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Turning Movement Restriction Addendum

To: Village of Hastings-on-Hudson
From: Sam Schwartz Engineering, DPC
Date: November 13, 2020
Re: Turning Movement Restriction Study Methodology
Project No: 17-01-2681

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1. Overview

Sam Schwartz Engineering, DPC ("*Sam Schwartz*") has prepared this document to amend the methodology of the Left Turning Movement Restrictions Plan on High Street in the Village of Hastings-on-Hudson. The original intention of the Left Turning Movement Restrictions plan was to compare counts in the volume network before and after prohibiting westbound left turns on High Street and a temporary U-Turn closure on Route 9 at Devon Way. However, shortly after implementing the restrictions on March 4, 2020, COVID-19 cases began to exponentially increase in New York state, with Governor Cuomo closing all nonessential businesses statewide on March 20, 2020. By March 23, 2020, New York City surpassed 12,000 cases – 35% of all COVID-19 recorded cases in the United States. Due to the quick spread of COVID-19 cases, travel restrictions, and business closures, there was an immediate decline in vehicular travel, especially for commuting trips throughout the region.

At the time of this memo, there are still significant impacts to vehicular travel in the region, with many places of work having employees telework when possible. With a "second wave" underway of expected increases in COVID-19 cases, it is possible that travel patterns may fluctuate to reflect future cases and travel restrictions.

In the interest of completing this study, *Sam Schwartz* will examine the traffic patterns using a series of Origin-Destination analyses through Streetlight. This paired with data available from Hastings-on-Hudson, will allow for *Sam Schwartz* to study commuters using High Street to access Executive Boulevard as a function of the commuting traffic from Saw Mill Parkway to Executive Boulevard.

2. Speed Counter Data and Streetlight Data Validation

2.1. Speed Counter Data

Speed counters were installed along High Street at James Street, Warren Street, and Amherst Drive. These speed counters provide volume and speed data going back to March 4, 2020 at 30-minute intervals. Because the data is available in the raw form at this minute level, changes in traffic patterns can be analyzed immediately before and after various conditions and travel restrictions due to COVID-19. **FIGURE 1** shows the placement of the speed counters along High Street.

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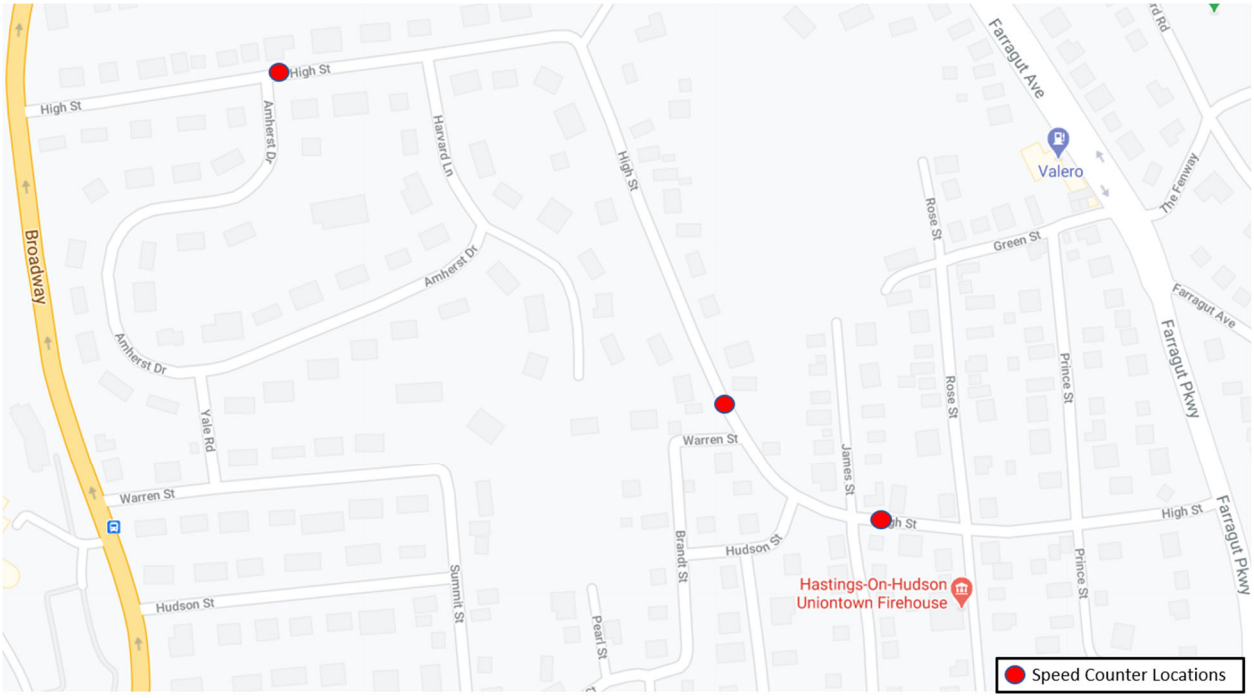
FIGURE 1: Speed Counter Locations



