

Route 108 – South Corridor Study



Dover, New Hampshire

By
Sebago Technics, Inc.
in association with
Alta Planning + Design

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Acknowledgments

The Sebago/Alta Consultant Team would like to acknowledge the time and efforts contributed to this Study by members of the City Staff and School Department, without which this document would not be as complete and useful to the community. These include:

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Executive Summary

This Executive Summary is intended to provide the reader with a quick synopsis of the scope, findings, and resulting recommendations of this Study. It does not provide all of the specific details that went into the development of the final recommendations, which resulted from a thorough vetting process with City and School Department staff. For this information we direct your attention to the full body of the Report.

The City of Dover and the Dover School Department engaged Sebago Technics (Sebago) and Alta Planning + Design (Alta) in 2016 to conduct a comprehensive traffic, safety, and pedestrian/bicycle study of the Route 108 South Corridor as depicted in Figure 1 on the following page. State Route 108 is a regionally significant corridor in the Seacoast Area of New Hampshire that has also been identified as a “Critical Corridor” in the City of Dover’s Master Plan. The primary objectives of this effort were fourfold:

- To recommend short, medium, and long-range improvements for addressing congestion that has plagued this corridor for a number of years
- To assess existing safety within the corridor and present actions for improving these conditions for all users
- To evaluate and recommend improvement actions for upgrading pedestrian and bicycle facilities within the Study Area
- To work with the School Department to identify opportunities for altering access and traffic operations within the High and Middle School campuses for the benefit of Route 108, especially as they may relate to the new High School construction



Route 108 at Back River Road

As such, this Study Report has been organized to address each of the above core objectives separately as follows:

1. Congestion Mitigation on Route 108
2. Corridor Safety
3. Bike and Pedestrian Facility Improvements
4. Middle and High School Access Modifications



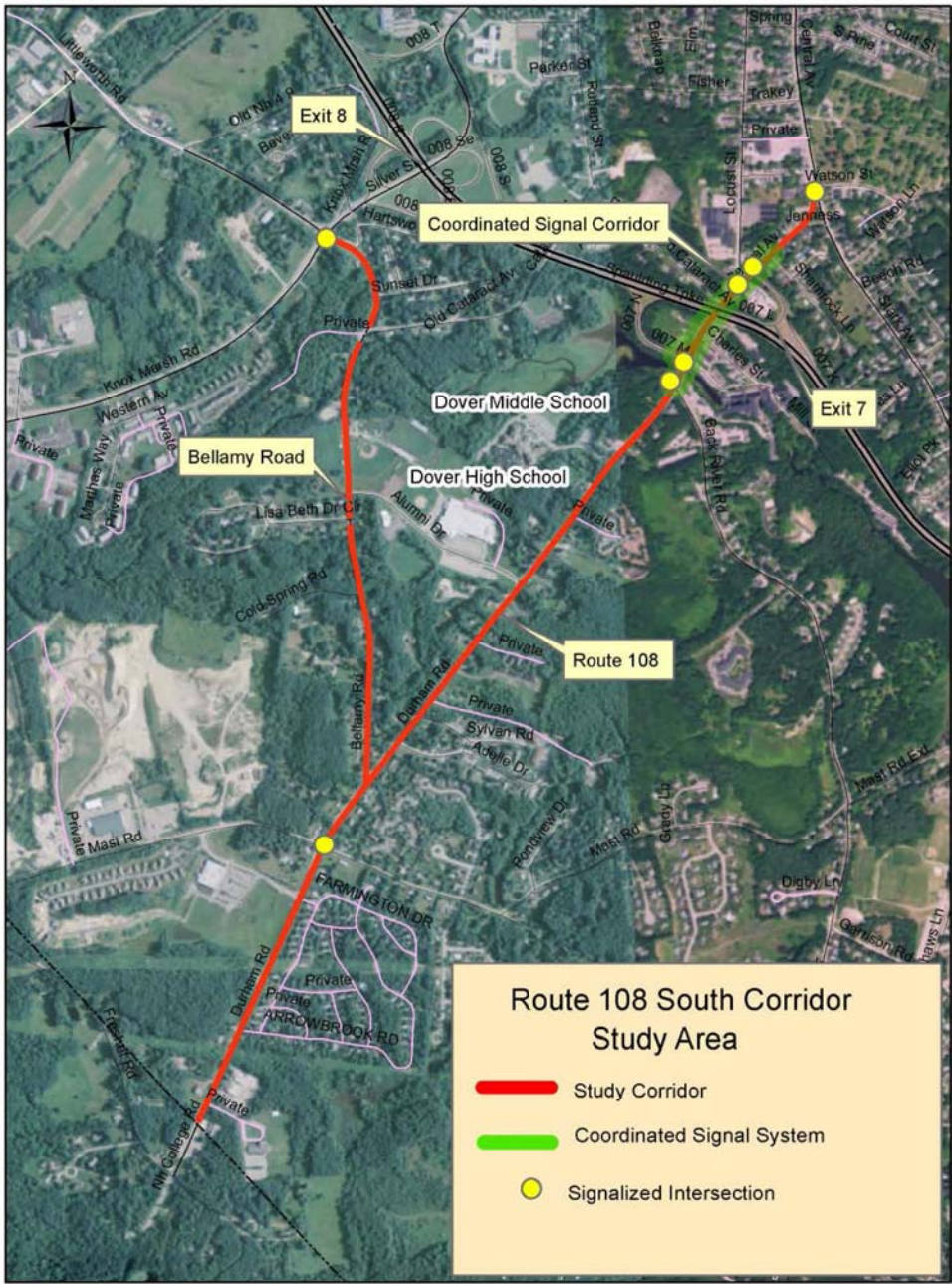


Figure 1: Study Area

The findings and recommendations presented herein for each of the four main focus areas represent the results of a combination of new data collection by Sebago and Alta; historical information from the Dover Police Department; and input from interviews with City staff and the School Department administration.

A summary of our findings and recommendations for the City's consideration are as follows:

Congestion Mitigation on Route 108

Short Range Improvements (0-2 years):

- SRI-1 Optimize Traffic Signal Coordination – Back River Road to Exit 7N (Already Completed)
- SRI-2 Upgrade vehicular detection at Locust Street and Spaulding Turnpike Exit 7 NB ramp with video detection
- SRI-3 Install traffic signal interconnect and upgrade detection and controller at Stark Avenue
- SRI-4 Construct left turn lane for northbound thru traffic at Daley Drive
- SRI-5 Implement Transit Signal Priority (TSP) at all signalized Intersections along Route 108
- SRI-6 Install Permanent vehicle travel time recording

Medium Range Improvements (2-4 Years)

- MRI-1/MRI-2 Install a traffic signal (MRI-1) or roundabout (MRI-2) at the intersection of Alumni Drive and Route 108
- MRI-3 Add lane and traffic signal improvements at Locust Street and Exit 7N ramp

Long Range Improvements (4+ Years)

- LRI-1 Convert the two intersections of Route 108 at Back River Road and Mill Street/Spaulding Turnpike Southbound Ramps from signalized to roundabout control

Corridor Safety

Short Range Improvements (0-2 Years)

- SRI-7 Install a flashing yellow arrow signal indication at the Exit 7N ramp intersection
- SRI-8 Install “No Right Turn on Red” dynamic blank out signs at Exit 7S ramp
- SRI-9 Monitor and implement access management opportunities within the corridor



Bike and Pedestrian Facilities

Short Range Improvements (0-2 Years)

- Add New and Improve Existing Crosswalks
- Stripe Bike Lanes on Route 108

Medium Range Improvements (2-4 Years)

- Improve Bus Stops with Pull Out Areas
- Construct New Sidewalk to Fill In Gaps
- Installation of Traffic Calming Elements

Middle and High School Access Modifications

Short Range Improvements (0-2 Years)

- SRI-10 Differentiate school release times by an additional 15 minutes to eliminate current overlap
- SRI-11 Retime traffic signal at Bellamy Road and Knox Marsh Road intersection to better accommodate school traffic

Medium Range Improvements (2-4 Years)

- MRI-4 Widen and improve the radii of the present connector road behind Middle School, Convert Daley Drive to right-in / right-out, and restripe Daily Drive to accommodate proposed circulation



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Interim Tech Memo May 20, 2016



Chapter 1 – Introduction

The City of Dover and the Dover School Department engaged Sebago Technics (Sebago) and Alta Planning + Design (Alta) in 2016 to conduct a comprehensive traffic, safety, pedestrian, and bicycle study of the Route 108 South Corridor as depicted in Figure 1 on the following page. State Route 108 is a regionally significant corridor in the Seacoast Area of New Hampshire that has also been identified as a “Critical Corridor” in the City of Dover’s Master Plan. The primary objectives of this effort were fourfold:

- To recommend short, medium, and long-range improvements for addressing congestion mitigation that has existed in this corridor for a number of years
- To assess safety within the corridor and present actions for improving these conditions for all users
- To evaluate and recommend improvement actions for upgrading pedestrian and bicycle facilities within the Study Area
- To work with the School Department to identify opportunities for altering access and traffic operations within the High and Middle School campuses for the benefit of Route 108, especially as they may relate to the new High School construction.

As such, this Study Report has been organized to address each of the above core objectives separately as follows:

Chapter 2 - Congestion Mitigation on Route 108

Chapter 3 – Corridor Safety Improvements

Chapter 4 - Bike and Pedestrian Facility Improvements

Chapter 5 - Middle and High School Access Modifications

The findings and recommendations presented herein for each of the four main focus areas represent the results of a combination of new data collection by Sebago and Alta; historical information from the Dover Police Department; and input from interviews with City staff and School Department administration. The end result of this Study effort is a Master Plan of recommendations that the City can use to monitor and implement over time as conditions warrant and financial resources become available.



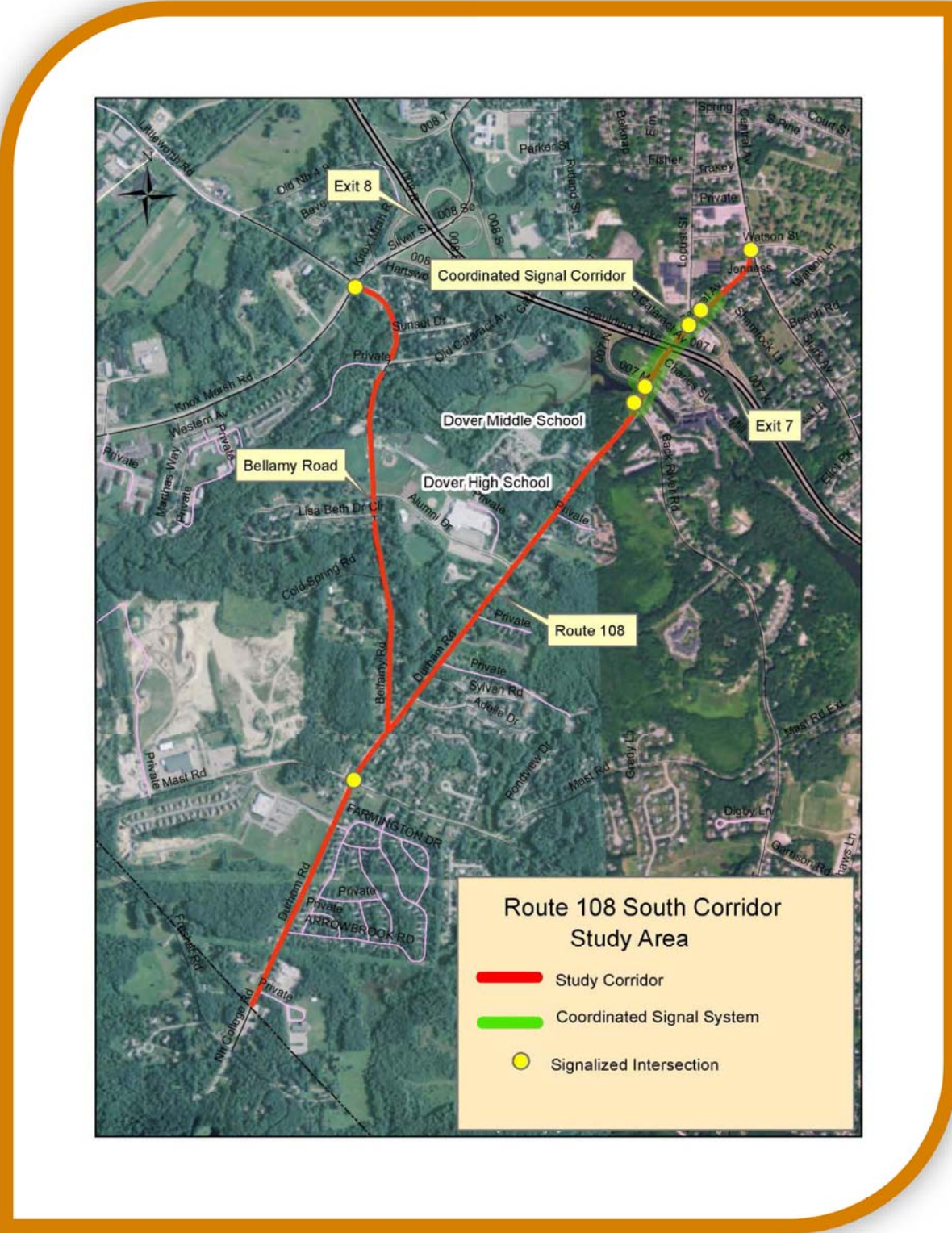


Figure 1: Study Area

Chapter 2 – Congestion Mitigation on Route 108

State Route 108 is a regionally significant corridor in the Seacoast Region of New Hampshire and serves as an important link between Dover and Durham. It also serves as a major commuter route for the majority of residences south of the Spaulding Turnpike, and also provides access to the City's Middle and High Schools and Exit 7 of the Spaulding Turnpike - further amplifying the commuter peaks and importance of Route 108 to the City's overall transportation network.

The following sections explain the existing conditions and present short, medium, and long-term improvements intended to lessen congestion and improve mobility through the Study Area for well into the future.

Existing Conditions

Number of Lanes, Traffic Signals, Roadway Widths, Travel Speed, and Traffic Distribution

Route 108 is a two-lane bi-directional minor arterial with a posted speed limit of 30 miles per hour. The roadway generally contains one twelve foot wide travel lane in each direction separated by a double yellow center line. There are four foot paved shoulders present on both sides. Sidewalk is also present on at least one side of the roadway throughout the corridor, with the location switching sides depending on physical constraints. Within the Study Area there are 7 signalized intersections located at Route 108 at Back River Road, Mill Street/Exit 7S Ramps, Locust Street, Exit 7N Ramps, Stark Avenue, and Mast Road. A seventh signal in the Study Area is located at Bellamy Road and Knox Marsh Road. Route 108 also serves the Wildcat Transit with several stops within the Study Area, and the existing shoulders are designated as bike lanes.

Bellamy Road is a minor arterial roadway with a posted speed limit of 30 miles per hour. Bellamy Road links Route 108 to Knox Marsh Road (Route 155) and the Exit 8 interchange on the Spaulding Turnpike and is approximately 1 mile in length. The existing roadway has two 11 foot lanes with narrow shoulders and an esplanade separated sidewalk along the east side. Trucks are currently prohibited from using Bellamy Road.

Alumni Drive is a local roadway with a posted speed limit of 20 miles per hour. Alumni Drive travels in a generally east-west direction between Route 108 and Bellamy Road. The existing roadway has one 12 foot travel lane in each direction separated by a double yellow center line. There is a bituminous sidewalk present on the northerly side of roadway. Alumni Drive is under stop control at both the intersection with Route 108 and the intersection with Bellamy Drive. Alumni Drive is primarily used to access Dover High School.

Daley Drive is a local roadway with a posted speed limit of 20 miles per hour. Daley Drive travels in a generally east-west direction from its intersection with Route 108. Daley Drive is approximately 30 feet wide with a one travel lane in each direction. There is a bituminous sidewalk present on the northerly side of the roadway. Daley Drive is used to access Dover Middle School. Daley Drive is under stop control at the intersection with Route 108.

The signalized intersections of Route 108 and Back River Road, Mill Street/Exit 7S, Locust Street, and Exit 7N Ramps are interconnected with copper wire. These intersections are controlled by upgraded TS-2 controllers. These improvements have been made in recent years as part of the City's on-going efforts to improve its traffic signal infrastructure. These four intersections are also connected to the City's central traffic signal server for monitoring and management. Detection at Back River Road and Mill Street has recently been upgraded to video. The intersections of Locust Street, Exit 7S, Stark Avenue, Mast Road, and Bellamy Road/Knox Marsh Road do not have this feature – they are all still using in-pavement loop detection. In addition, these three latter intersections are all operating as isolated intersections and are not presently connected to the City's central traffic signal management system.

Accurate Counts based in North Reading, Massachusetts, gathered traffic turning movement count data on May 26th, 2016 at the following intersections for use in this Study:

- Route 108 and Alumni Drive
- Route 108 and Daley Drive
- Bellamy Road and Alumni Drive

These counts included the hours from 6:30 AM to 8:30 AM and 2:00 PM to 6:00 PM and were gathered using video recording. The AM and PM peak hour volumes for the three above mentioned intersections are shown in Figure 2.

The counts show that traffic on Bellamy Road is larger than expected. The volume of northbound traffic on Bellamy Road is on average equal to 75% of the northbound traffic volume on Route 108. The school entrance on Bellamy Road also has the largest amount of both entering and exiting volumes, which would suggest that people are already aware of Bellamy Road as an alternative to Route 108 for school access.

In the AM the majority of traffic destined for the schools enters by Bellamy Road. Exiting traffic favors Bellamy Road and Daley Drive over Alumni Drive. When compared to Daley Drive, Alumni Drive has more entering traffic, but there is less traffic exiting. This is logical in the AM peak hour as both employees and students drive to and park in the school campus, so the total number of entering vehicles should be larger than the total number of exiting vehicles. However, it was noted that Alumni Drive has noticeably less exiting traffic than the other two entrances during the AM peak period, suggesting that traffic entering by the Alumni Drive entrance is exiting somewhere else.

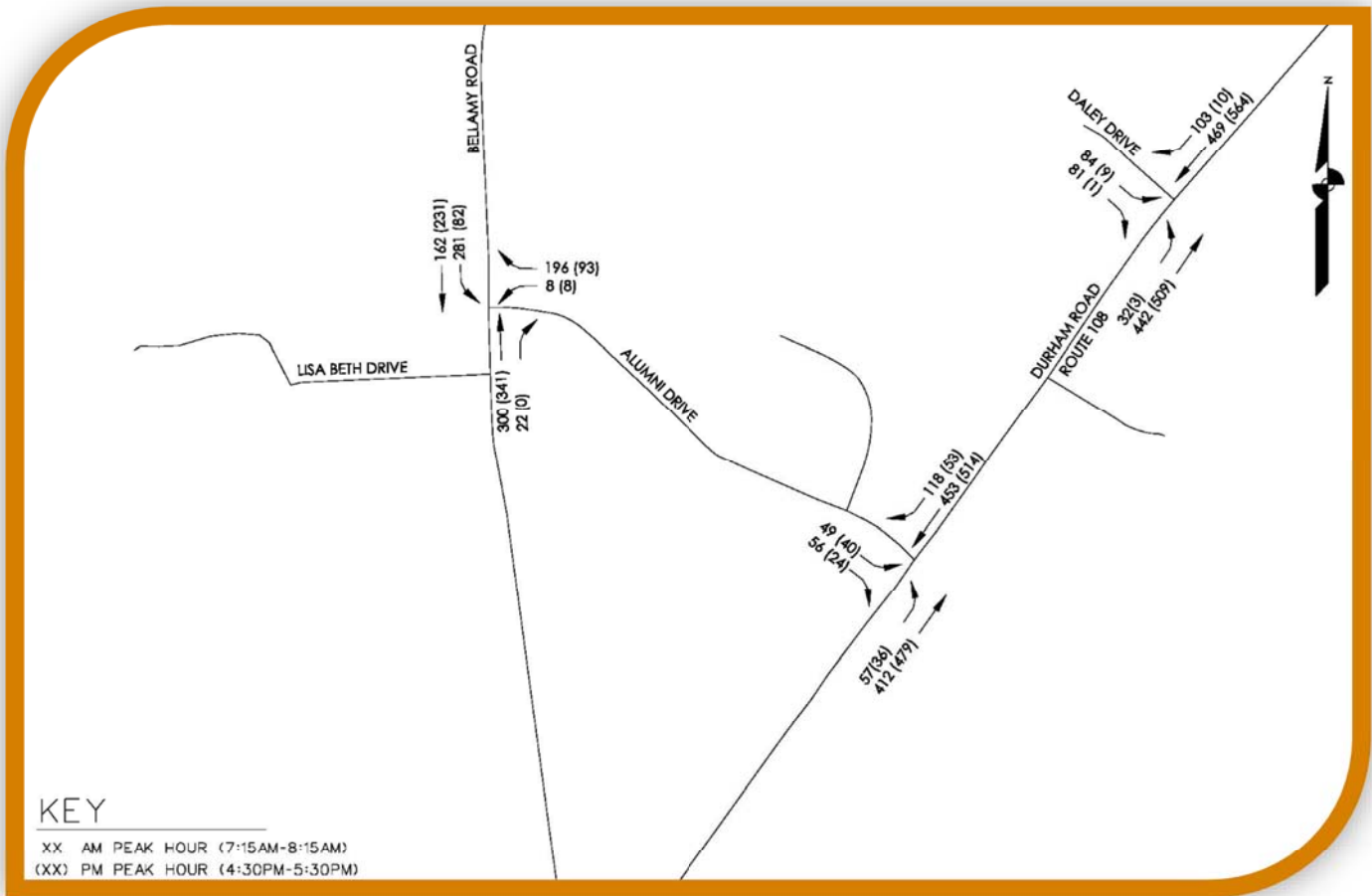


Figure 2: Peak Hour Volumes, School Area

Signalized Intersections – Capacity

The Study Area contains a total of seven signalized intersections. These include the following locations:

- Route 108 @ Back River Road
- Route 108 @ Mill Street / Spaulding Exit 7S Ramp
- Route 108 @ Locust Street
- Route 108 @ Spaulding Exit 7N Ramp
- Route 108 @ Stark Avenue
- Route 108 @ Mast Road
- Knox Marsh Road @ Bellamy Road/Littleworth Road

The four intersections of Route 108 at Back River Road, Mill Street, Locust Street and the Spaulding Turnpike Exit 7 North Ramp are controlled by two traffic controllers located at the intersections of Mill Street and Locust Street. These controllers have been recently upgraded to

McCain Omni eX TS-2 controllers, which are interconnected with copper wire that has been in place for a number of years.

