestrian display on northwest corner for Pedestrian Ø4 (Exclusive Pedestrian) not displaying countdown.
3	Princeton-Hightstown Rd (CR 571) & Bernt Midland Blvd/Slayback Dr	Econolite ASC/3	No GPS or comm. Date OK. Clock 10 seconds fast.	Ø1 (EBLT) video detection showing vehicle call with no presence *at times* and looks to either be picking up calls with shadows or from vehicles in the adjacent lanes. Ø2 (WB) and Ø6 (EB) have no detection and showing no calls in controller. This does not create an issue but adding main street detection would improved free operation and would reduce off-peak side street delays.
4	Princeton-Hightstown Rd (CR 571) & Rabbit Hill Rd/Lanwin Blvd	Econolite ASC/3	No GPS or comm. Date OK. Clock 5 min, 23 seconds slow.	Ø2 (WB) and Ø6 (EB) have no detection and showing no calls in controller (not an issue, just observation for free operation behavior). Countdown on pedestrian display for pedestrian Ø4 (SB) on southwest corner not illuminating.
5	Princeton-Hightstown Rd (CR 571) & Southfield Rd	Econolite ASC/3	No GPS or comm. Date OK. Clock 5 seconds slow.	Ø4 (southbound) and Ø7 (southbound left-turn) both have constant calls, resulting in the side street utilizing all available time each cycle, regardless of demand. Pedestrian buttons not consistent with other intersections and appear to be signed to be for eastbound and westbound but actually are for Ø4 (SB) and to cross Princeton-Hightstown Rd (CR 571). There are only crosswalks for eastbound-westbound and not northbound-southbound, so it is inconsistent and could be confusing to pedestrians. All pushbuttons place call on pedestrian phase 4. Would be a more efficient and safer operation if pedestrian calls either placed calls on both Ø4 and Ø8 or the buttons on the northeast and southeast corner were adjusted to call pedestrian Ø8 instead of Ø4. Cover on pedestal on northwest corner missing, exposing wire access at base of pole.
6	Princeton-Hightstown Rd (CR 571) & Old Trenton Rd (CR 535)	Econolite ASC/3	No GPS or comm. Date OK. Clock 41 seconds fast.	No issues observed, all detection working properly.