At these locations, data is available for westbound traffic volumes, number of speeding vehicles, the average speed, and the peak speed. **FIGURE 2** shows average weekly traffic volumes in March. **FIGURE 3** shows monthly average traffic volumes at the High and James Street intersection.

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FIGURE 2: Westbound High and James Street Traffic Volumes in March

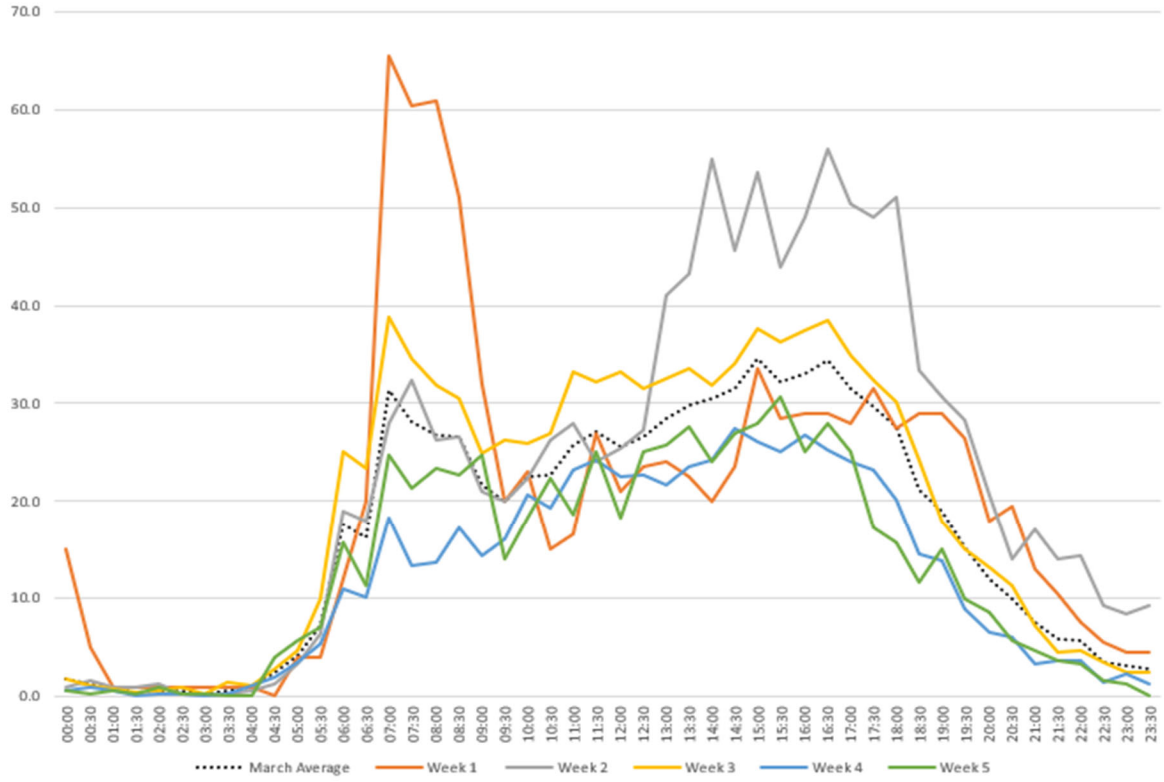
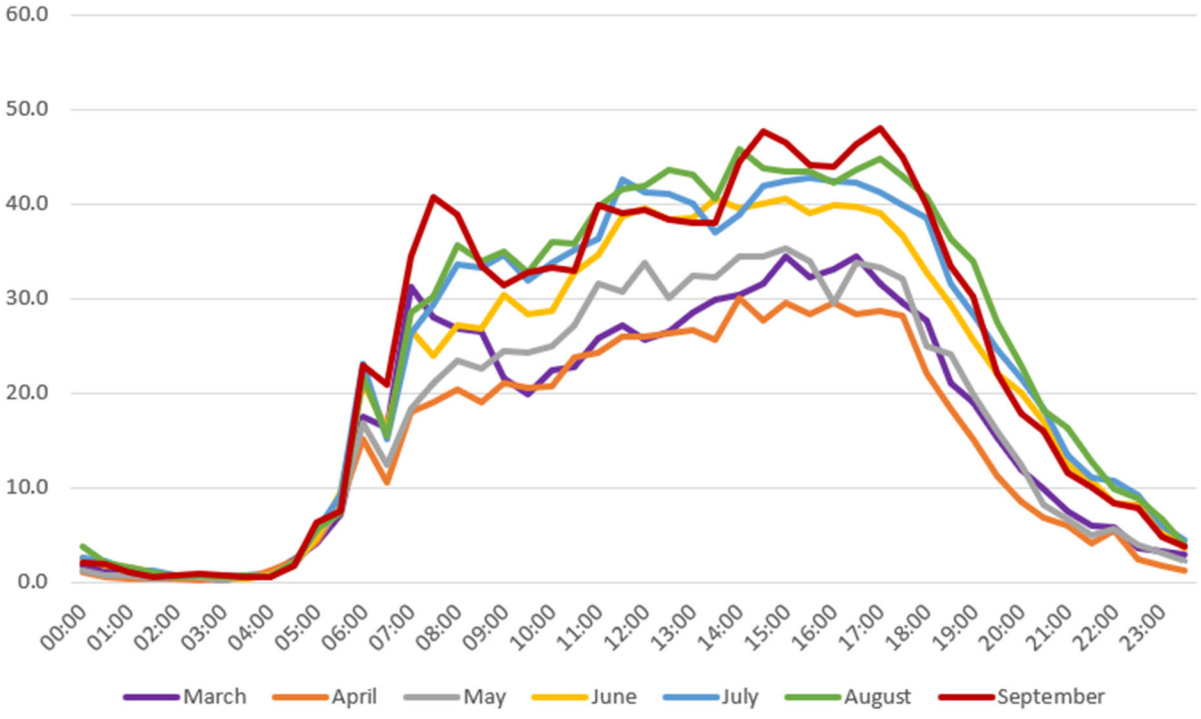


FIGURE 3: Westbound High and James Street Traffic Volumes by Month



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As seen in **FIGURE 3**, traffic volumes have increased every month since April, with September data showing the highest traffic volumes during the 7AM – 9AM hours. The increased volume during these AM peak hours in September suggest increased commuting trips and school trips, and that continuing the Origin-Destination study using Streetlight is feasible.