Existing traffic volumes for these four intersections are shown in Figure 3. These counts were obtained from the existing GridSmart traffic cameras at the intersections of Route 108 at Back



View from GridSmart camera at Back River Road

River Road and Route 108 at Mill Street. Manual traffic movement count data for the four intersections were also available from counts conducted in 2011. Using this combined data, volumes for the intersection of Route 108 and Locust Street/Spaulding Exit 7S ramp were updated proportionally to match the throughput shown from the 2016 GridSmart counts at Back River Road and Mill Street.

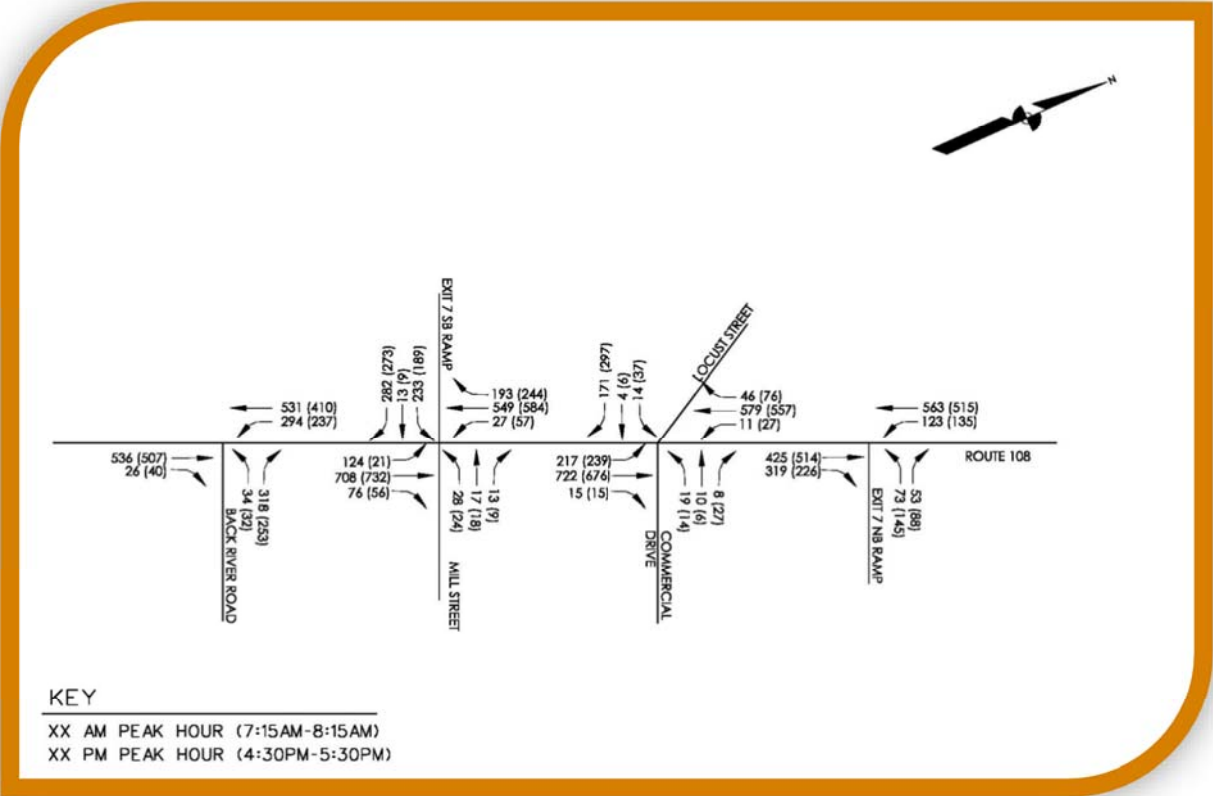


Figure 3: Peak Hour Volumes, Signalized Intersections
 Project: 15512

Capacity at signalized intersections is typically measured on a movement by movement basis and is defined by a saturated flow rate multiplied by a green ratio. The saturated flow rate represents the maximum number of vehicles that the intersection movement could support and is typically between 1,500 and 1,800 vehicles per hour depending on various factors such as movement type, roadway width, and vehicle composition. The green ratio reduces the saturated flow rate based on the amount of green time available to the movement compared to the entire cycle. The green ratio could be as much as 60% for a heavy traffic mainline approach with little side street volume to as small as 10% for a small volume side street.

Once the approach capacity is determined then it is compared to the approach volume to calculate the volume to capacity (V/C) ratio. Figure 4 shows the estimated approach V/C ratios for both the AM and PM peak hours for all four signalized intersections.

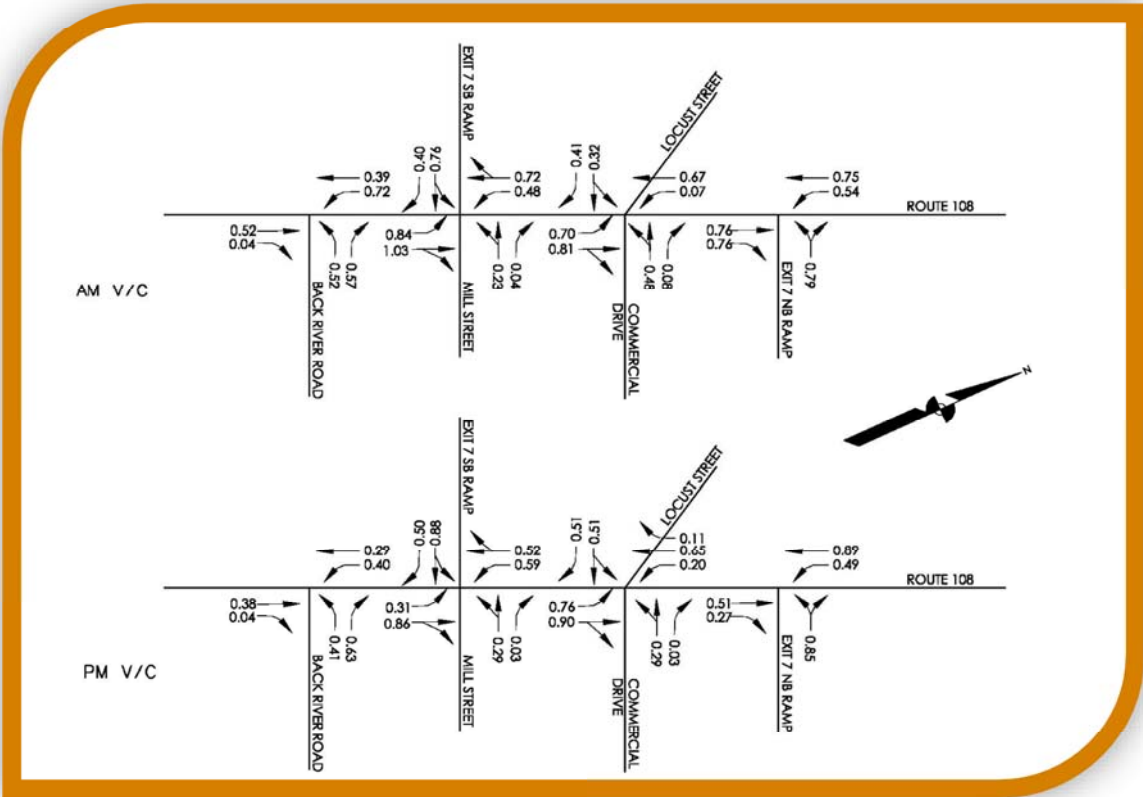


Figure 4: Existing V/C Ratios

As can be seen in both peak hours, multiple northbound and southbound mainline movements are greater than 0.70 and the left turns onto Route 108 from both Exit 7 ramps are above 0.75. Movement v/c ratios at these magnitudes suggest that volumes on both the mainline and the ramps are nearing the maximum capacity available to the respective movements, which is leading to congestion and delay in both peak hours. As the mainline and ramps compete against each other for available green time, any timing modifications designed to improve one will only

harm the other. The capacity of the existing signal infrastructure has recently been maximized through the use of customized phasing, time of day coordination plans, and green time split assignments based on traffic volumes collected by the GridSmart Cameras located at the intersections of Route 108 at Back River Road and Route 108 at Mill Street/Spaulding Ramp.

Short Range Improvements (SRI's) - 0-2 years

The following are improvements that could be completed without major modifications to the existing roadway. These improvements are intended to be solutions that can be implemented in the near future without dependence on other improvements.

SRI-1: Optimize Traffic Signal Coordination – Back River Road to Exit 7N (Completed)

In the Spring of 2016, Sebago Technics deployed new coordinated Time of Day (TOD) programming at the signalized intersections on Route 108 between Back River Road and the Exit 7N Ramp. By coordinating the Mill Street and Locust Street controllers, the goal was to reduce congestion within the corridor and reduce overall travel times for both Route 108 and Back River Road motorists.

To evaluate the effectiveness of the new coordination programming, two “BlueTOAD” devices were deployed which capture Bluetooth signals emanating from vehicles in the corridor which are used to estimate travel times between two specific locations. Over the months of October and November 2016 we collected data on both Back River Road and Route 108 with and without traffic signal coordination on Route 108. In doing this, we were able to quantify the differences in traffic performance (travel times or delay reductions) being realized with the refined traffic signal programming. Since historical complaints had been received from Back River Road users, as well as motorists on Route 108, we positioned the BlueTOAD devices such that we could capture information about both legs of this intersection.



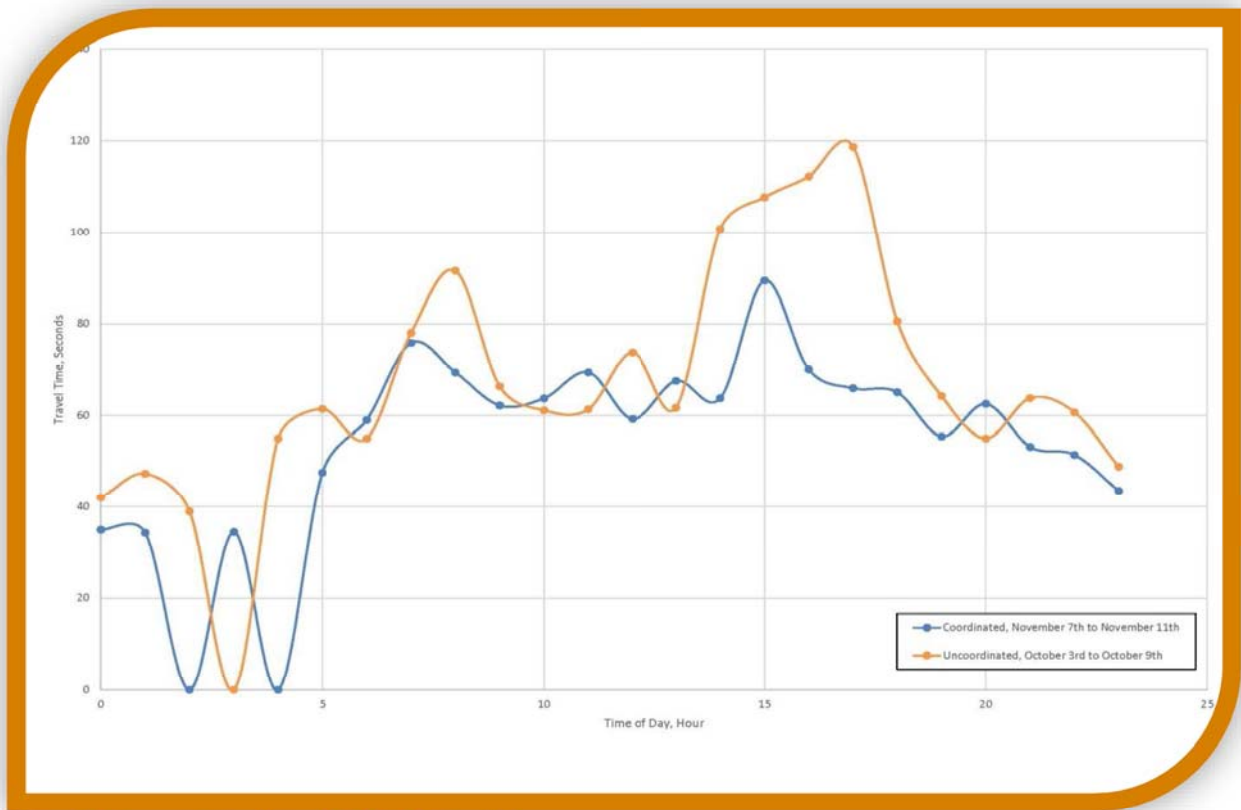


Figure 5: Route 108 Northbound BlueTOAD Results

Route 108 was evaluated between the Fire Station north of Daley Drive and Locust Street. Both the northbound and southbound directions were independently measured and the travel times for each hour from Monday to Friday were averaged producing the results shown in Figures 5 and 6.

Similar BlueTOAD data was collected for the Back River Road approach and is presented in Figure 7. As can be seen from these comparative graphs, there were significant reductions in average travel time for vehicles operating in all three directions throughout the day as a result of the new coordinated signal timings.



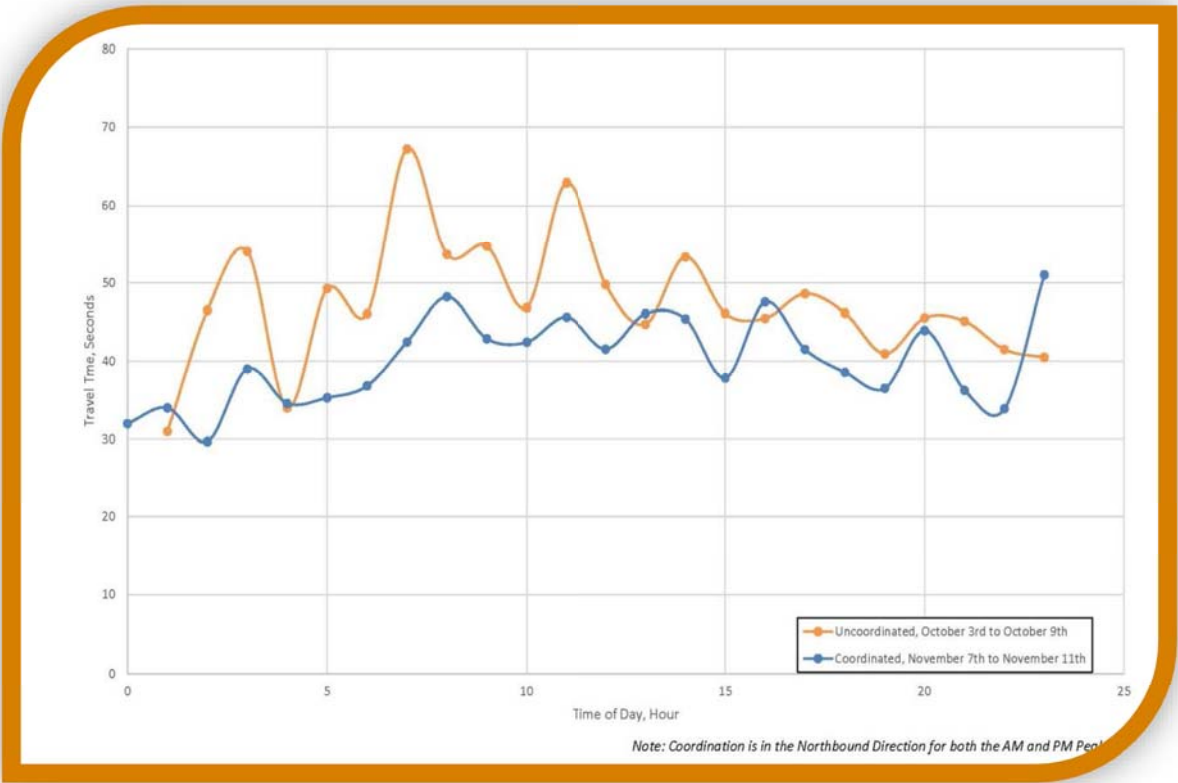


Figure 6: Route 108 Southbound BlueTOAD Results

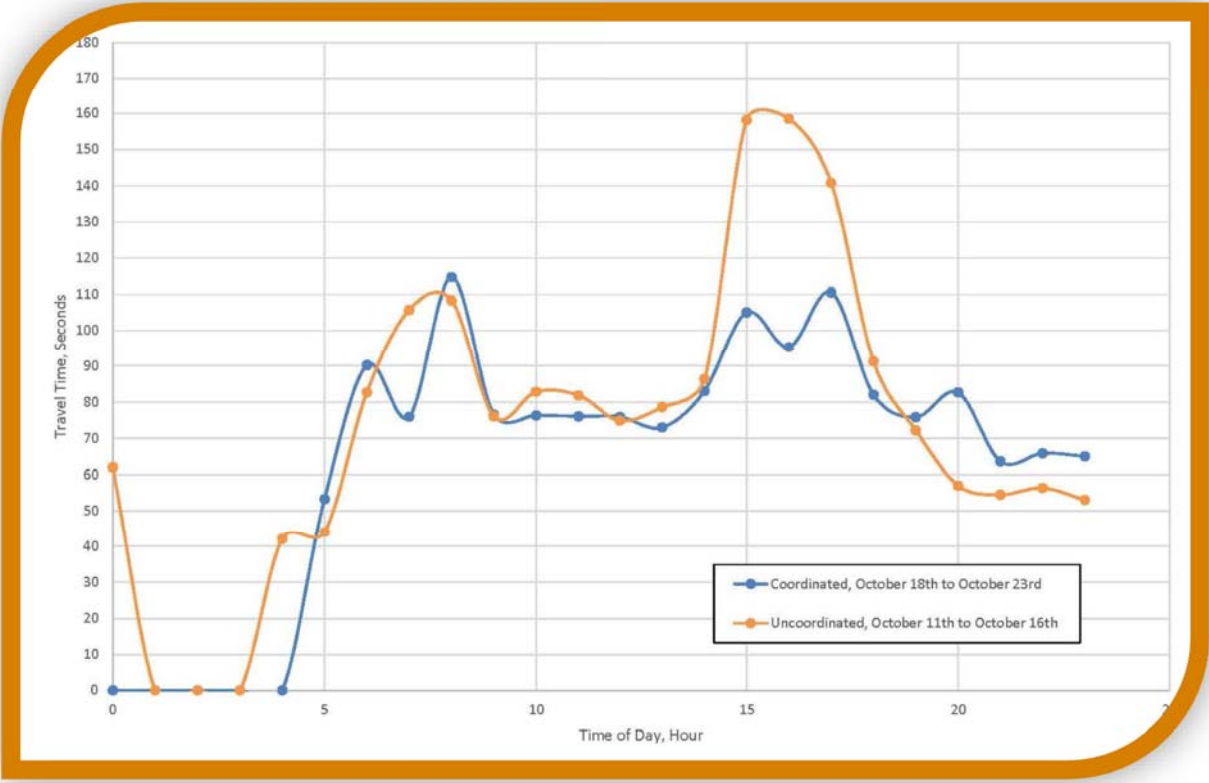


Figure 7: Back River Road BlueToad Results



SRI-2: Upgrade Vehicular Detection at Locust Street and Spaulding Turnpike Exit 7 NB Ramp

This intersection currently has inductive in-pavement loops for vehicular detection. It is recommended to upgrade both of these intersections to video detection, similar to what is currently in place at the Mill Street and Back River Road intersections. Installing GridSmart type video detection at these locations will not only provide more reliable detection as compared to loops, but will also allow for the continuous counting of traffic volumes. This data, combined with the data that is currently available from the Mill Street and Back River Road intersections, will allow for more accurate optimization of the signal coordination throughout this key section of Route 108.

SRI-3: Install Traffic Signal Interconnect between Locust Street and Stark Avenue

As mentioned previously, the Stark Avenue traffic signal cannot currently communicate with the City's central management server. This should be addressed with some form of communications linkage – wireless or fiber optic cabling. In addition, this intersection should be retrofitted with a new video detection system and a new ATC controller.

Modifications at Daley Drive

During the AM peak hour there are noticeable delays related to the movements entering and exiting the Middle School at Daley Drive. The following presents several options for improving the conditions at this intersection.

SRI-4: Construct a Left Turn Bypass Lane for Northbound Thru Traffic.

From the traffic count videos it was observed that northbound through traffic uses the shoulder to pass traffic turning left into the school. Vehicles that make this maneuver help to reduce the delay caused by the left turn traffic, however this maneuver is not particularly safe and increases the risk of crashes at this intersection. We recommend widening the northbound approach to create a formal left turn lane. The left turn lane would allow through traffic to easily and safely pass left turning traffic. Although the left turn lane would improve safety and alleviate the delay caused by traffic entering the school, it does not help the exiting vehicles. Ultimately, exiting vehicles would utilize Alumni Drive via the internal circulation improvements within the school campus, which is discussed later in Chapter 5 - Middle and High School Access Modifications. This left turn lane is shown on a concept plan at the end of this chapter.

Signalizing this intersection or converting it to a roundabout were both considered, however based on the traffic counts collected as part of this Study, a traffic signal would not be warranted. Performance-wise the roundabout would reduce the delays for entering and exiting traffic while having minimal impacts to the other traffic on Route 108, however the cost associated with constructing such an improvement seemed to exceed the benefits realized.

SRI-5: Implement Transit Signal Priority (TSP) at all Signalized Intersections along Route 108

Wildcat Transit Routes 3A and 3B travel through the Route 108 study corridor both to and from Durham to the south and terminating at the intersection of Central Avenue and Glenwood Avenue in Dover. A map of these transit routes is included in the Appendix. This option would implement Transit Signal Priority (TSP) on both the existing and any proposed signal infrastructure within the Route 108 Corridor from Stark Avenue to Mast Road. Implementing TSP would allow for signals to be programmed to provide for more efficient and reliable travel of the transit buses through this corridor. New hardware would need to be installed in both the buses and the signal cabinets for this technology to be utilized, but this would be relatively inexpensive.

SRI-6: Permanent Vehicle Travel Time Recording

In order to permanently obtain travel time data similar to that collected by the BlueToad previously discussed, it is recommended to install permanent Bluetooth signal capturing equipment in the existing traffic signal cabinets. Having this automated data being continuously recorded can provide immediate data driven feedback on changes in congestion levels and any signal timing changes which may be implemented in the future to address changes in traffic volumes.

Medium Range Improvements (MRI's) 2-4 Years

Modifications at Alumni Drive

MRI-1: Signalize Alumni Drive

Traffic control signal warrants detailed in the *2009 Manual of Uniform Traffic Control Devices (MUTCD)* were evaluated for the intersection of Alumni Drive. The traffic counts taken for Alumni Drive only had 6 hours of data, compared to the normal 12 hours that is gathered for a true signal warrant analysis, however the counted hours represent the highest volume hours that are most likely to meet these warrants. The warrant analysis was run with both Alumni Drive traffic only and with the additional entering and exiting left turns from Daley Drive representing the scenario where access to Daley Drive at Route 108 would be limited to right turning traffic only.

Warrant 1, the 8 hour Warrant, has three conditions and any one of the conditions needs to be satisfied for the warrant to be met. Out of the three conditions only Warrant 1B is appropriate in this case. Warrant 1B checks for the interruption of continuous traffic related to the major street being such a heavy volume that the side street suffers excessive delay or conflict when entering the major street. To meet Warrant 1B the hourly volume has to be greater than 750

vehicles on the major road and 75 on the minor approach for 8 hours. Without Daley Drive's traffic, Alumni Drive met 3 out of the 6 hours counted. With the additional traffic, all 6 counted hours were met. There is a possibility that additional uncounted hours may have also met the requirements based on trends within the traffic counts.

Warrant 2 only requires 4 hours to have larger hourly volumes on the major road and minor approach to be met. Rather than a static relationship between the requirements for the major and minor streets, similar to Warrant 1, Warrant 2 uses a dynamic relationship where the volume on the major road increases the requirement for the minor approach decreases. When considering solely Alumni Drive traffic, only the 2:00 PM hour meet these requirements. With the combination of Alumni Drive and Daley Drive traffic, both the 8:00 AM and 2:00 PM hours meet the Warrant requirements. It is worth noting that the remaining 4 hours counted are very close to meeting the requirements with the additional Daley Drive traffic.

Warrant 4 is the pedestrian volume warrant and requires at least 100 crossing pedestrians in a single hour in order to be considered. During the 2:00 PM hour there were only 43 recorded pedestrians, thus Warrant 4 is not met.

Warrant 5 is related to intersections that serve as major crossing points for school children. This warrant is normally only considered after alternative methods have been proven unsuccessful. The MUTCD suggests attempting alternatives such as crossing guards, warning signs and flashers, school speed zones, or grade-separated crossings before this Warrant can be considered.

The remaining warrants in the MUTCD do not apply to the Alumni Drive intersection.

To evaluate the performance of a signal at Alumni Drive, the intersection was modeled and optimized within Synchro 9 and then simulated using SimTraffic to estimate the potential delays and queues that would result. For analysis purposes, only the condition with the relocated Daley Drive traffic was modeled, since this condition would have to be in place for the traffic volumes to satisfy Warrants 1B and 2. Table 1 in the following section compares the existing delays and signalized delays for all approaches at this intersection.

MRI-2: Construct a Roundabout at Alumni Drive

Although Alumni Drive is close to meeting Warrant 1B and Warrant 2 for a signalized intersection, we also evaluated the feasibility of a roundabout. Based on the traffic volumes a single lane roundabout would be at about half capacity. Attached at the end of this chapter is a concept plan of a roundabout at the intersection of Route 108 and Alumni Drive. As can be seen there is adequate right of way to fit a full-sized circle.

Table 1 summarizes the SimTraffic simulation results of a roundabout with those of existing conditions and those of a signalized intersection. As can be seen, the signal and roundabout

options both perform better for the Alumni Drive approach traffic than existing conditions when the traffic is relocated from Daley Drive, therefore improvements to the Alumni Drive intersection are dependent on the ultimate decision regarding the Daley Drive improvements.

While it can be seen that a roundabout at this location may perform slightly better than a signal, the capital costs of designing and constructing a roundabout would be higher than that of a signal. This would need to be considered when deciding which improvement should be implemented.

Table 1 Alumni Drive Alternatives Performance Comparison:

<i>Movement</i>	<i>AM Existing</i>	<i>AM Signalized</i>	<i>AM Roundabout</i>	<i>PM Existing</i>	<i>PM Signalized</i>	<i>PM Roundabout</i>
	<i>Delay (sec.)</i>	<i>Delay (sec.)</i>	<i>Delay (sec.)</i>	<i>Delay (sec.)</i>	<i>Delay (sec.)</i>	<i>Delay (sec.)</i>
Route 108 NB LT	16	15	5	5	6	4
Route 108 NB TH	6	5	5	2	3	5
Route 108 SB TH	3	17	9	3	7	6
Alumni Dr EB RT	94	21	5	6	6	4
Alumni Dr EB LT	177	9	6	22	11	4
Overall Delay	27	14	7	3	5	5

MRI-3: Lane and Signal Improvements on Route 108 at Locust Street/Exit 7N Ramps

Several modifications have been identified as medium range/cost for the intersection of Route 108 with Locust Street and the Spaulding Exit 7N ramps. These improvements involve adding capacity to multiple approaches, which will improve operations and minimize queuing. The attached concept plan shows this improvement in addition to the proposed long range improvements. These modifications can remain in place if the long range improvement presented in the following section is implemented.

Route 108 is proposed to be widened to a 3-lane cross-section between Mill Street and Locust Street. The revised cross section would include two-lanes northbound and one lane south bound. At the intersection with Locust Street, Route 108 Northbound would be further widened to three lanes in order to accommodate a dedicated left turn lane, a thru only lane and a thru/right turn lane. The addition of a lane between the two intersections lowers the probability that queues will spill back from the intersection with Locust Street to the intersection of Mill

Street. Minimizing this queue spill back is critical to ensuring the corridor operates efficiently. When the queue does spill back to Mill Street, this can lock up both this intersection and the intersection with Back River Road.

Between the intersection with Locust Street and the Spaulding Exit 7N Ramp, Route 108 northbound would be two lanes consisting of one thru lane and one right turn lane onto the Spaulding Turnpike Ramp. This additional lane would allow traffic turning right onto the ramp to bypass any queuing thru vehicles. In order to implement this change, right-of-way takings would be required from the adjacent property. Some of the existing signal equipment would also need to be modified to adjust for this change and location of approach lanes.

Also proposed is the addition of a right turn lane on the Spaulding Exit 7N Ramp. This right turn lane would provide additional space for right turning vehicles to reach the channelized right turn onto Route 108 northbound without being affected by vehicles queuing to turn left. The addition of this lane would allow for the ramp to receive less green time, and therefore allowing a larger percentage of the signal cycle to be dedicated to Route 108 movements. This modification could be completed within the existing roadway right-of-way.

Implementing these improvements would require the revisiting of the signal coordination of the entire corridor to fine tune splits and offsets in order to optimize to the new configuration.

Long Range Improvements (LRI's) (4+ years)

Long Range Traffic Forecast

To analyze potential long range improvements for the corridor, it was necessary to first determine what amount of traffic growth should be predicted for future alternative analysis. Using the State of New Hampshire State and County Population Projections, September 2016 and traffic counts conducted by the New Hampshire Department of Transportation, a future growth increase of 15% over base year design volumes was chosen. Based upon the above mentioned population projections, this would represent a 2040 future design year for medium and long range improvements. Based upon existing traffic volumes, it was determined that the PM Peak Hour is the critical design hour for the entire corridor, and therefore would dictate what future improvements are warranted. All analysis of the following medium and long range improvements was completed for the PM Peak Hour traffic volumes.

The microscopic traffic simulation software Vissim 9.0 was used to model the corridor from Back River Road to the Spaulding Turnpike Northbound Ramps to analyze the proposed medium and long range improvements. This section was selected because it represents the main bottleneck within the corridor.

The focus of the analysis of the proposed medium and long range improvements is to minimize travel times and delays for traffic travelling the length of the Route 108 Corridor. Also, projected queues were calculated to determine what impact the alternatives would have on the Spaulding Turnpike off-ramps. An alternative was considered to be non-feasible if the calculated 95th percentile queues for either of the ramp approaches were found to be in close proximity to the length of the ramp.

LRI-1: Convert the intersections of Back River Road and Mill Street to Roundabouts



This improvement involves converting the signalized intersections of Route 108 with Back River Road and with Mill Street/Exit 7S Ramps to two roundabouts. A concept of the intersections at Back River Road and Mill Street is included at the end of the chapter.

Results of the Vissim simulation are displayed in Figures 10 thru 12. Metrics shown include average vehicle travel time for the corridor, average vehicle delay for the corridor, and calculated 95th percentile queues for all

intersection approaches. Average vehicle travel time and average vehicle delay are measured for both northbound and southbound traffic travelling the entire length of the corridor. The

Example of a Turbo Roundabout in the Netherlands

located just north of Daley Drive and the end of the corridor at the intersection of Route 108 and Jenness Street.

start of the corridor is considered to be a point in front of the fire station

Due to the high mainline volumes, the roundabouts at the intersections of Back River Road and Mill Street would have additional lanes to increase traffic flow across the bridge minimizing the probability that traffic will back up. This type of design, having more through lanes than circulating lanes, is known as a “turbo” design. The roundabouts only have the extra lane on one side as the additional through lanes are only needed for the bridge approaches giving a half-turbo design. This concept is drawn with the intent to potentially mitigate impacts to the bridge.

There are additional design features for the proposed Back River Road and Mill Street roundabouts to further improve the capacity. Initially in our analysis the Exit 7 SB Ramp

approach at the Mill Street roundabout was modeled as a single lane. We found in simulation that the ramp was having issues with queuing back onto the Spaulding Turnpike. To alleviate the problem the approach was remodeled to include two lanes. The left lane would be directed northbound by the circulating lane of the roundabout and the right lane would direct traffic southbound onto the bridge. By configuring the approach with two lanes the capacity was significantly increased, lowering the queues to acceptable levels.

As can be seen from the results, delays and travel times for southbound traffic are projected to be approximately equal to existing conditions with the coordinated signals. Northbound traffic would see a decrease in delay for those travelling the length of the corridor. Important to note is the reduction in queues that many approaches would be projected to have with this improvement.

Ultimately the design shown would make significant improvements to the capacity at the intersections of Back River Road and Mill Street without significant modifications to the bridge between the intersections or the Spaulding Turnpike overpass bridge just north of Mill Street. There are right-of-way impacts at both intersections and the bridge abutments over the river may have to be modified to accommodate the wider approach.

The improved capacity at the Back River and Mill Street intersections will lower delays and will allow greater amounts of traffic to flow north to the Locust Street intersection. As this intersection would no longer be part of a coordinated system, it could be retimed to optimize for the new volume patterns which would occur.

LRI-1 would leave the intersection of Route 108 and Locust Street/Spaulding Northbound Ramps in the configuration as described in the medium range improvement MRI-3.