2.2. Streetlight Data Validation

To record Origin-Destination before and after the implementation of the left turning restrictions, *Sam Schwartz* has decided to use Streetlight, which tracks vehicles travelling through a set of gates, the locations of which will be designed by *Sam Schwartz* to capture relevant movements for this study. Raw data from speed counters will be compared to data from the Streetlight gates to determine if the Streetlight data needs further calibration for the specific conditions in the Village of Hastings-on-Hudson.

This comparison and potential calibration will be based on the westbound High and James Street speed counter location and will be applied to all other Streetlight gates included in this effort. Count data between the hours of 7AM – 9AM in the months of April, May, June, July, and August will be compared. If the Streetlight data at these hours is accurate with a 10% margin of error or less, the Streetlight data will remain uncalibrated for the remainder of the study. If the Streetlight data differs from the speed counter data more than the 10% margin of error, a calibration factor will be calculated and applied to all subsequent Streetlight data.

3. Streetlight Gate Locations and Analysis

Based on a 2019 Origin-Destination Study, *Sam Schwartz* is aware that a significant portion of High Street traffic during the AM peak hour are commuting trips to the office complex at Route 9 and Executive Boulevard. The primary goal in this study is to record these commuters in an expanded Origin-Destination analysis using Streetlight through a variety of measures to deter commuters from using the Hastings-on-Hudson local roadway network.

Although these commuting trips experienced a decrease in the last several months due to COVID-19, *Sam Schwartz* seeks to examine the volume of trips cutting through Hastings-on-Hudson as a percentage of the trips from Saw Mill Parkway and Ravensdale Road to Executive Boulevard. By using the volume of trips from Saw Mill to Executive Boulevard as a reference, *Sam Schwartz* can compare patterns during various COVID-19 travel restrictions and data before the pandemic. As the implementation of the restricted left turns coincides with COVID-19, it is crucial to have a means of comparing pre-pandemic and current travel data.

For the purposes of this analysis, the Origin-Destination Study will be broken into two parts. The origin points will be defined as users traveling southbound on Saw Mill Parkway north of Clarence Avenue and users traveling westbound on Ravensdale Road. The destination point will be the office complex at Route 9 and Executive Boulevard. Unless commuters navigate between the origins and destination point using Saw Mill Parkway's Executive Boulevard exit, all commuters must pass through the High and James Street intersection. As such, the origin-destination will be divided into two parts: the first between the origin points and the midpoint, the second between the midpoint and the destination. See **FIGURE 4** for the mapped origin and destination points and **FIGURE 5** for all the proposed gates.

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FIGURE 4: Mapped Origin, Midpoint, and Destination Points