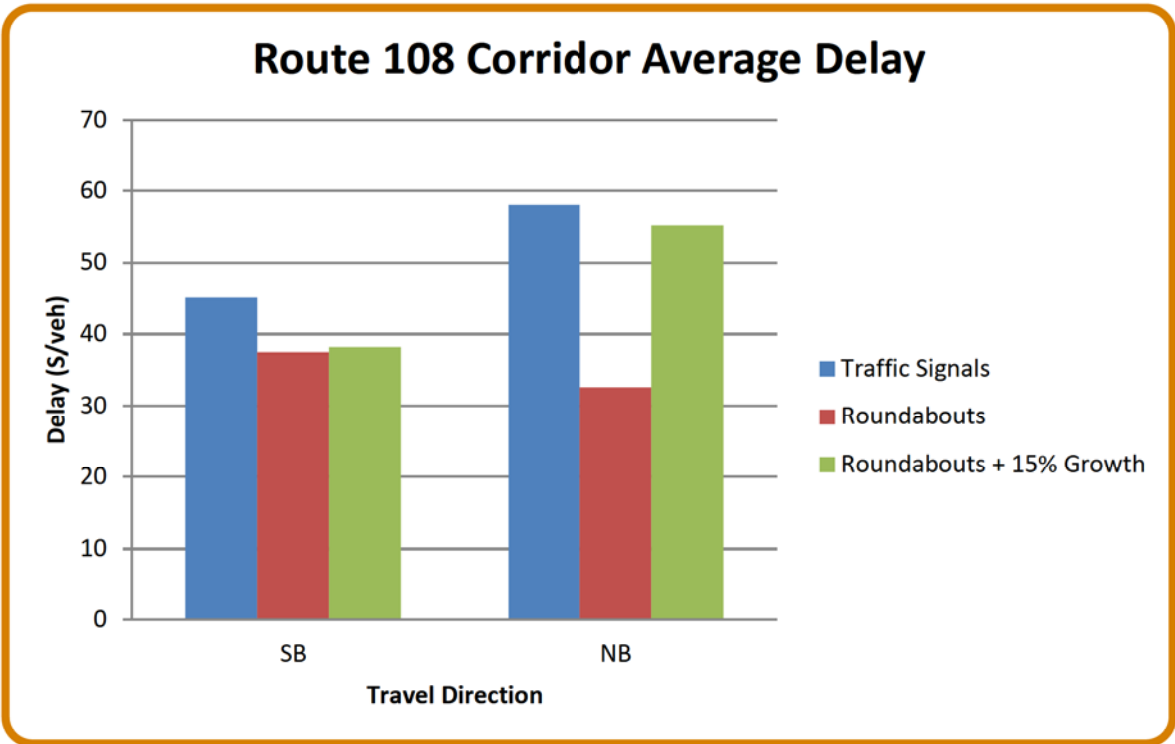


Figure 10: Average Corridor Delay

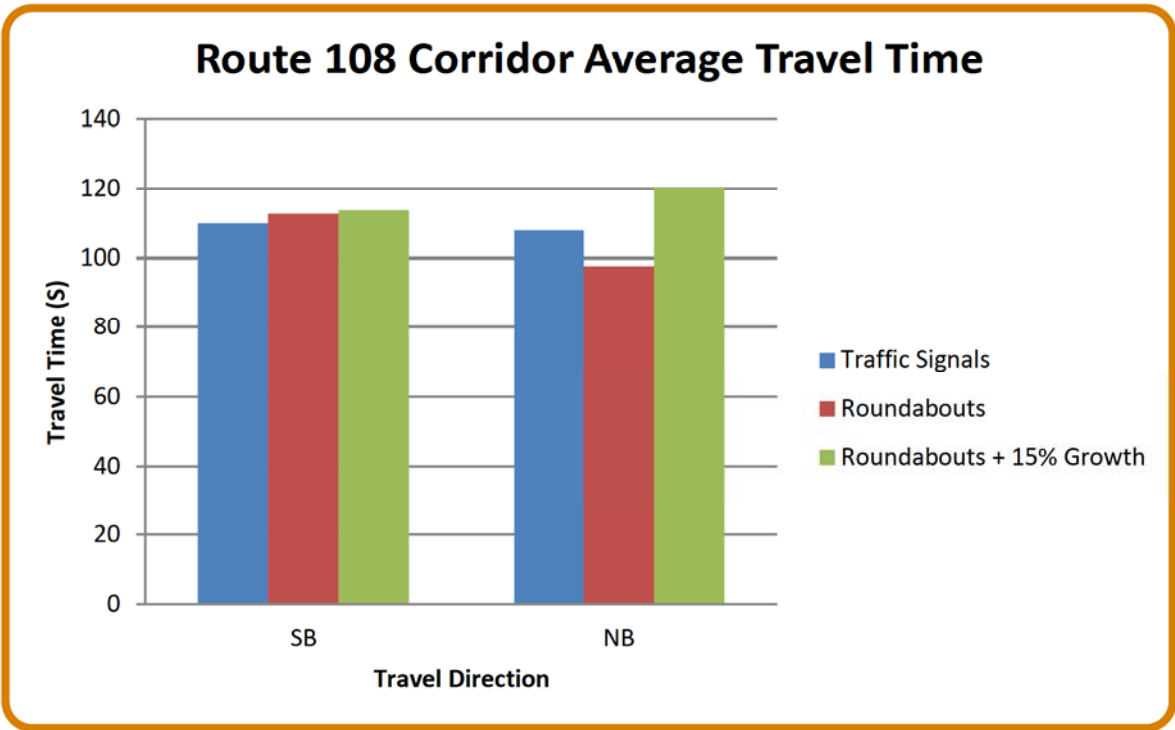


Figure 11: Average Corridor Travel Time



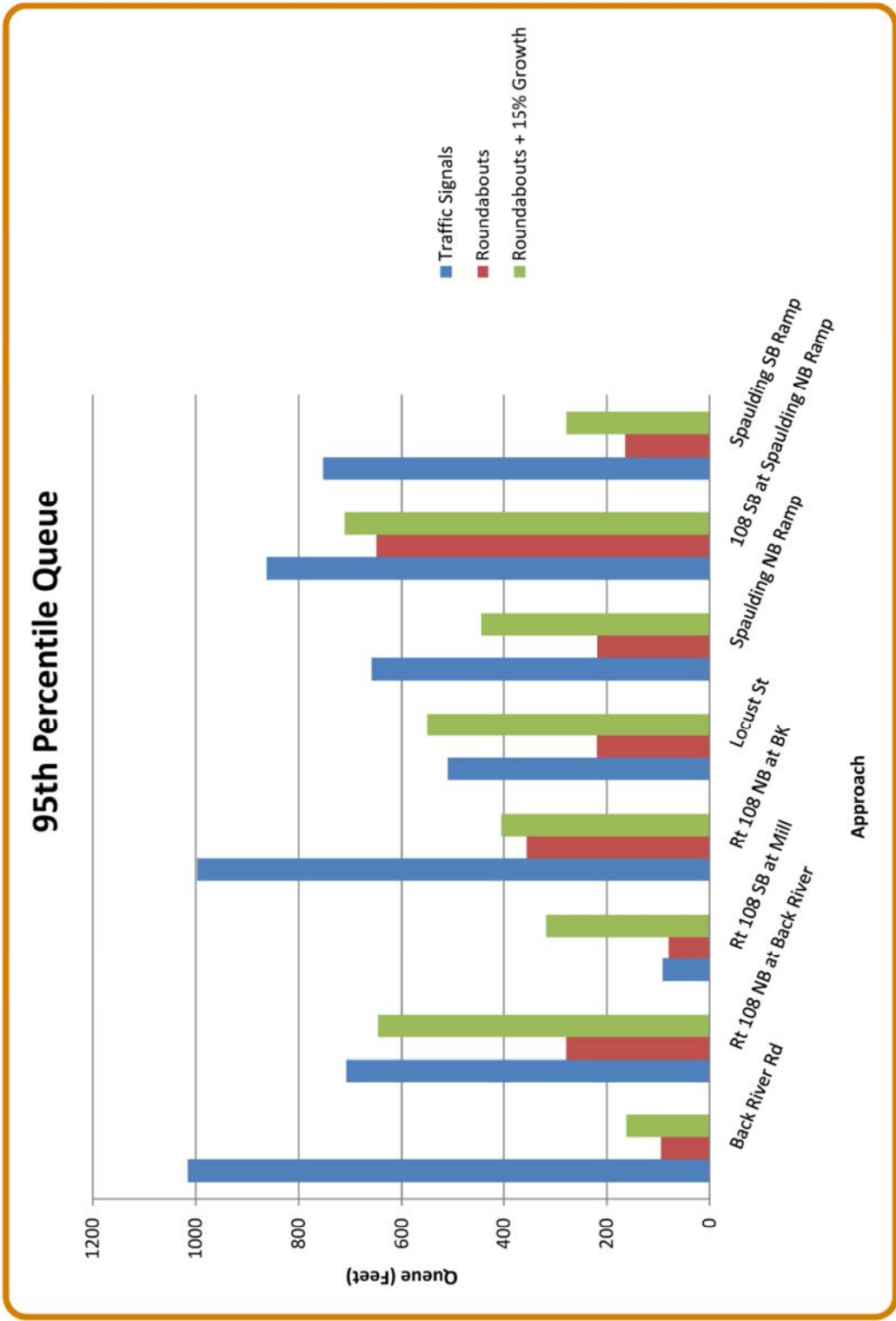


Figure 12: 95th Percentile Queues



Other Explored Improvements but Not Deemed Viable

The following improvements were explored during the course of the Study but the benefits did not outweigh the costs so they were dropped from further consideration.

Daily Drive Relocation

The property to the north of Daley Road is available for purchase, which raised possibility of relocating the Daily Drive intersection to the Back River Road intersection. Relocation would involve building roughly 1,250 feet of new road through this undeveloped parcel. The addition of a new approach at the Back River Intersection would complicate the phasing of the existing traffic signal and would reduce the total amount of green time available to Route 108 and the other existing approaches. Overall the relocation of Daily Drive would worsen the performance of the Back River Road and Mill Street intersections to less than acceptable levels based on our simulations. For these reasons, this idea was discarded and not carried further as part of the Study's recommendations.

Addition of Southbound Right Turn Lanes

We evaluated the possibility of adding additional right turn lanes at the intersections of Daley Drive and Alumni Drive on Route 108. Using Synchro 9 and SimTraffic the intersections were modeled both with and without right turn lanes to determine the effects of the additional lanes. In the existing condition the southbound right turn movements at both Alumni Drive and Daley Drive were determined to be Level of Service (LOS) A (2 seconds and 9 seconds of delay, respectively). As the additional lanes are for movements with already low delays there was only a small increase in performance when adding the two additional lanes. The slight improvement in performance at these two intersections would not be worth the costs of adding the additional lanes and thus this improvement was not explored further.

Convert the Locust and Exit 7N Ramps to a Roundabout

This alternative involved changing the intersection Route 108 and Locust Street/Exit 7N Ramps from signalized control to a roundabout. This modification would require Locust Street to be relocated opposite the current location of the highway off-ramp. This relocation would necessitate the acquiring of the property of the existing gas station. The Burger King driveway would become unsignalized and be modified to allow for right turn in and out movements only. In order to accommodate the projected future year traffic volumes, the Route 108 southbound approach would need to consist of two entry lanes, with one for thru/right turn movements and one for left turn movements. The remaining three approaches would be single lane entry with a right turn bypass lane. While this roundabout configuration will perform well at base design traffic volumes, the Route 108 approach's become oversaturated under future year design volumes. This could potentially be mitigated by the construction of a full two lane roundabout; however we did not explore this option as it would become cost prohibitive.

In order to construct this roundabout, in any size variation, the acquisition of the existing gas station in the northwest corner of the intersection would be required. Further right-of-way takings on other adjacent properties may also be required. This would present a significant increase in cost.

Congestion Mitigation Recommendations

Because of the high level of importance of Route 108 South Corridor in Dover, it is helpful to have a graduated plan of action that can be implemented as traffic volumes increase over time. The following recommendations are presented in this manner – short, medium and long-range in scope.

Short Range Improvements (0-2 years):

- SRI-1 Optimize Traffic Signal Coordination – Back River Road to Exit 7N (Already Completed)
- SRI-2 Upgrade Vehicular Detection at Locust Street and Spaulding Turnpike Exit 7 NB Ramps
- SRI-3 Install Traffic Signal Interconnect and Upgrade Detection and Controller at Stark Avenue
- SRI-4 Construct Left Turn Lane for Northbound Traffic at Daley Drive
- SRI-5 Implement TSP at all signalized Intersections along Route 108
- SRI-6 Permanent Vehicle Travel Time Recording

Medium Range Improvements (2-4 Years):

- MRI -1/MRI-2 Install a traffic signal or roundabout at the intersection of Alumni Drive and Route 108
- MRI-3 Add Lane and Traffic Signal Improvements at Locust Street and Exit 7N Ramps

Long Range Improvements (4+ Years):

- LRI-1 Convert the two intersections of Route 108 with Back River Road and Mill Street/Spaulding Turnpike Southbound Ramps from signalized to roundabout control.



DALEY DRIVE
SRI-4, LEFT TURN LANE



SCALE 1" = 60'



DALEY DRIVE

ROUTE 108

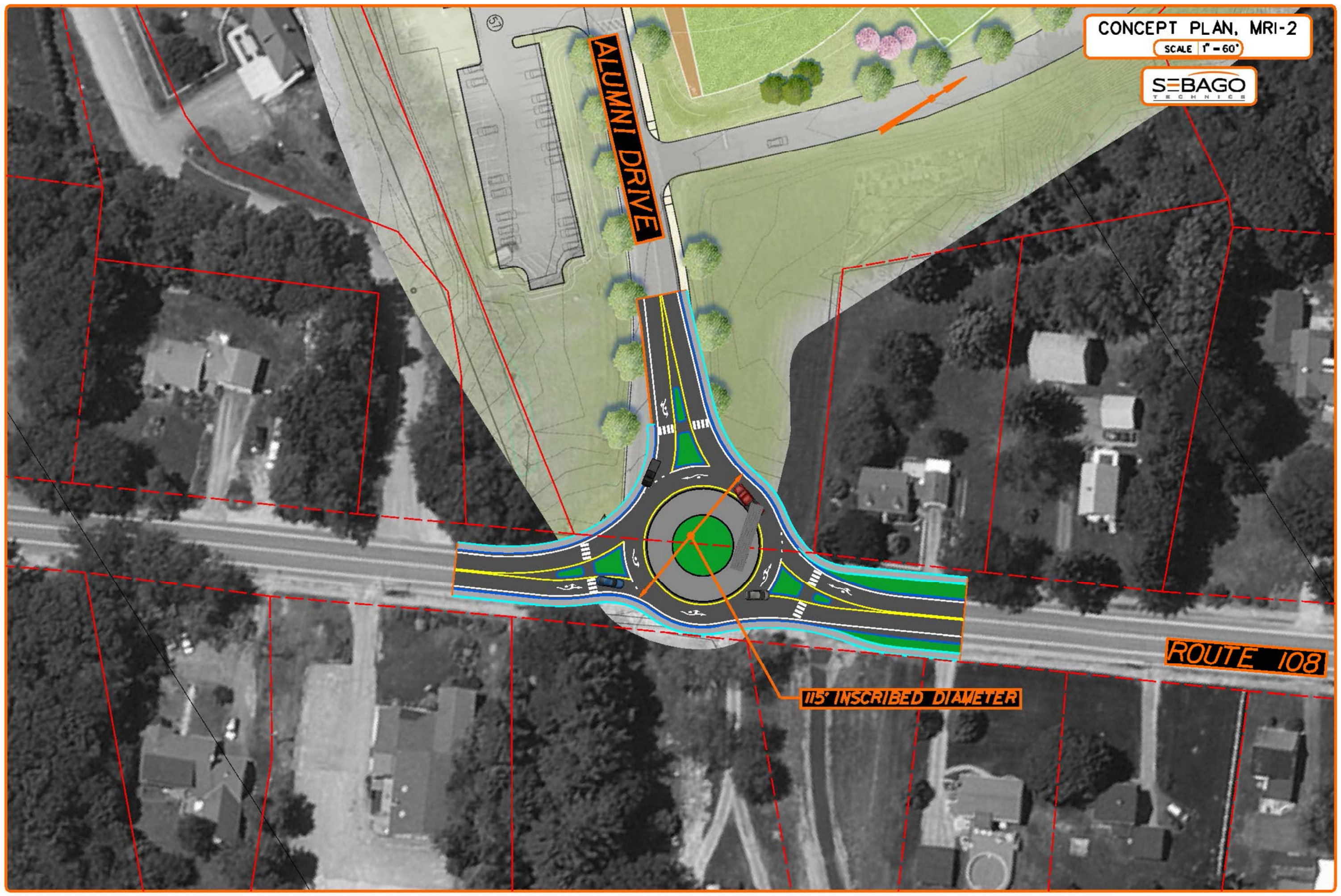
CONCEPT PLAN, MRI-2
SCALE 1" = 60'

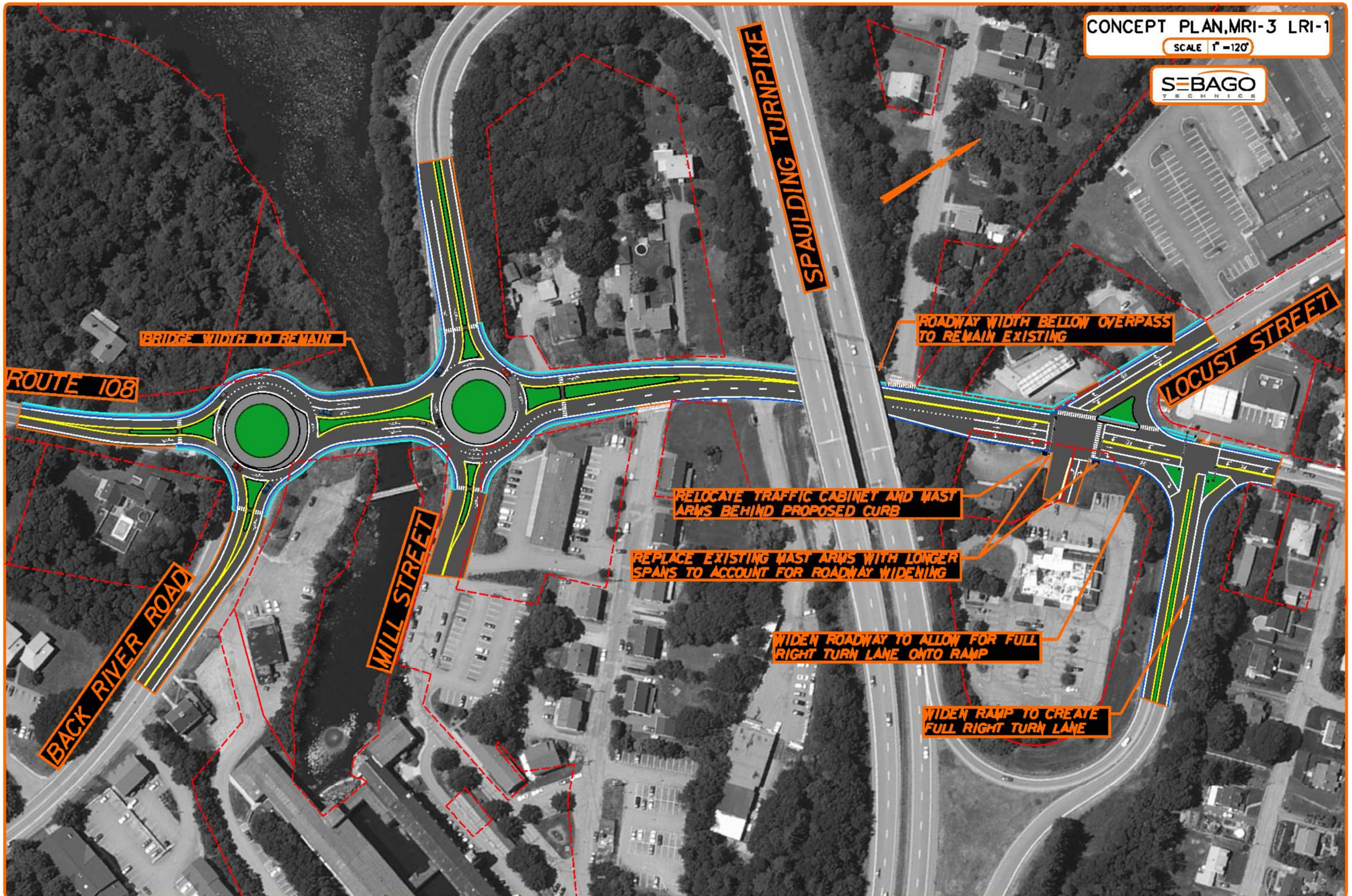


ALUMNI DRIVE

ROUTE 108

115' INSCRIBED DIAMETER





BRIDGE WIDTH TO REMAIN

ROUTE 108

SPAULDING TURNPIKE

ROADWAY WIDTH BELLOW OVERPASS TO REMAIN EXISTING

LOCUST STREET

RELOCATE TRAFFIC CABINET AND MAST ARMS BEHIND PROPOSED CURB

REPLACE EXISTING MAST ARMS WITH LONGER SPANS TO ACCOUNT FOR ROADWAY WIDENING

WIDEN ROADWAY TO ALLOW FOR FULL RIGHT TURN LANE ONTO RAMP

WIDEN RAMP TO CREATE FULL RIGHT TURN LANE

BACK RIVER ROAD

MILL STREET

Chapter 3 – Corridor Safety

Route 108 within the Study Area is locally recognized as a congested area with a relatively large amount of traffic at certain times of the day. These two traits tend to exacerbate potentially unsafe intersections leading to increases in the number of crashes causing property damage, loss of time, and potential injuries/loss of life.

To assess the safety of Route 108, accident data was compiled by the Dover Police Department for the most recent three years including 2013 to 2015. The Study Area for this review included Route 108 from Mast Road to Stark Avenue and Bellamy Road from Route 108 to Cataract Avenue. In total there were 140 accidents during the three-year time period with 41, 46, and 53 accidents happening in 2013, 2014, and 2015, respectively.

A detailed Interim Technical Memorandum was prepared on this topic May 20, 2016. An overview of these findings is presented herein. For more detail, the reader is encouraged to see the Interim Technical Memorandum, included in the Appendix.

Existing Conditions

The data compiled by the Dover Police Department was used to create a number of crash diagrams. These crash diagrams summarized the reported information into a visual format so that patterns and similarities between crashes could be easily identified.

Noticeable Patterns in Crash Occurrence

The crash diagrams illustrated a large number of accidents involving rear ends, 65 in total. Rear end accidents are not a surprise as Route 108 is a congested corridor that sees a large amount of traffic on a daily basis and it is not uncommon to have rear end accidents at signalized intersections. The majority of these accidents did happen during the AM and PM peak hours, which supports the supposition that congestion may be a major contributing factor to these accidents.

The second highest crash pattern (30 in total) was left turning vehicles failing to yield to oncoming traffic. This is most prevalent at the intersections of Route 108 and Exit 7N Ramp and at Route 108 and Back River Road, with 11 and 6 accidents occurring respectively.

The third highest crash pattern (9 in total) was failure to yield crashes involving right turns not yielding to oncoming traffic. The majority of these crashes occurred between the Back River Road and the Exit 7N Ramp intersections and most were located at the Shell gas station entrance onto Route 108.

The remainder of the reported crashes were sporadic throughout the Study Area. Clearly, the heaviest concentration of crashes is occurring on Route 108 between Back River Road and Stark Avenue.

Overall the majority of crashes in the Study Area resulted in property damage only. Just 20 of the 140 total accidents resulted in some form of personal injury. Most of the injury related accidents occurred on Route 108 at the intersections of Back River Road and Locust Street with 5 and 7 accidents, respectively. The remaining crashes were spread across the Study Area. The largest cause of injury related crashes was traffic failing to yield to oncoming traffic resulting in 7 of the 20 total accidents.

There were a total of 3 pedestrian and 1 bicycle crashes within the Study Area. The first crash occurred at 2:00 PM on Alumni Drive and involved two pedestrians crossing without a crosswalk in heavy traffic and resulted in injury. The next crash involved a single pedestrian crossing east to west at 7:00 AM in the crosswalk located at the intersection of Route 108 and Alumni Drive and a northbound vehicle, resulting in injury. The last pedestrian crash was located at Route 108 at Mill Street and resulted from a right turning vehicle from the Exit 7S ramp failing to yield to a crossing pedestrian with the walk symbol at 2:00 PM, the crash did not result an injury. The lone bicycle crash was caused by a northbound bicycle on Stark Avenue failing to yield to traffic turning from Route 108 onto East Watson Street which resulted in an injury.

Safety Improvement Actions

All safety related improvement actions are considered short range and should be programmed as soon as funds can be made available.

SRI-1 Traffic Signal Coordination within the Corridor (Completed)

New coordination plans for the four traffic signals between the intersections of Back River Road and the Exit 7N Ramp were implemented in the spring of 2016. With these coordination plans traffic has become platooned throughout the corridor, leading to less overall stops and more predictable traffic patterns. The addition of coordination should also result in the overall reduction of rear end crashes and other crashes as congestion lessens. *The Federal Highway Administration's 2007 Desktop Reference for Crash Reduction Factors*⁽¹⁾ suggests a reduction in all crashes of 15-16% will result when signal coordination is provided.

SRI-7 Install a Flashing Yellow Signal Indication at the Exit 7N Ramp Intersection

In early 2015, a flashing yellow arrow indication was installed for the left turn lane on Route 108 at the Back River Road intersection. This indication better conveys when the left turn movement is permissive when compared to a traditional green ball. There was not a single crash related to

failure to yield in 2015 after the flashing yellow arrow was installed. Furthermore, it is interesting to note that 4 of the 6 of these types of crashes prior to 2015 were attributed to the permissive left onto Back River Road after 7 PM, or during off-peak times. This would suggest that the flashing yellow arrow indication is a good countermeasure against failure to yield crashes in off-peak periods.

The crash history at the intersection of Route 108 and the Exit 7N Ramp has similar patterns as the crashes at Back River Road. The majority of crashes were related to the permissive left turn onto the Exit 7N Ramp. As was the case at Back River Road, most of these occurred (7 of 8) after the PM peak hour. Given the positive results experienced at Back River Road with the flashing yellow arrow, this treatment should be considered for this intersection as well.

SRI-8 Install No Right Turn on Red Dynamic Blank Out Signs at Exit 7S Ramps

A potential countermeasure to future pedestrian crashes may be the addition of a no right turn on red dynamic blank out sign at the intersection of Route 108 and Exit 7S Ramp for the ramp approach. These signs would inform drivers that the pedestrian phase is active and a right turn on red is not allowed while still allowing a right turn on red when the pedestrian phase is inactive. A similar sign could also be added for the right turn onto the Exit 7S ramp from Route 108 southbound which may have prevented the pedestrian crash that occurred at this location.

STI-9 Monitor and Implement Access Management Opportunities within the Corridor

Access management for Route 108 should be considered to further reduce the number of accidents. Both gas stations' entrances onto Route 108 near Locust Street have a concentration of crashes related to turning traffic. There should be a significant reduction in crashes if the access was limited from Route 108 and traffic was moved to the Locust Street entrances instead.

Corridor Safety Recommendations

In summary our recommendations regarding the safety of Route 108 in the Study Area are as follows:

- SRI-7 Install a Flashing Yellow Signal Indication at the Exit 7N Ramp Intersection
- SRI-8 Install No Right Turn on Red Dynamic Blank Out Signs at Exit 7S Ramps
- STI -9 Monitor and Implement Access Management Opportunities within the Corridor



Chapter 4 – Bike and Pedestrian Facilities

In conjunction with the traffic analysis and roadway safety recommendations, the Sebago/Alta Team assessed pedestrian and bicycle facilities along the Route 108 and Bellamy Road corridors. Particular attention was paid to infrastructure that enabled walking and bicycling by students and staff to Dover Middle School and Dover High School. Results of the Team’s analysis led to six general recommendations and 22 specific project recommendations to improve access, connectivity and safety.

Existing Conditions

The roadway context that surrounds the Dover Middle School and Dover High School offers a difficult environment for students and staff wishing to walk or bike to school. While the linear corridors themselves—Route 108 and Bellamy Road—offer modest facilities for pedestrians and bicyclists, the lack of a safe and comfortable connection to the neighborhoods to the north and east of the Spaulding Turnpike is the biggest challenge.

Route 108/Durham Road Corridor

The Route 108/Durham Road corridor is heavily travelled and experiences significant congestion during peak periods. This is especially the case during the school year as a significant percentage of morning and mid-afternoon traffic is related to student drop-off and pick-up at both schools. As such, heavy turn movements onto and out of Alumni Drive and Daley Drive can create conflicts with those walking or bicycling. Sidewalks exist along one side of the Route 108 (not ideal for a major arterial) while only a few crosswalks connect the two sides of the roadway. Also, crosswalks parallel with Route 108 are lacking at intersections with cross streets, except at signalized intersections.

The most-significant challenge to walking or bicycling is the multiple intersections formed by the Exit 7 on and off ramps to and from the Spaulding Turnpike. These intersections are multi-lane, carry large volumes of turning traffic, have large turning radii and generally permit right turning on red. These characteristics increase the likelihood of conflicts with walkers and bicyclists, especially pre-teens and teens who do not have the same level of experience as adults and can be more-easily distracted by friends and smart phones. Beyond the Exit 7 intersections, other challenges to walking and bicycling include the lack of crosswalks on Central Avenue and the intersection of Jenness Street with both Central and Stark that are awkward for walkers and bicyclists. In aggregate, these features discourage walking and bicycling from the eastern neighborhoods to the schools.



Bellamy Road Corridor

The Bellamy Road corridor is a somewhat more pleasant road to walk or bicycle for students on their way to school because of lower traffic volumes and speeds. There is also a continuous sidewalk on the side most proximate to the school campus, minimizing the need for crossing Bellamy except for those living along Lisa Beth Drive. There is also a wide portion of the sidewalk and a raised crosswalk/speed table near the campus that facilitates safe walking and bicycling.

Bellamy Road is most challenging at its end points where a lack of crosswalks and the wide intersection with Route 155 make for a difficult crossing without a motor vehicle. There are also narrow shoulders which discourage bicycling on the road and all-but-require students to ride on the sidewalk. For students wanting to bicycle to either school from the neighborhood between Silver Street, Central Avenue and the Spaulding Turnpike, Cataract Avenue provides a less-direct, but far more comfortable route than Rutland Street and Route 108. Additional signage and perhaps traffic calming could make Cataract an even better connection for bicyclists wanting to not only access the neighborhoods east of the Spaulding, but also downtown.

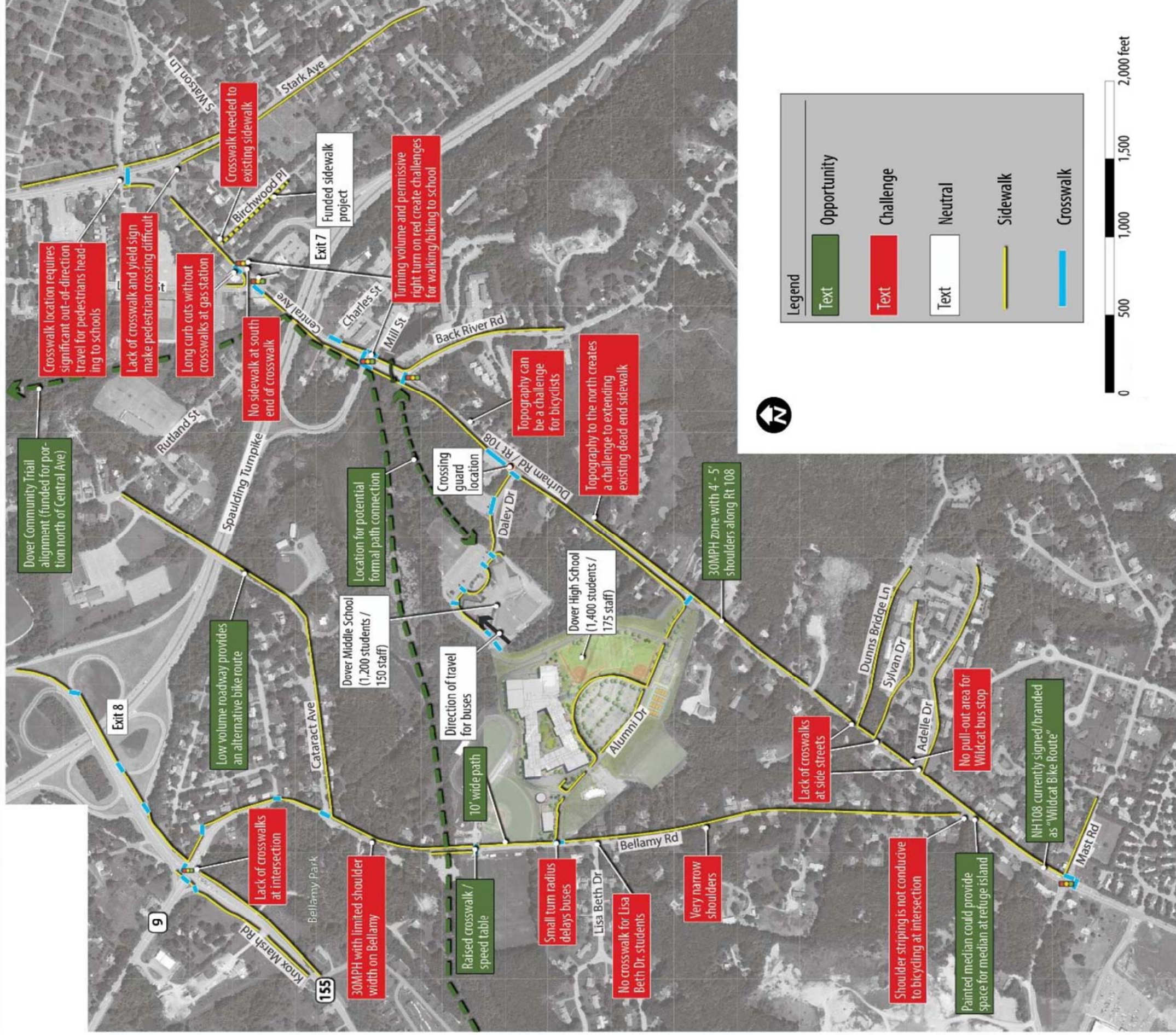
Access to Middle and High School Buildings

Access to the Middle School and High School for walkers and bicyclists is by way of Alumni Drive or Daley Drive. Sidewalks and crosswalks along the latter are well defined and lead directly to the front door of the Middle School from Route 108. Some use an informal footpath through the wooded area east of the school in order to cut off an angle and avoid the busy traffic along 108 between Daley Drive and Back River Road. The 8'-10' wide paved path along Alumni Drive provides access to Dover High School from either Route 108 or Bellamy Road. From Bellamy, some students walk or bike along the path that runs between the baseball diamond and the football field. According to Principal Peter Driscoll, fewer than ten students ride bikes to school during good weather.

In the near future, Dover High School will be rebuilt with construction anticipated to be completed by the fall of 2018. The site plan for the new High School maintains Alumni Drive as the primary access route with a service drive/fire lane that connects Alumni Drive to the Middle School. A 6'-6" sidewalk runs the length of Alumni Drive and bends around the parking lot in the center of the site in order to provide access to the primary entry plaza. The sidewalk includes no grassy or tree-lined buffer to adjacent traffic and is significantly narrower than the current condition. While 6'-6" accommodates ADA, it lacks space for pedestrians and bicyclists to comfortably share, especially during the waves of students that arrive and depart from school within a short period of time. Additionally, provisions should be made to accommodate the desire lines of high school students who will take the shortest route to the main entry whether a paved path is provided or not. Finally, according the high school's landscape architects, only six standard bike racks will be provided. At the standard two bikes per rack, the 12 parking spaces

for nearly 1,600 students and staff may accommodate current demand but does not consider potential increases in bicycling over the coming years and decades.



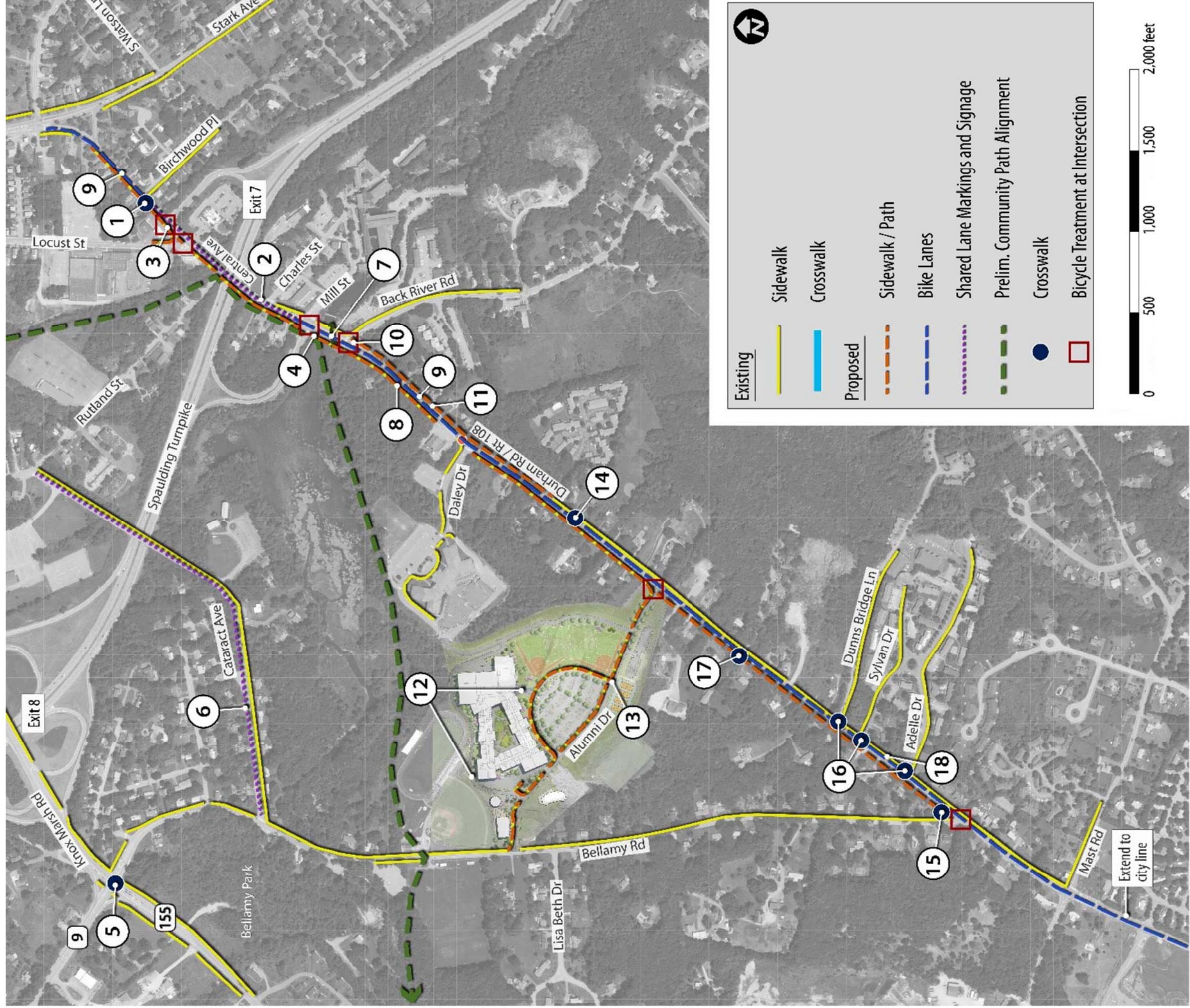


Recommendations

After the existing conditions assessment and with feedback from the City of Dover, the Team developed 18 Complete Streets recommendations to improve access, connectivity and safety for pedestrians and bicyclists. The City of Dover is no stranger to Complete Streets design, as the recent reconstruction of Silver Street near downtown Dover includes improvements for motorists, bus riders, walkers and bicyclists.

Numbered recommendations can be found on the summary map and the summary matrix on the following pages. The project recommendations include a diverse mix of facility types, including new/improved crosswalks, the infill of sidewalk gaps, median islands at existing crosswalks, bicycle lanes, shared lane markings, path improvements, traffic calming elements and improved bus stops. Within the matrix, each recommendation is evaluated based on Complete Streets criteria in order to understand prioritization and phasing.





Pedestrian/Bicycle Project Prioritization Matrix*

Project	Project Type	Project Description & Location	Weighting:										Total (max of 39)	Project has likely public support	Range of Cost (max: \$\$\$)	Timeline (short, medium or long term)
			3	3	3	3	2	2	2	2	1	1				
			Improves pedestrian-bicycle safety	Provides direct access to at least one school	Completes the street	Ease of implementation	Impact on traffic circulation		Estimated level of latent demand		Provides direct access to at least one school	Impact on traffic circulation		Estimated level of latent demand		Improves pedestrian-bicycle safety

General Recommendations

G1	Sidewalks	Repair/repave sidewalks in the direct vicinity of all schools which are damaged or rutted and may create a safety hazard for walkers and children on bicycle															
G2	Crosswalks	Repaint all crosswalks in the zebra-stripe or continental style using a non-slip Epoxy paint. Include school crosswalk warning assembly (includes signs and yellow-green, moveable crossing bollards) across all crosswalks across arterial and collector streets.															
G3	Warning beacons	Replace the existing flashing warning beacons along Route 108 with new equipment															
G4	Future planning	Consider a Citywide pedestrian and bicycle master plan in the near future in order to coordinate recommendations here with others throughout the															

Project Recommendations

1	Crosswalk	As a complement to the new sidewalk on Birchwood Place, add a new crosswalk and median island across Central Avenue just west of Birchwood where a painted median current sits	3	2	2	3	3	3	2	2	3	2	2	3	2	32	X	\$\$	medium
2	Shared lane markings	In the bike lane gap between the exit 7 southbound ramp and Birchwood Place (per #11 below), install shared lane markings and signage for bicycle continuity	1	2	2	2	3	3	2	2	3	3	2	2	3	25		\$	short
3	Crosswalk	Paint a crosswalk at the wide curb cut to the Dover Travel Stop gas station (to be accommodated with redevelopment of the parcel)	1	2	2	1	3	3	2	2	3	3	2	2	3	23		\$	short
4	Turning Radii	Reduce curb radii at the southbound Exit 7 ramp at Central Ave/Route 108 in order to reduce the length of the crosswalk and/or prohibit right turns on red	3	3	3	2	2	2	2	3	3	2	2	3	3	35	X	\$\$	med
5	Crosswalk	Improve crosswalk geometry and connectivity at the Knox Marsh Road/Route 155 intersection with Bellamy Road by adding new pedestrian signal equipment	3	1	2	3	2	1	1	2	3	2	1	1	1	26		\$\$\$	long
6	Bike Route	Shared lane markings, bike-friendly catch basins, signage and traffic calming elements along Cataract Avenue from Bellamy to Rutland to improve it as a bicycle route for students; consider similar treatment on Rutland from Silver to Central as well	2	2	2	2	3	3	3	2	3	3	2	3	2	30	X	\$\$	short
7	Grade Separated Crossing	Explore opportunity to create a path beneath Rt 108 on the south side of the Bellamy River at the intersection of Route 108 and Back River Rd. to facilitate pedestrian travel to area convenience stores	3	2	1	1	3	2	1	1	3	1	2	2	2	25		\$\$\$\$	long
8	Sidewalk	To accommodate the number of students walking to/from the middle and high schools, widen sidewalk on north side of Durham Road/Route 108 from Alumni Drive to Stark Avenue	1	3	3	2	3	1	3	3	1	3	2	3	29		\$\$\$	med	
9	Bike lane	Current 4'-5" wide shoulder along Durham Road/Route 108 and sections of Central Avenue should be designated as a bike lane with 6" lane lines (rather than 4"), stencils, bike-friendly catch basins and additional signage.	3	2	3	3	3	3	3	3	3	3	3	3	36	X	\$\$	short	
10	Intersection treatment	At intersection of Durham Rd/Back River Rd, consider green pavement markings and other special design features to enhance bicycle safety in conflict areas with motor vehicles	3	2	3	2	3	3	2	3	3	2	3	2	33	X	\$\$	short	
11	Sidewalk	Extend Durham Road/Route 108 east sidewalk to Back River Road and include crosswalk to connect to existing sidewalk on the northeast side	2	1	2	3	3	3	1	1	3	1	1	1	24		\$\$\$	long	
12	Bike Parking	The planned number of bike racks (6) for the Dover High School is inadequate and should be increased to 20 minimum, with half protected from the elements	1	3	2	2	3	3	2	2	3	3	2	2	28		\$\$	short	
13	Sidewalk	Planned 6'-6" sidewalk along Alumni Drive from Bellamy to Durham Road/Route 108 is inadequate and should be widened to 10' (or 8' with a grass buffer)	2	3	3	2	3	3	2	3	3	3	3	3	34	X	\$\$	short	
14	Crosswalk	New crosswalk across Durham Road/Route 108 where the east sidewalk deadends at the driveway entry to The Garrison townhomes	2	2	2	2	3	3	2	2	3	3	2	2	28		\$	short	
15	Crosswalk	New crosswalk and median island across Durham Road/Route 108 at the north leg of the Bellamy Road intersection	3	2	2	3	2	2	3	2	3	2	2	2	31	X	\$\$	med	
16	Crosswalk	New crosswalks along the east side of Durham Road/Route 108 at Adelle Drive, Sylvan Drive and Dunns Bridge Lane	2	2	2	3	3	3	2	2	3	3	2	2	30	X	\$	short	
17	Sidewalk	New sidewalk along the west side of Durham Road/Route 108 from Alumni Drive to Bellamy Road	2	2	3	3	3	3	3	3	1	1	1	29		\$\$\$	med		
18	Bus Stop	Create additional space for Wildcat Bus to fully pull out of roadway into shoulder on Rte 108 in between Adelle Dr & Sylvan Dr	3	2	2	3	3	3	2	2	3	1	1	30	X	\$\$\$	med		

* - the project evaluation based on the weighted criteria are meant to be a guideline for consideration by the City of Dover. It is not intended to be an inflexible implementation plan.

A selection of prioritized project recommendations are described and illustrated in additional detail below. Note that recommendations are preliminary in nature and additional traffic analysis and more-detailed design will be needed for some projects before implementation.

Project 1: Improved Crosswalk at Birchwood Place

With the City’s recent completion of the sidewalk on Birchwood Place, it creates the need for a safe crossing to the existing sidewalk on the north side of Central Avenue. Adding a new crosswalk across Birchwood and a short section of sidewalk provides the opportunity for the Central Avenue crossing to utilize the painted median space. In its place, a median island can accompany a new hi-visibility crosswalk and north-side curb cut to complete the connection.