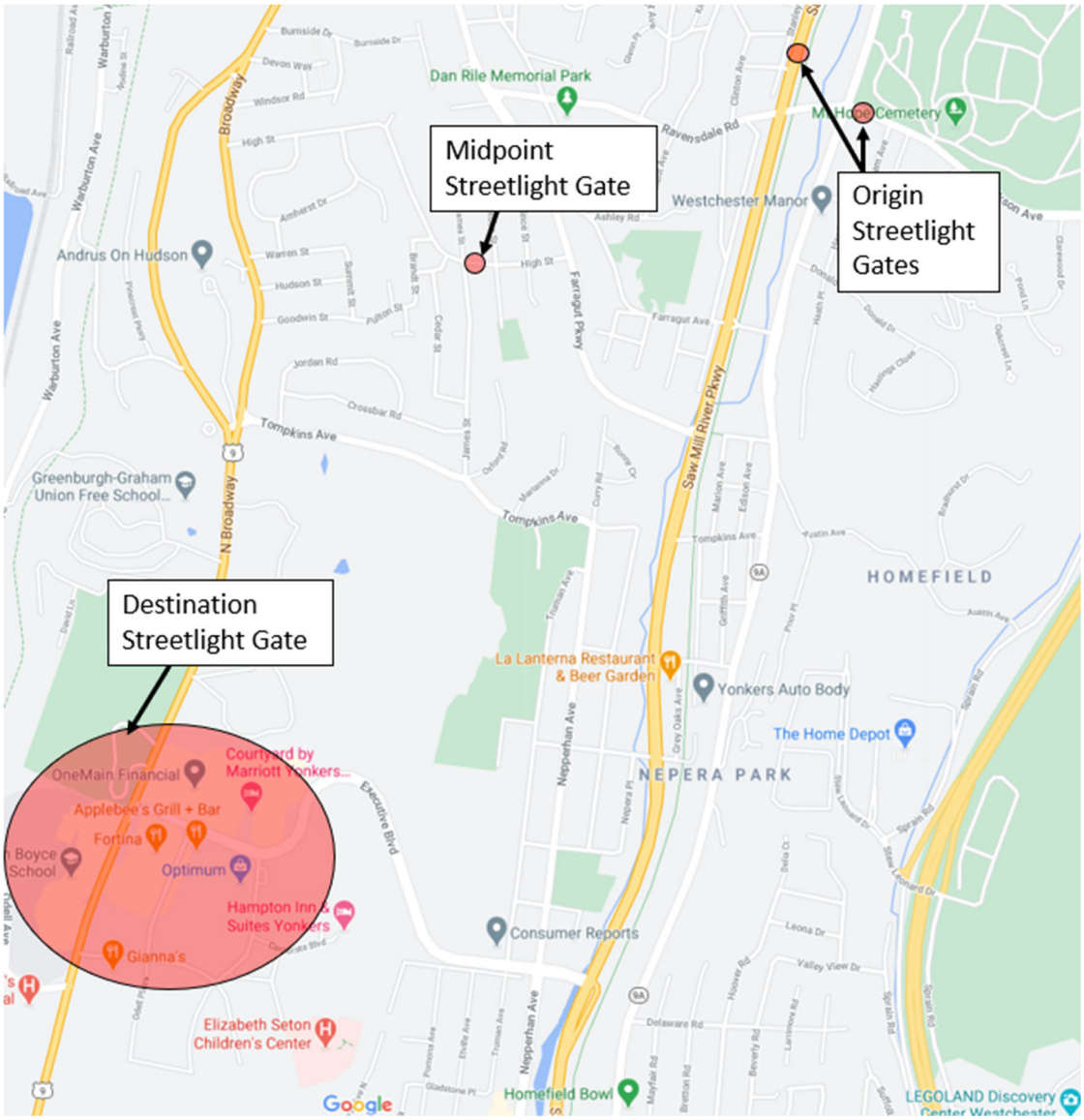

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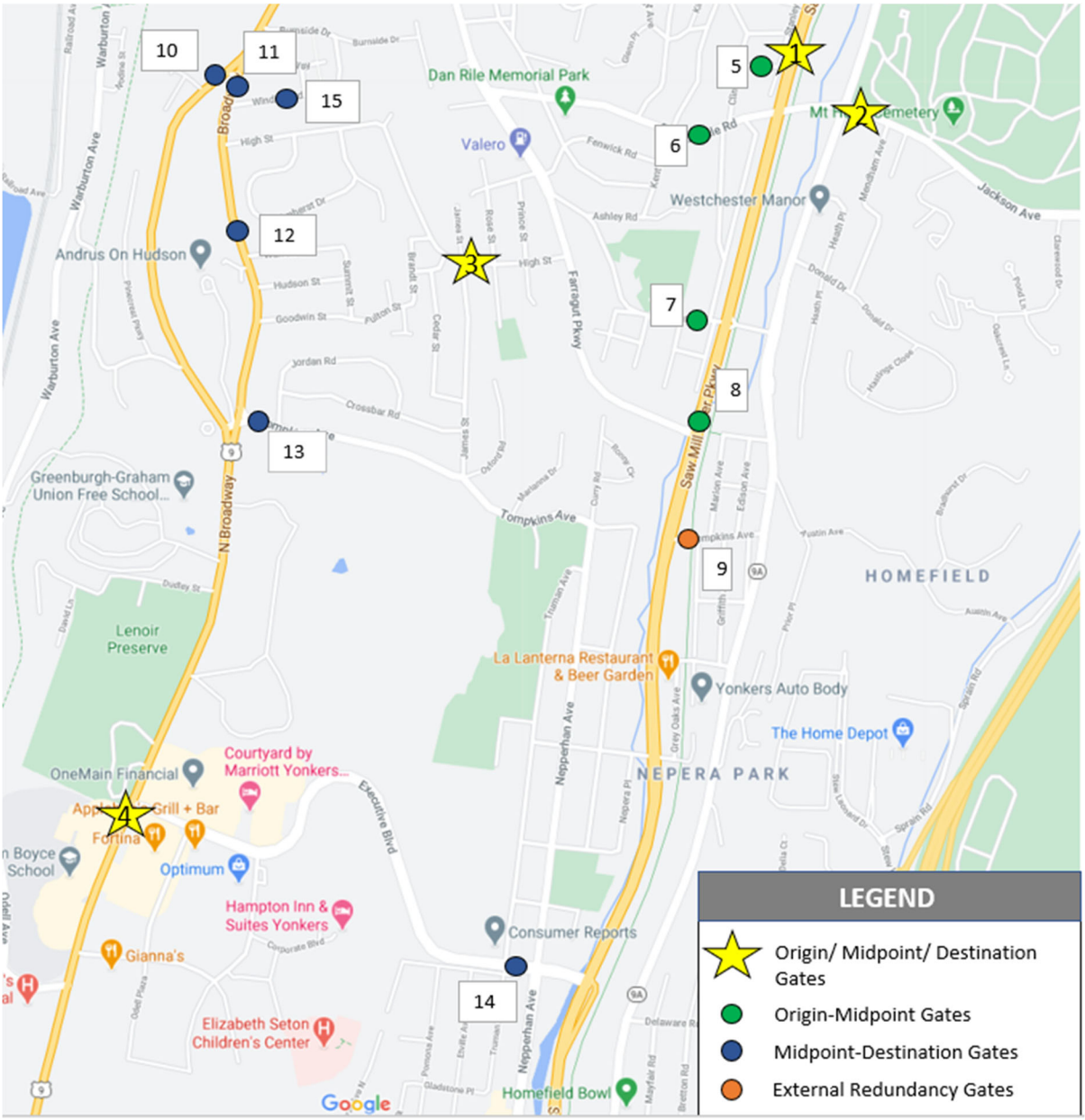
FIGURE 5: Proposed Streetlight Gate Layout



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3.1. Origin- Midpoint Analysis

There are six identified paths from the origin points to the midpoint at High and James Street.

- Path A comes from the Saw Mill Parkway origin point and uses the Clarence Avenue exit to navigate onto Ravensdale Road, turns left onto Farragut Parkway, and then right onto High Street.
- Path B also uses the Saw Mill Parkway and Clarence Avenue exit, but instead continues south along Clinton Avenue until turning left onto Farragut Avenue, turning left again on Farragut Parkway, and then right onto High Street.
- Path C comes from the Ravensdale Road origin point and travels westbound to Farragut Parkway, turns left, and then turns right onto High Street.
- Path D also comes from the Ravensdale Road origin point and travels westbound but turns left onto Clinton Avenue, right onto Farragut Avenue, left onto Farragut Parkway, and then right onto High Street.
- Path E travels from the Sawmill Parkway origin point and uses the Farragut Avenue exit to travel westbound, turn left onto Farragut Parkway, and then right onto High Street.
- Path F travels from the Sawmill Parkway origin point, uses the Farragut Parkway exit to travel westbound and then turns left onto High Street.