Project #1: Central Ave at Birchwood Place

Existing Conditions



Proposed

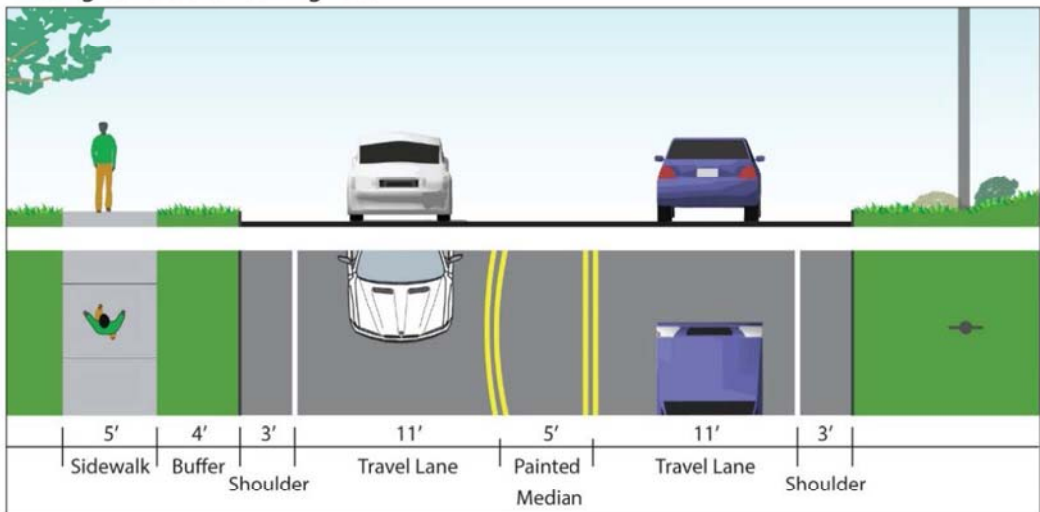


Project #1: Central Ave at Birchwood Place

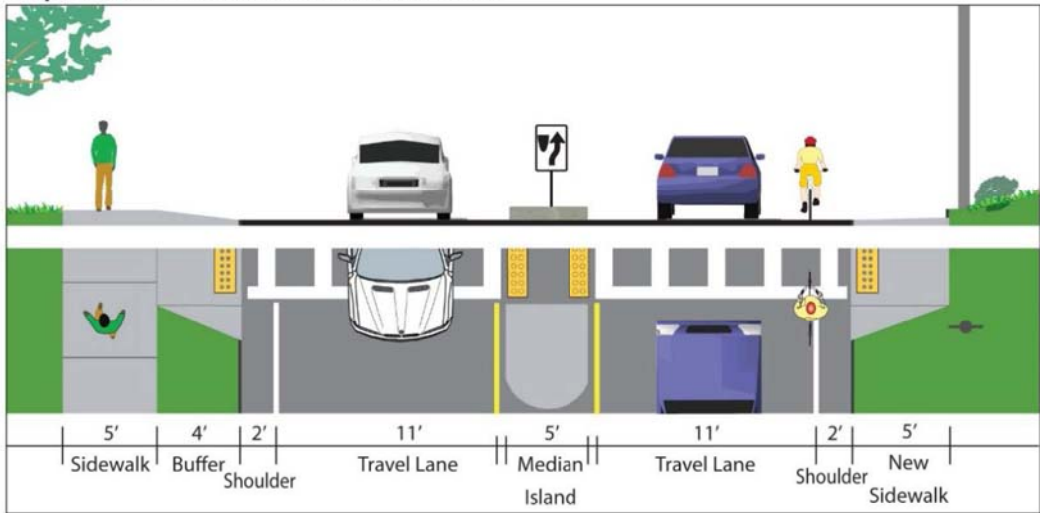


Project #1: Central Ave at Birchwood Place

Existing Conditions Looking East



Proposed New Crosswalk and Median Island



Project 9 and 10: Route 108 Bike Lanes and Improved Bus Stop

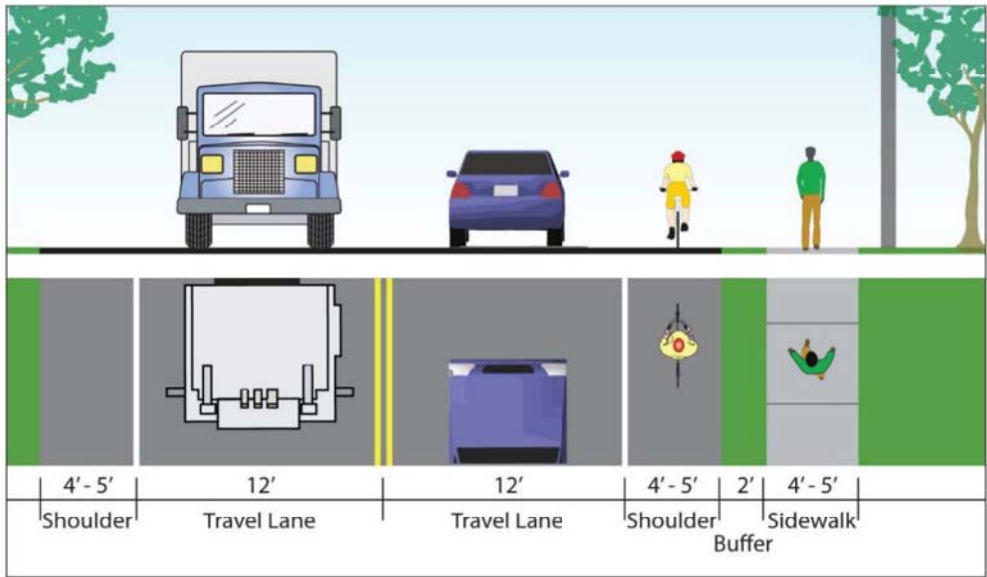
Currently, Wildcat Transit buses between Dover and Durham run along Route 108 with infrequent stops including one just north of the intersection with Bellamy Road. In addition, Route 108 currently features 4'-5'-wide shoulders that are branded as the Wildcat Bike Route. In order to enhance both bicycle travel along the corridor and transit use, the Team's recommendation is to create a continuous 5'-wide (minimum) bicycle lane from the Exit 7 southbound ramp to the Durham Town Line. This would maintain the current branding, but add bike lane stencils and signage to clarify its exclusive use by bicyclists. In addition, the widening of



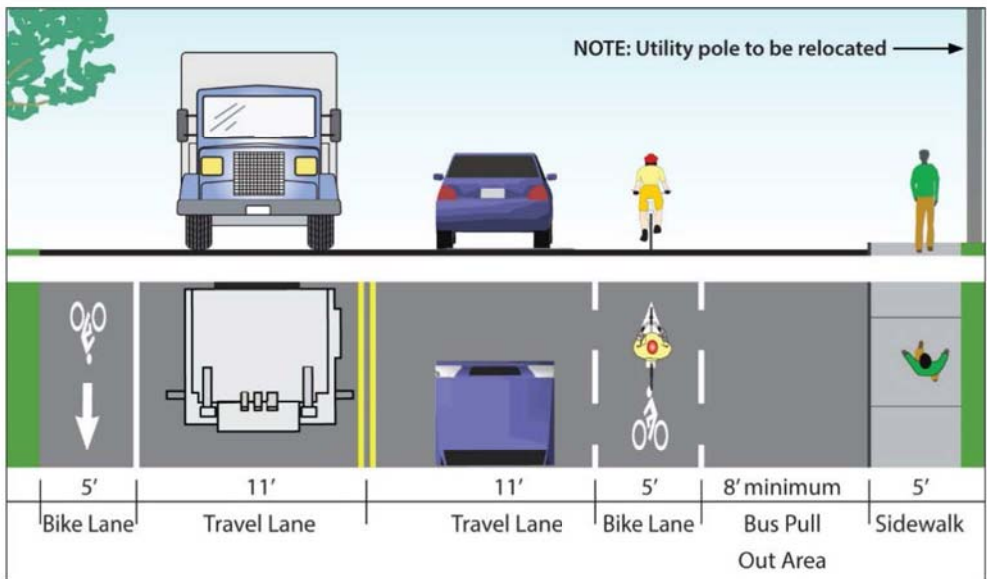
the roadway shoulder at bus stop locations (recommendation illustrates a concept plan for one bus stop only) can provide space for the Wildcat bus to pull out of both the traffic lane and bike lane. Improvements at the one bus stop illustrated in the graphics below should also consider a bus shelter and bench, if space allows in the right of way, or within an adjacent easement.

Project #9 and #10: Rt. 108 between Adelle Drive and Sylvan Place

Existing Conditions



Proposed Wildcat Bus Pullout Area



Project #9 and #10: Rt. 108 between Adelle Drive and Sylvan Place



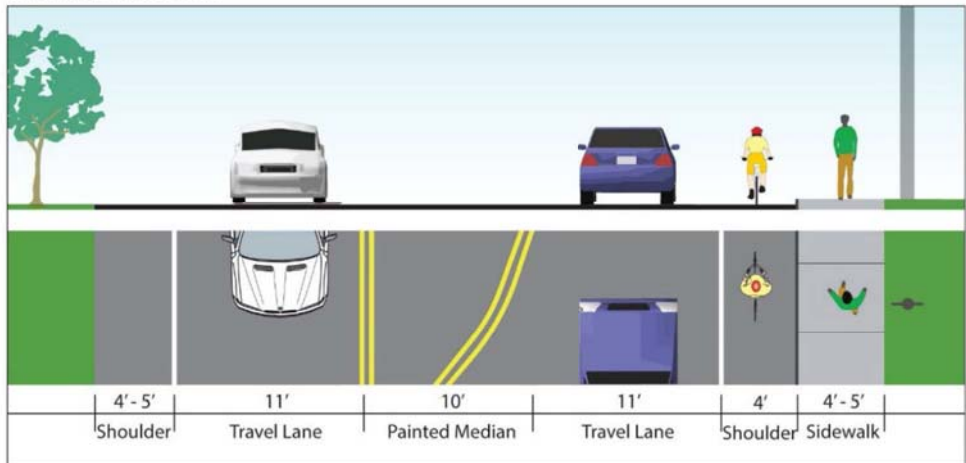
Project 15 and 17: Route 108 at Bellamy Crosswalk and New West-side Sidewalk

Currently, continuous sidewalks exist on the east (northbound) side of Durham Road/Route 108, but only on the west side between Stark Avenue and Alumni Drive. A high priority project recommendation is to extend the west side sidewalk from Alumni Drive to Bellamy Road. That would provide a walking facility for school kids who live on that section of Route 108 and preclude the need to either walk in a dirt shoulder and/or cross Route 108 twice to access either the High School or Middle School. In order to better-integrate the new west sidewalk with the east sidewalk on Route 108, a new crossing should be included at the Bellamy Road intersection. At the north leg of the intersection, a painted median provides the ideal opportunity to include a median island in the center of Route 108, providing a safe refuge for pedestrians between the

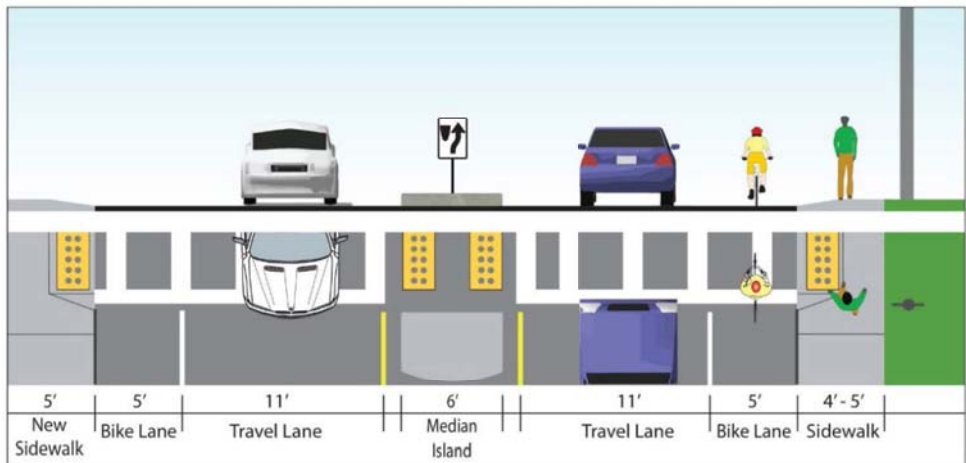
Project #9, #15 and #17: Rt. 108 at Bellamy Road

two directions of traffic flow.

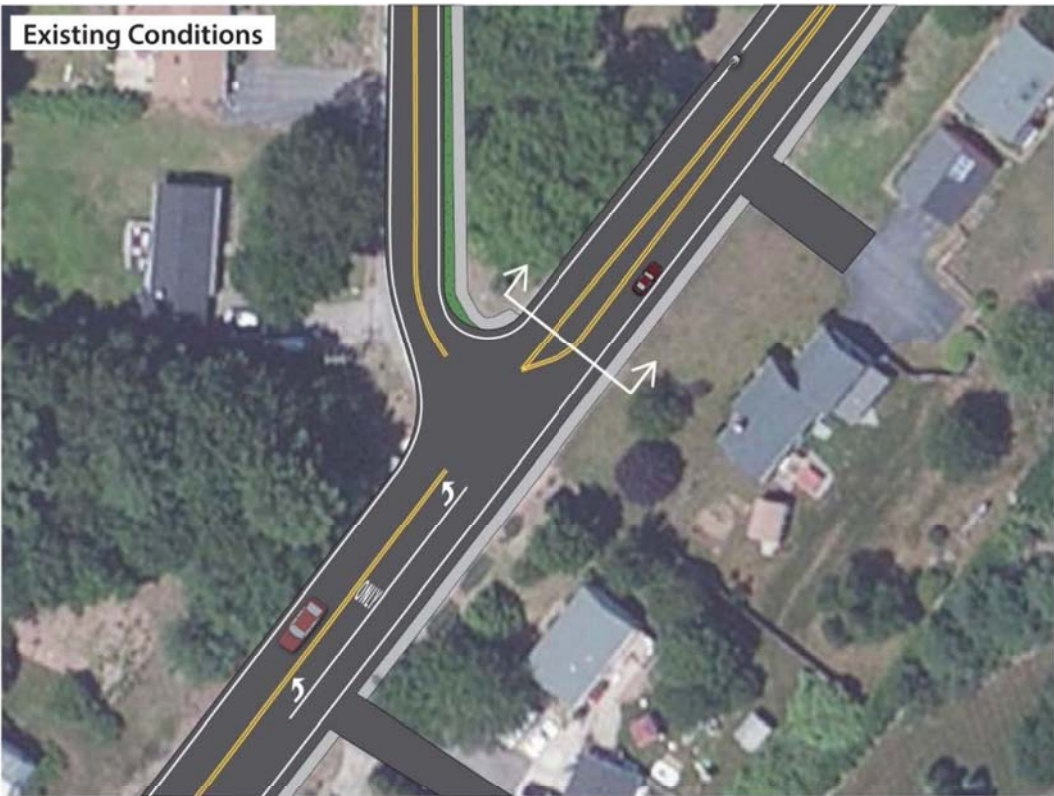
Existing Conditions



Proposed New Median Island and Crosswalk



Project #9, #15 and #17: Rt. 108 at Bellamy Road



Chapter 5 – Middle and High School Coordination

Evaluation of School Release Times

SRI-10 Differentiate School Release Times by an Additional 15 Minutes to Eliminate Current Overlap

It was found that the Middle and High Schools already have a staggered release time of roughly 15 minutes with release times of 2:15 PM and 2:30 PM for the Middle and High Schools, respectively. The traffic counts gathered for Route 108 show that the traffic volumes on Route 108 just south of the High School are relatively stable throughout the hour, thus the peak of the schools seems to be the cause of the congestion experienced during this time period.

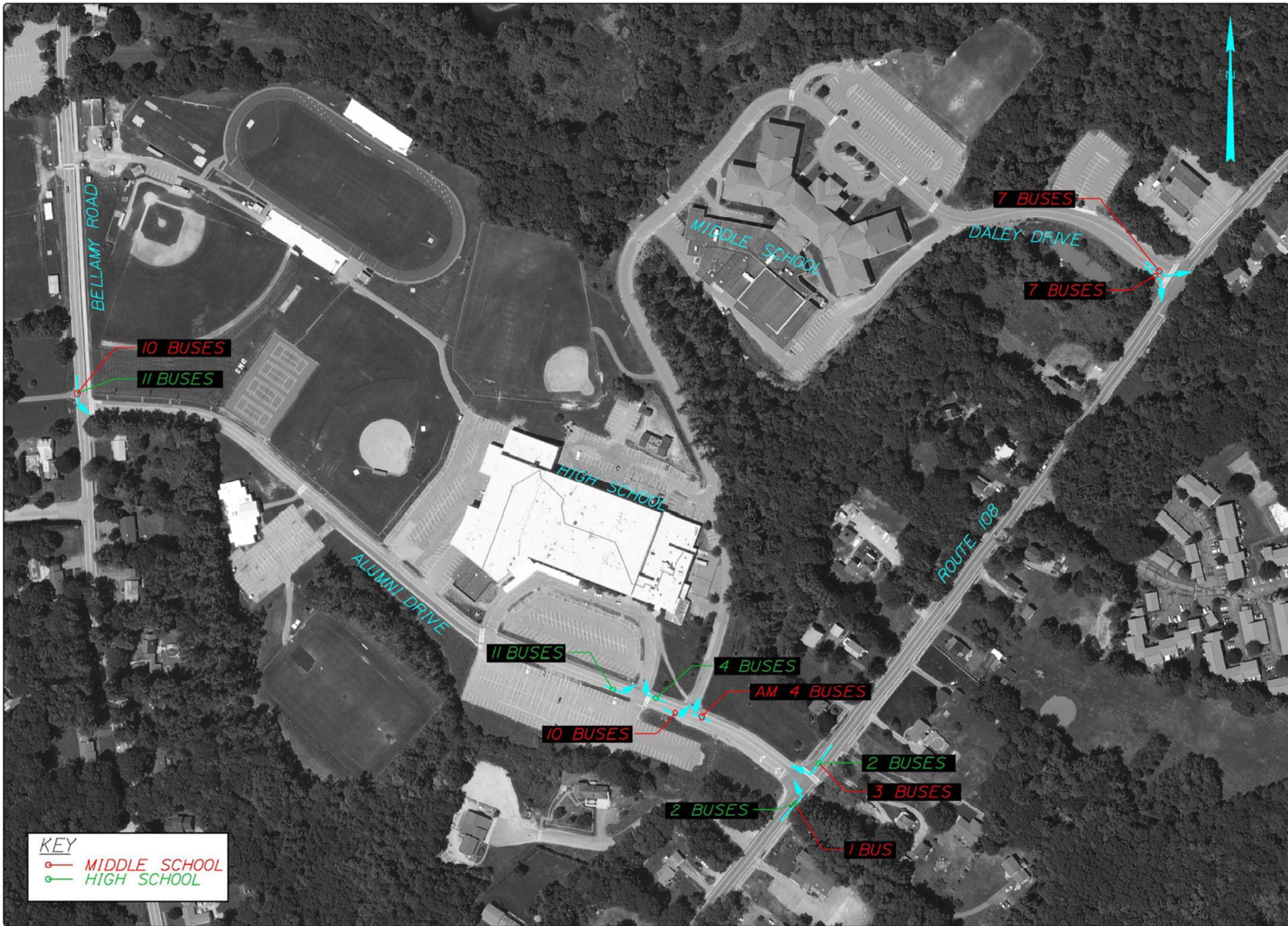
The traffic counts also show that the peak in traffic on Daley Drive due to the release in the Middle School on average took two 15 minute periods or 30 minutes in total. As the releases for the two schools are only staggered by 15 minutes there appears to be some overlap between the peaks of the two schools. The traffic data collected would suggest that the difference in release times be increased to 30 minutes if possible so that the peaks of the two schools do not overlap.

Bus Enter and Exiting Patterns

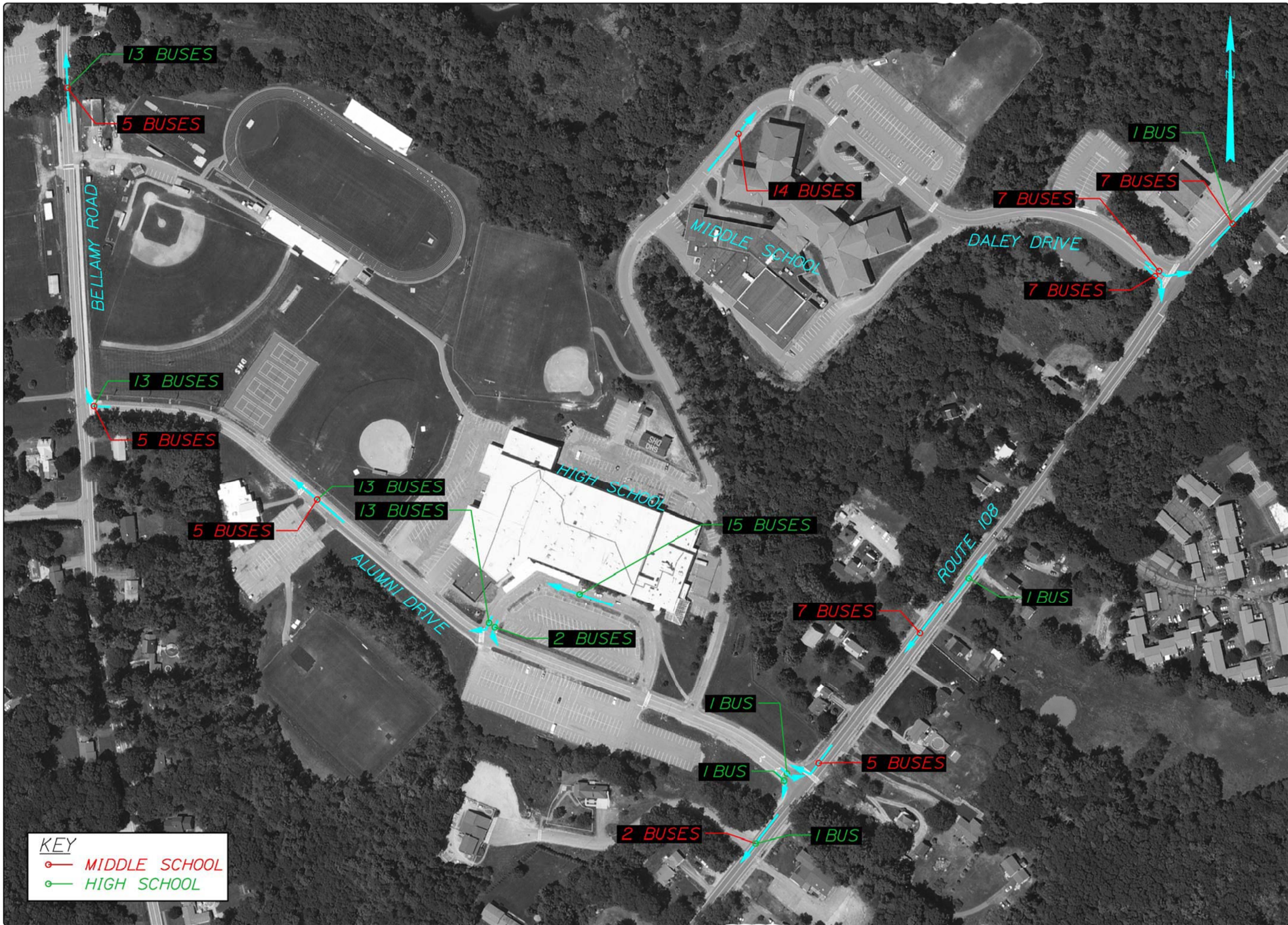
Contact was made with “First Student” who manages the busses for the Dover Schools. They explained their bus schedule and the most common routes of the busses. The AM and PM school bus circulation on an average day are shown on the following pages.

As can be seen in the AM the majority of busses arrive via Bellamy Road for both the Middle and High Schools. All the busses for the Middle School enter Alumni Drive and use the connector road between Alumni Drive and Daley Drive before dropping off students. In the PM the 14 Middle School busses are split between northbound and southbound on Route 108. Out of the 7 busses that head southbound, 5 of them turn onto Alumni Drive to turn northbound on Bellamy Road.

The busses currently utilize Bellamy Road more than Route 108, however in the PM the 7 busses that use Route 108 in order to get to Alumni Drive are adding additional heavy vehicle traffic to Route 108. With some adjustments in internal circulation within the school campus itself, the busses could use the connector road to travel to Alumni Drive rather than using Route 108. This rerouting is consistent with what was discussed in Chapter 2, Congestion Mitigation on Route 108, with regard to altering the access provisions at Daley Drive and Alumni Drive.



KEY
 — MIDDLE SCHOOL
 — HIGH SCHOOL



Bellamy Road at Knox Marsh Road Intersection

SRI-11 Retime Signal At Bellamy Road and Knox Marsh Road Intersection to Better Accommodate School Traffic

Bellamy Road is a heavily used access for the two schools, as has been mentioned previously. As a result, traffic often backs up at the Knox Marsh Road intersection in the afternoon during school release times. This existing signal could be retimed to better accommodate the increase in traffic coming from the school. Since this traffic occurs at a similar time each day, the signal can be programmed with a time of day schedule to reflect this increase in traffic.

Internal Circulation

Currently the two schools are connected by a narrow paved road linking Daley Drive with Alumni Drive. This road serves as the only internal connection between the two campuses and operates as a one-way road from Alumni Drive to Daley Drive.

The Middle School has a paved road that loops around the school and provides access to a small parking lot in the south corner. However, the present turns in this road's alignment are too sharp for larger vehicles.

MRI-4 School Circulation Improvements

The extra capacity as a result of proposed roundabout at the intersection of Route 108 at Alumni allows for the opportunity to improve the traffic circulation within the school campus. A concept layout plan is included at the end of this section. The following Figure shows the proposed circulation improvements in relation to the other improvements at the Route 108 intersections. The change in circulation would start at the intersection of Route 108 and Daley Drive by converting Daley Drive to one way and an entrance only. Once on Daley Drive, the busses would merge into the left lane and continue to the rear of the school while the remaining traffic would stay to the right. In front of the school, traffic can split into those using the parking lot and other traffic continuing to the drop off zone. The pavement on the south side of the school would be widened to allow for a new drop off zone for the busses and the old drop off zone to the west of the building would be utilized by parents. Both busses and other traffic would utilize the existing connector road to get to Alumni Drive.

The proposed circulation would both improve safety and reduce delays at multiple locations around the school campus. Converting the Daley Drive approach to an entrance only reduces the number of conflicting traffic movements at this intersection and removes the need for a crossing guard. Separating the busses from other traffic reduces the delay for busses and removes the existing conflict point in front of the school. With the new configuration the student drop off zone is not located in the parking lot. Overall flow to and from the parking lot

will be greatly improved. The proposed drop off zone allows for multiple cars to be stopped at one time and also allows traffic to pass by stopped cars. Once traffic arrives at Alumni Drive they will have the option of heading towards Bellamy Road or to get back on Route 108 utilizing the proposed roundabout.



SCHOOL CAMPUS IMPROVEMENTS

SEBAGO TECHNICS

SCALE 1" = 120'

MIDDLE SCHOOL CIRCULATION, MRI-4

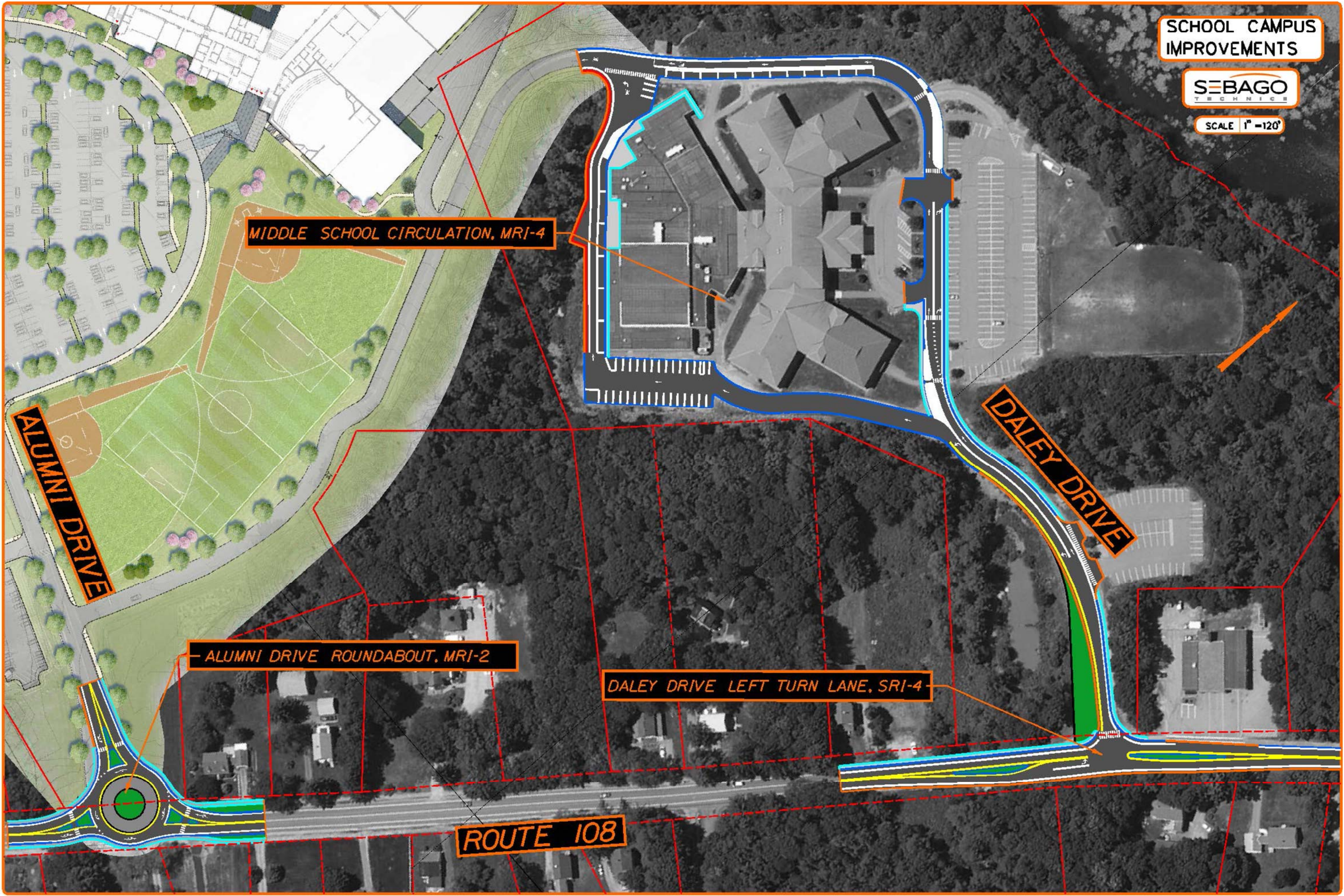
ALUMNI DRIVE

ALUMNI DRIVE ROUNDABOUT, MRI-2

DALEY DRIVE LEFT TURN LANE, SRI-4

DALEY DRIVE

ROUTE 108



Middle and High School Campus Recommendations

Once the School Department and City are in sync with the long-range plan for the Route 108 Corridor the matter of ingress and egress from the Middle School and the internal circulation between the two campuses can be formalized using the ideas presented above.

In summary our recommendations for improvements to the Middle and High School are as follows. The recommendations are categorized as either short or medium range improvements:

Short Range Improvements (0-2 Years)

- SRI-10 - Differentiate School Release Times by 15 Minutes to Eliminate Current Overlap
- SRI-11 - Retime Signal At Bellamy Road and Knox Marsh Road Intersection to Better Accommodate School Traffic

Medium Range Improvements (2-4 Years)

- MRI-4 Widen and Improve the Access Road Behind the Middle School, Convert Daily Drive to One Way and Change the Approach at Route 108 to an Entrance Only.



MIDDLE SCHOOL
CIRCULATION MRI-4



SCALE 1" = 120'

DALEY DRIVE

BUSSES AND AUTHORIZED
TRAFFIC ONLY

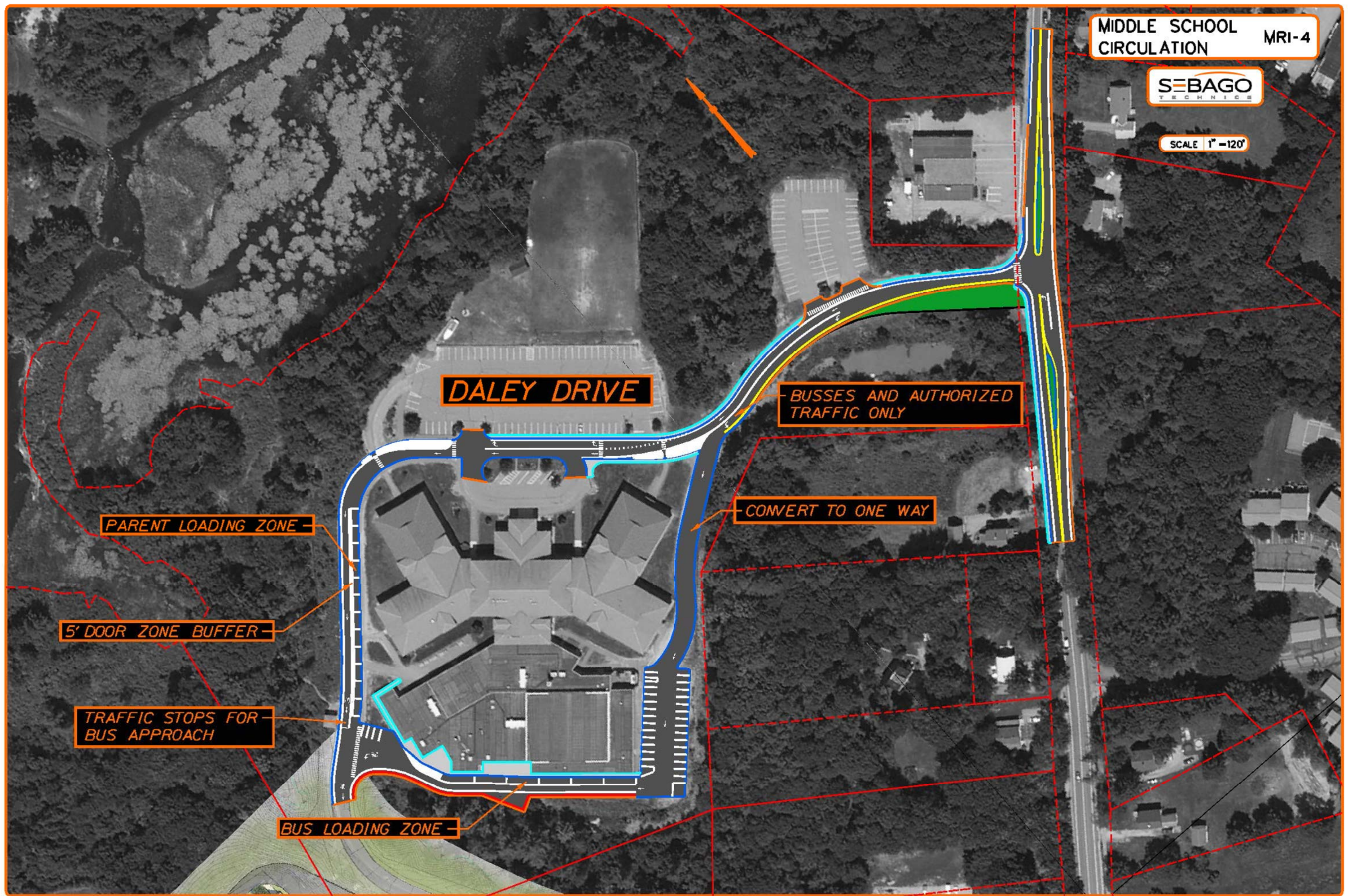
CONVERT TO ONE WAY

PARENT LOADING ZONE

5' DOOR ZONE BUFFER

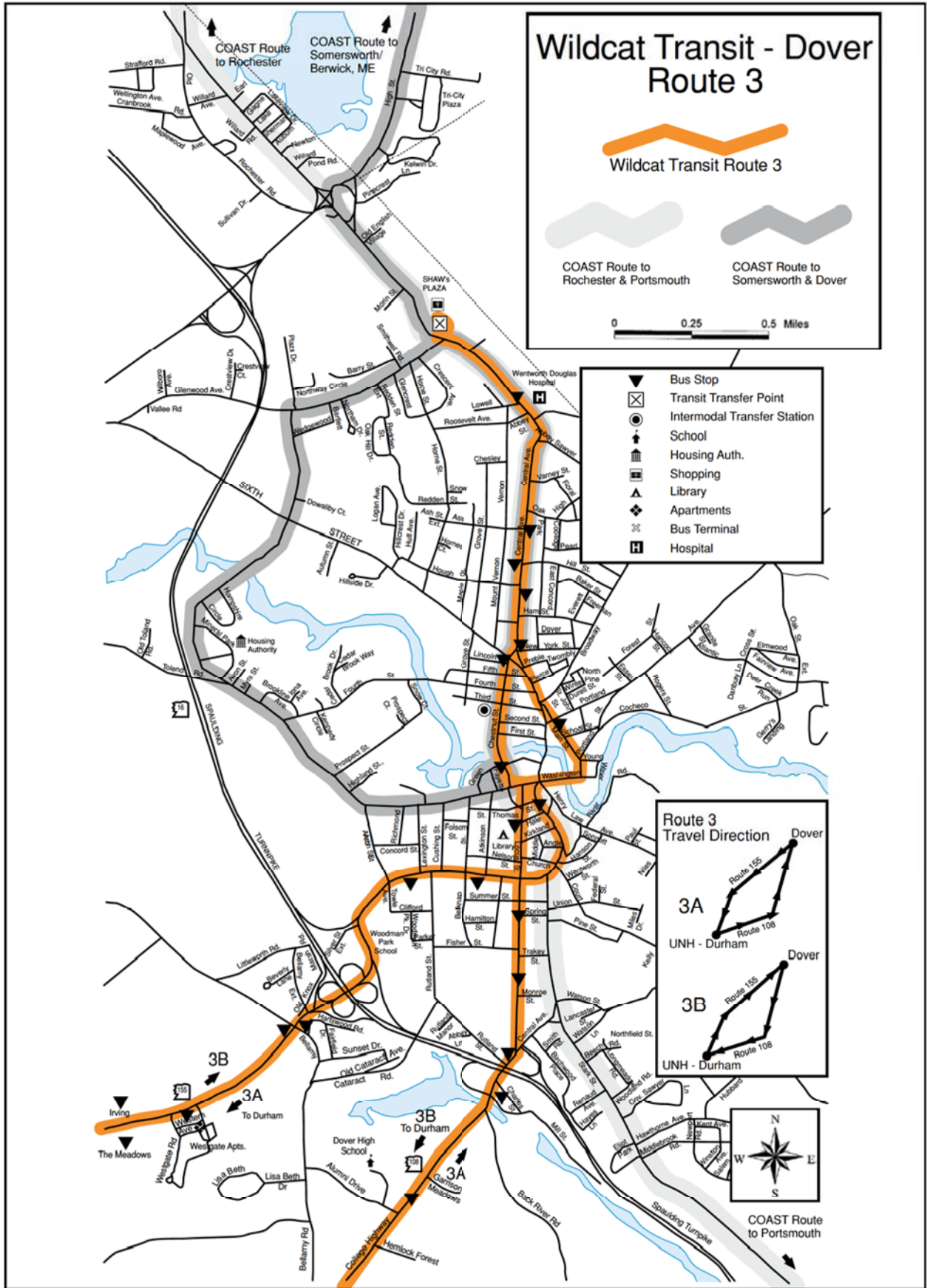
TRAFFIC STOPS FOR
BUS APPROACH

BUS LOADING ZONE



Appendix





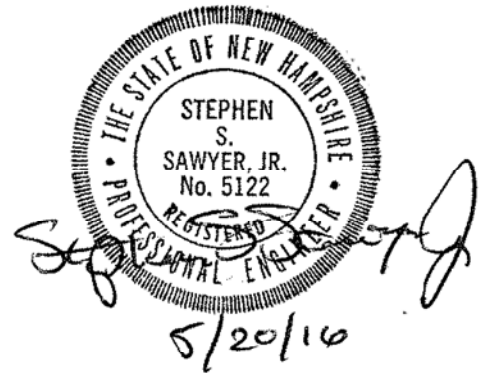
Memorandum

15512

To: Chris Parker
Marn Speidel

From: Steve Sawyer

Date: May 20, 2016



Subject: Draft Safety Audit for Route 108 South Corridor

We have completed the Draft Safety Audit for the Route 108 South Corridor as one element of our overall Route 108 Corridor Study. The Study Area for this review included Route 108 from Mast Road to Stark Avenue and Bellamy Road from Route 108 to Cataract Avenue. Accident data was compiled from individual reports by the Dover Police Department for the most recent three years including 2013 to 2015. In total there were 140 accidents during this time period with 41, 46, and 53 accidents happening in 2013, 2014, and 2015, respectively.

Accident Summary

The Dover Police Department summary for the reported accidents included the following data:

- Location
- DPD Report Number
- Date
- Time
- Day of Week
- Crash Type
- Number of Vehicles
- Severity
- Causation
- Surface Conditions / Weather
- General Summary

The above data was used to create accident diagrams for the major roadway links intersections where accidents occurred. These accident diagrams are attached.