See **TABLE 1** for the Origin-Midpoint paths defined in terms of gates travelled.

TABLE 1: Origin-Midpoint Path Identification using Streetlight Gates

Path	Must use Gates	Must NOT use Gates
Path A	1; 3; 4; 5; 6	
Path B	1; 3; 4; 5; 7	
Path C	2; 3; 4; 6	
Path D	2; 3; 4; 7	
Path E	1; 3; 4; 7	5
Path F	1; 3; 4; 8	

3.2. Midpoint- Destination Analysis

There are four possible paths from the midpoint of High and James Street to the intersection of Route 9 and Executive Boulevard.

- Path 1 turns left onto James Street to access Tompkins Avenue, turns right, and then travel to Executive Boulevard via Route 9.
- Path 2, similarly to Path 1, turns left onto James Street to access Tompkins Avenue, but instead turn left, travelling eastbound to Nepperhan Avenue, and then travel south to Executive Boulevard.
- Path 3 users turn left onto Hudson or Warren Street to access Route 9 northbound, use the U-turn at Devon Way to access Route 9 southbound, and then access the office complex at Executive Boulevard via Route 9.

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- Path 4 identifies roadway users who continue to travel westbound on High Street until turning right onto Route 9, use the U-turn at Devon Way, and then access the office complex via Route 9.

The proposed gate layout is detailed and path identification using the gates is detailed in **TABLE 2.**

TABLE 2: Midpoint-Destination Path Identification using Streetlight Gates

Path	Must use Gates	Must NOT use Gates
Path 1	1 OR 2; 3; 4; 13	
Path 2	1 OR 2; 3; 4; 14	
Path 3	1 OR 2; 3; 4; 10; 11; 12	
Path 4	1 OR 2; 3; 4; 10; 11	12

4. U-Turn at Devon Way Closure Experiment

Sam Schwartz will place the gates as specified in **FIGURE 5** to track commuters between the origin and destination points as they travel through the roadway network through several conditions. There are at least four conditions that *Sam Schwartz* will study: before any network changes in March 2020, Phase 1 of the left turn restriction at High and James Street without enforcement, Phase 2 of the left turn restriction with enforcement, and Phase 3 of the temporary U-Turn Restriction. While the start of Phase 2 has been delayed, it will maintain two months of Phase 2 data collection and two months of Phase 3 data collection, as originally intended.

Phase 1 of the turn restriction started at its implementation in early March 2020 and will continue until late November of 2020. Because this coincides with the beginning of the COVID-19 pandemic, this was also a period of reduced traffic volumes. Starting in the month of November, as traffic patterns have increased again along High Street, Phase 2 will start, which includes the enforcement of the left turn restriction to ensure compliance. Phase 2 will continue until February of 2021, with data from days immediately surrounding the holidays being excluded from the study. A comparison between path choice between Phase 1 and Phase 2 may potentially yield conclusions about compliance in the absence of law enforcement.

Phase 3 beginning in February of 2021 will include enforcement of the AM left turn restrictions, but also the temporary closure of the U-Turn at Devon Way. This closure will specifically target users of Path 3 or Path 4 as described in **TABLE 2**. This closure, as analyzed in the January 31, 2020 memo, is expected to detour users of Path 3 or Path 4 by an average of one mile with an associated four minute detour. Those detours may include using Burnside Drive, Devon Way, Windsor Road, and Strafford Lane. In the event these local roads are used following the U-Turn closure, these commuters will be recorded through Streetlight gate 15. However, it is anticipated that the additional delay would further discourage commuters from using the local roadway network in favor of Saw Mill Parkway's Executive Boulevard exit.

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The travel patterns during the Phase 3 will be compared to those in Phase 1 and 2 to determine the impact of the U-Turn closure on commuter path choice as an independent variable. Additional network adjustments may be considered by the Village if a decrease in commuters using the Hastings-on-Hudson local roadway network is not achieved.