As can be seen in the diagrams there are a large number of accidents involving rear ends, 65 in total. Rear end accidents are not a surprise as Route 108 is a congested corridor that sees a large amount of traffic on a daily basis and it is not uncommon to have rear end accidents at signalized intersections. The majority of these accidents did happen during the AM and PM peak hours, which supports the supposition that congestion may be a major contributing factor to these accidents.

The second highest crash pattern (30) was left turning vehicles failing to yield to oncoming traffic. This is most prevalent at the intersections of Route 108 and Exit 7N Ramp and at Route 108 and Back River Road, with 11 and 6 accidents occurring respectively.

The third highest crash pattern (9) was failure to yield accidents involving right turns not yielding to oncoming traffic. The majority of these accidents occurred between the Back River Road and the Exit 7N Ramp intersections and most were located at the Shell gas station entrance onto Route 108.

The remainder of the reported crashes were sporadic throughout the Study Area. Clearly, the heaviest concentration of crashes are occurring on Route 108 between Back River Road and Stark Avenue.

Overall the majority of accidents in the Study Area resulted in property damage only. Just 20 of the 140 total accidents resulted in some form of personal injury. Most of the injury related accidents occurred on Route 108 at the intersections of Back River Road and Locust Street with 5 and 7 accidents respectively. The remaining accidents were spread across the Study Area. The largest cause of injury related accidents was traffic failing to yield to oncoming traffic resulting in 7 of the 20 total accidents.

There were a total of 3 pedestrian and 1 bicycle accidents within the Study Area. The first occurred at 2:00 PM on Alumni Drive and involved two pedestrians crossing without a crosswalk in heavy traffic and resulted in injury. The next involved a single pedestrian crossing east to west at 7:00 AM in the crosswalk located at the intersection of Route 108 and Alumni Drive and a northbound vehicle, resulting in injury. This accident seems to have occurred when a crossing guard was present. The last pedestrian accident was located at Route 108 at Mill Street and resulted from a right turning vehicle from Exit 7S Ramp failing to yield to a crossing pedestrian with the walk symbol at 2:00 PM, the accident did not result an injury. The lone bicycle accident was caused by a northbound bicycle on Stark Avenue failing to yield to traffic turning from Route 108 onto East Watson Street which resulted in an injury.

Potential Countermeasures

Sebago Technics is soon to implement new coordination plans for the four signals between the intersections of Back River Road and the Exit 7N Ramp. With these coordination plans traffic will become platooned throughout the corridor, leading to less overall stops and more predictable traffic patterns. The addition of coordination should see an overall reduction of rear end accidents and other accidents as congestion lessens. The Federal Highway Administration's 2007 Desktop Reference for Crash Reduction Factors suggests a reduction in all crashes of 15-16% will result when signal coordination is provided.

In early 2015 a flashing yellow arrow indication was installed for the left turn lane on Route 108 at the Back River Road intersection. This indication better conveys when the left turn movement is protected or permissive when compared to a traditional green arrow or green ball arrangement. There was not a single accident related to failure to yield in 2015 after the flashing yellow arrow was installed. Furthermore, it is interesting to note that 4 of the 6 of these type of accidents prior to 2015 were attributed to the permissive left onto Back River Road after 7 PM, or during off-peak times. This would suggest that the flashing yellow arrow indication is a good countermeasure against failure to yield accidents in off-peak periods.

The accident history at the intersection of Route 108 and the Exit 7N Ramp has similar patterns as the accidents at Back River Road. The majority of crashes were related to the permissive left turn onto the Exit 7N Ramp. As was the case at Back River Road, most of these occurred after the PM peak hour, 7 of 8. Given the positive results experienced at Back River Road with the flashing yellow arrow, this treatment should be considered for this intersection as well.

Access management for Route 108 should be considered to further reduce the number of accidents. Both of the gas station's entrances at Locust Street onto Route 108 have a concentration of accidents related to turning traffic. There should be a reduction in accidents if the access was limited from Route 108 and traffic was moved to the signalized Locust Street approach.

A potential countermeasure to future pedestrian accidents may be the addition of a no right turn on red blank out sign at the intersection of Route 108 and Exit 7S Ramp for the Ramp approach. This would inform drivers that the pedestrian phase is active and a right turn on red is not allowed. A similar sign could also be added for the right turn onto the Exit 7S Ramp from Route 108 southbound.

Conclusions and Recommendations

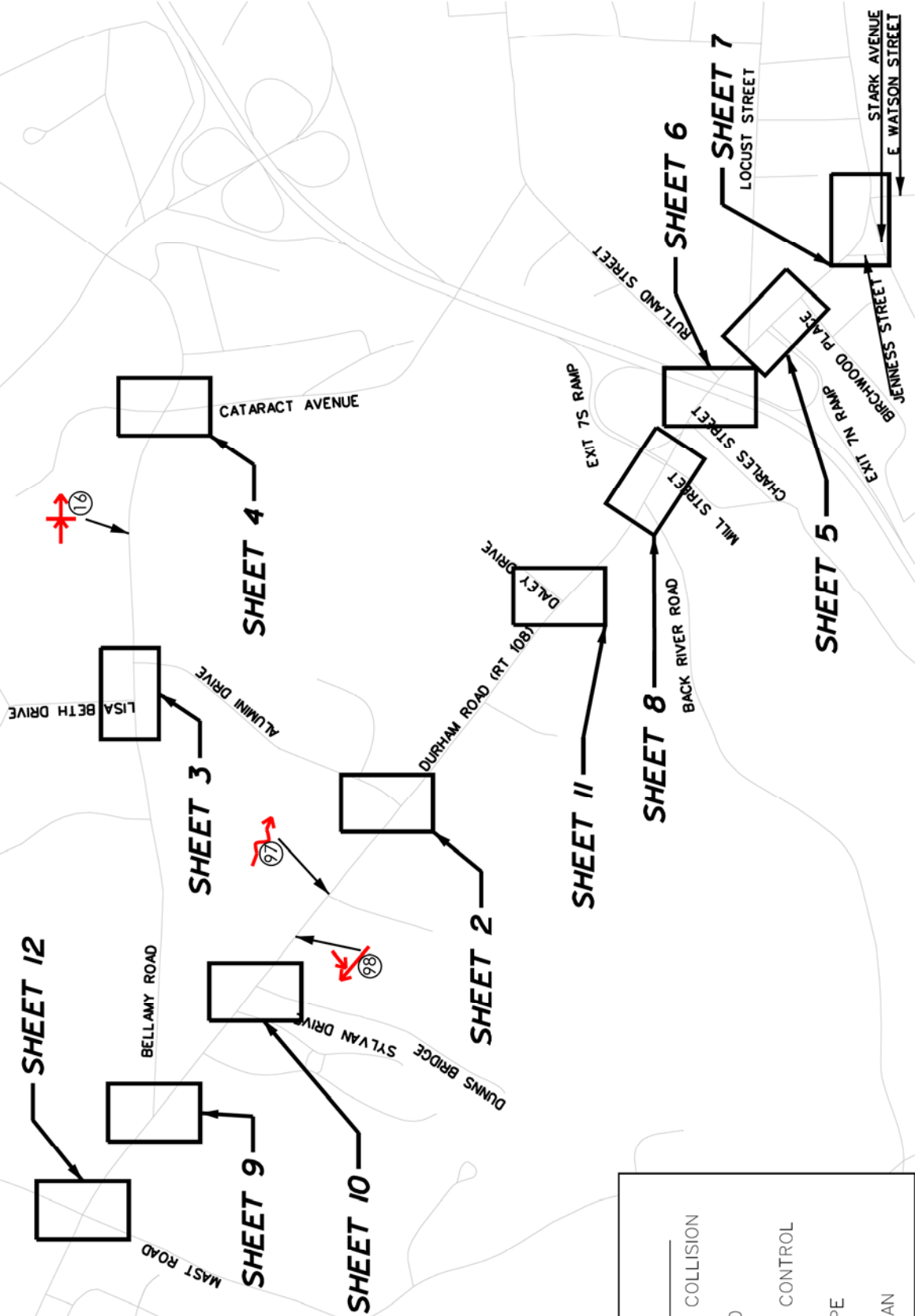
Sebago Technics has completed this Safety Audit for the Study Area including Route 108 from the intersection of Mast Road to the intersection of Stark Avenue and Bellamy Road from Route 108 to Cataract Avenue. Our findings are as follows:

1. From the accident data supplied, two major correlations of accident type can be shown. The first is a large number of rear end accidents throughout the entire Study Area with the majority being located on Route 108 between the intersections of Back River Road and the Exit 7N Ramp. The second is head on and angle accidents due to drivers failing to yield to oncoming traffic, which mostly occurred on Route 108 at the intersections of Back River Road and the Exit 7N Ramp.
2. Coordination will soon be implemented on Route 108 between the intersections of Back River Road and the Exit 7N Ramp. The addition of coordination should reduce the total number of vehicle stops and in turn reduce the number of rear end accidents. The FHWA suggests that a 15-16% reduction in all crashes will be experienced when coordination is implemented.
3. A flashing yellow arrow indication was installed on the Back River Road intersection in early 2015. After this installation there was not a single failure to yield accident for the remainder of 2015. By installing a flashing yellow arrow indication at the intersection of the Exit 7N Ramp a similar reduction in accidents may be possible.

4. Access management should be considered throughout the Route 108 corridor with a focus on the intersection of Route 108 and Locust Street to prevent future accidents.
5. A no right turn on red blank out sign should be added to the Exit 7S Ramp approach to lessen the chance of further pedestrian accidents at this intersection. A similar sign could also be added for the right turn onto the Exit 7S Ramp from Route 108 southbound.
6. Besides Route 108 between the intersections of Back River Road and the Exit 7N Ramp, the remaining Study Area has a low frequency of accidents that do not raise any particular safety concerns that require attention at this time.

Attachments:

- Study Area Map
- Accident Diagrams
- Accident Summary 2013-2015



KEY	
	HEAD ON COLLISION
	REAR END
	LOSS OF CONTROL
	SIDE SWIPE
	PEDESTRIAN

SCALE: 1" : 900'
 DATE: 05/09/16
 SHEET: 1 OF 12

ACCIDENT DIAGRAM MAP
 ROUTE 108

FOR: DOVER, NEW HAMPSHIRE

LOCATION: DOVER, NEW HAMPSHIRE



WWW.SEBAGOTECHNICS.COM
 75 John Roberts Rd., Suite B
 South Portland, ME 04106
 Tel. 207-200-2100



KEY

- HEAD ON COLLISION
- REAR END
- LOSS OF CONTROL
- SIDE SWIPE
- PEDESTRIAN

SCALE: 1" : 180'
 DATE: 05/09/16
 SHEET: 2 OF 12

ACCIDENT DIAGRAM
 ROUTE 108 @ ALUMINI DRIVE

FOR: CITY OF DOVER
 288 CENTRAL AVE.
 DOVER, NH 03820

LOCATION: DOVER, NEW HAMPSHIRE

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 TECHNICALS

WWW.SEBAGOTECHNICALS.COM
 75 John Roberts Rd. 250 Goddard Rd.
 Suite 1A Suite B
 South Portland, ME 04106 Lewiston, ME 04240
 Tel. 207-200-2100 Tel. 207-783-5656



KEY

-  HEAD ON COLLISION
-  REAR END
-  LOSS OF CONTROL
-  SIDE SWIPE

SCALE:	1" : 180'
DATE:	05/09/16
SHEET:	3 OF 12

ACCIDENT DIAGRAM
 BELLAMY ROAD @ ALUMINI DRIVE

FOR: CITY OF DOVER
 288 CENTRAL AVE.
 DOVER, NH 03820

LOCATION: DOVER, NEW HAMPSHIRE

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 Tel. 207-200-2100

250 Goddard Rd.
 Suite B
 Lewiston, ME 04240
 Tel. 207-783-5656



KEY

-  HEAD ON COLLISION
-  REAR END
-  LOSS OF CONTROL
-  SIDE SWIPE

SCALE:	1" : 180'
DATE:	05/09/16
SHEET:	4 OF 12

ACCIDENT DIAGRAM
 BELLAMY ROAD @ CATARACT AVENUE

FOR: CITY OF DOVER
 288 CENTRAL AVE.
 DOVER, NH 03820

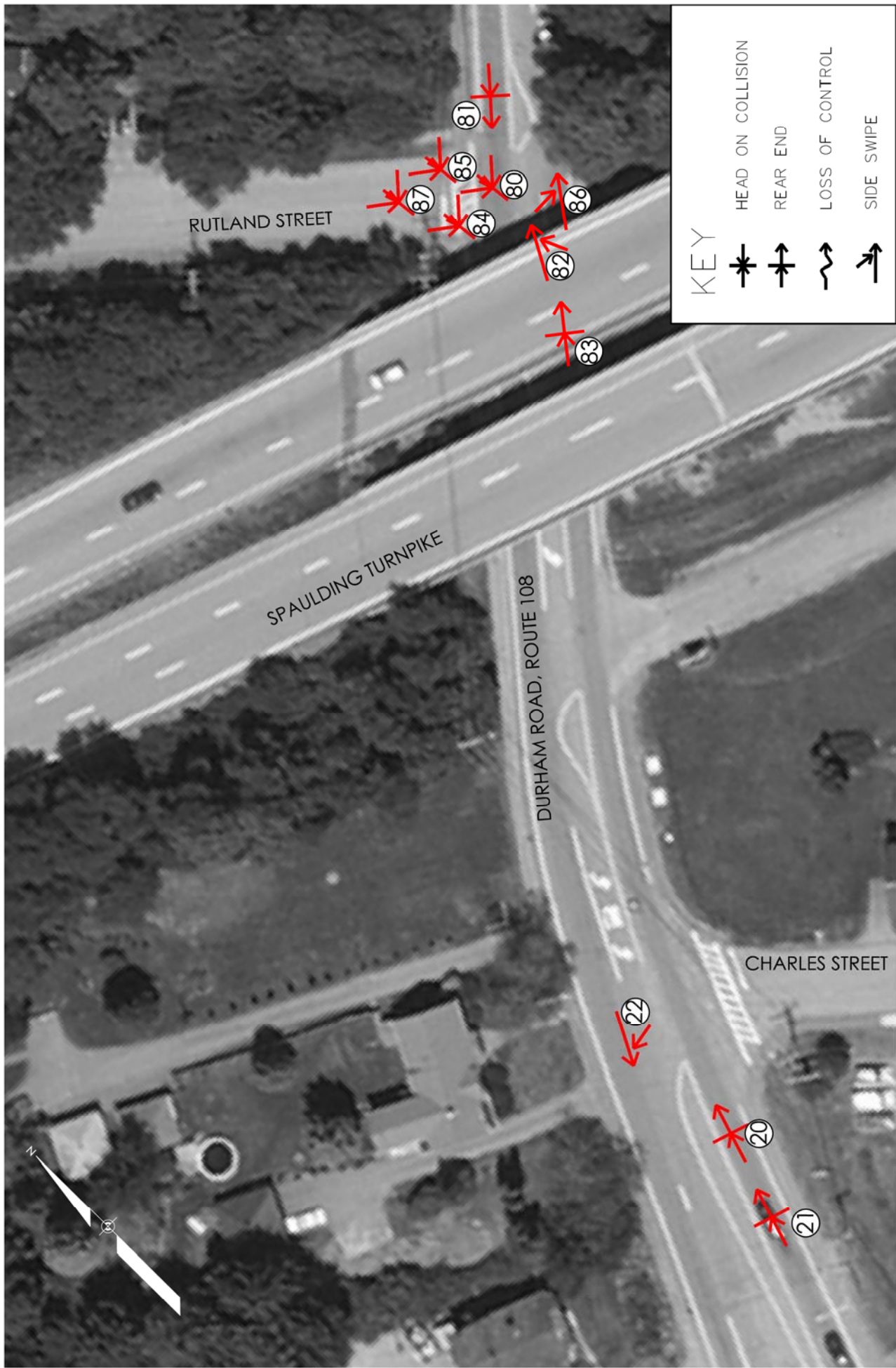
LOCATION: DOVER, NEW HAMPSHIRE

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KEY	
	HEAD ON COLLISION
	REAR END
	LOSS OF CONTROL
	SIDE SWIPE

SCALE:	1" : 180'
DATE:	05/09/16
SHEET:	5 OF 12

ACCIDENT DIAGRAM
 ROUTE 108 @ RUTLAND STREET

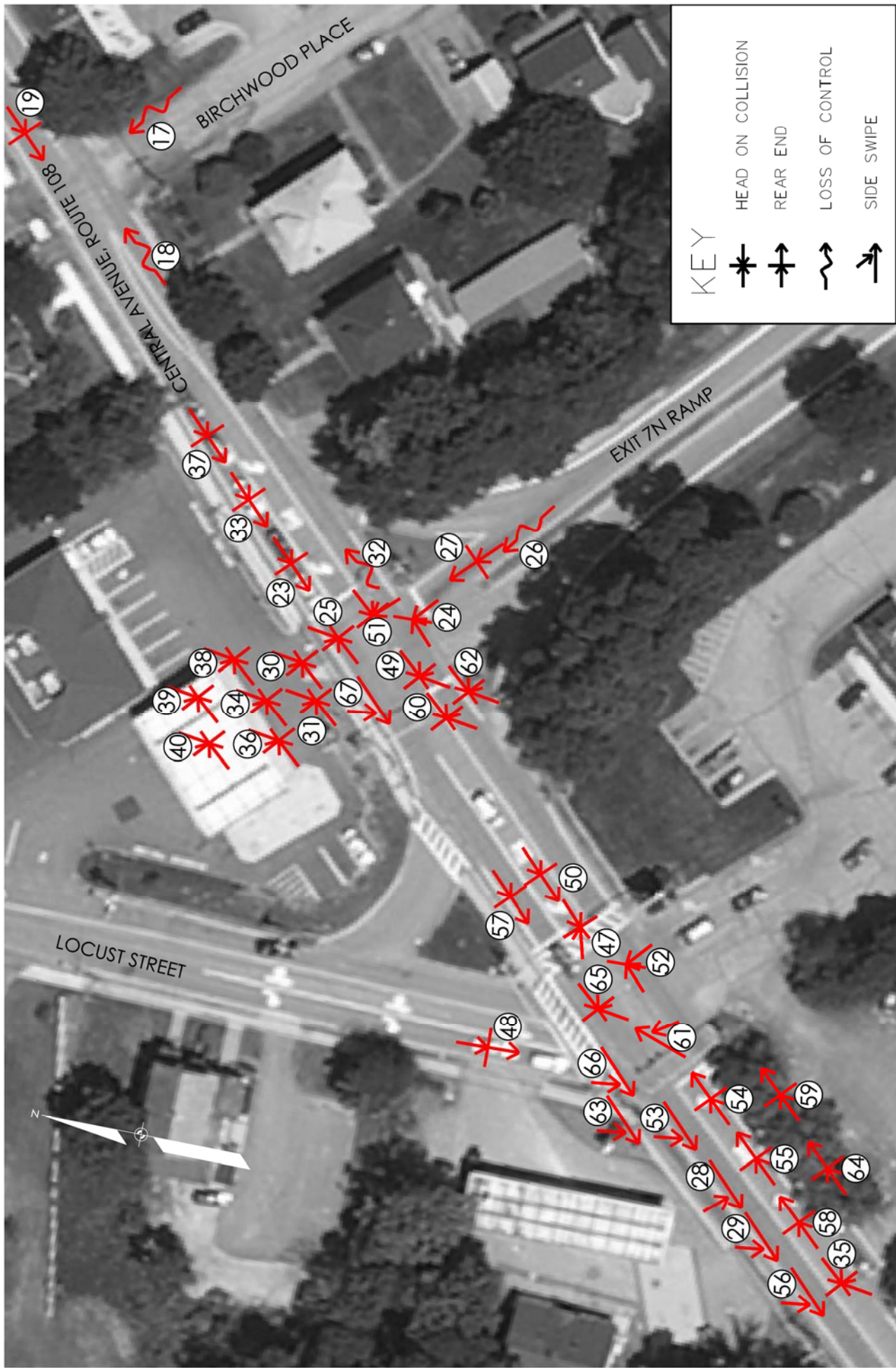
FOR: CITY OF DOVER
 288 CENTRAL AVE.
 DOVER, NH 03820

LOCATION: DOVER, NEW HAMPSHIRE

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 Lewiston, ME 04240
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KEY

- HEAD ON COLLISION
- REAR END
- LOSS OF CONTROL
- SIDE SWIPE

SCALE: 1" : 180'
 DATE: 05/09/16
 SHEET: 6 OF 12

ACCIDENT DIAGRAM
 ROUTE 108 @ LOCUST STREET

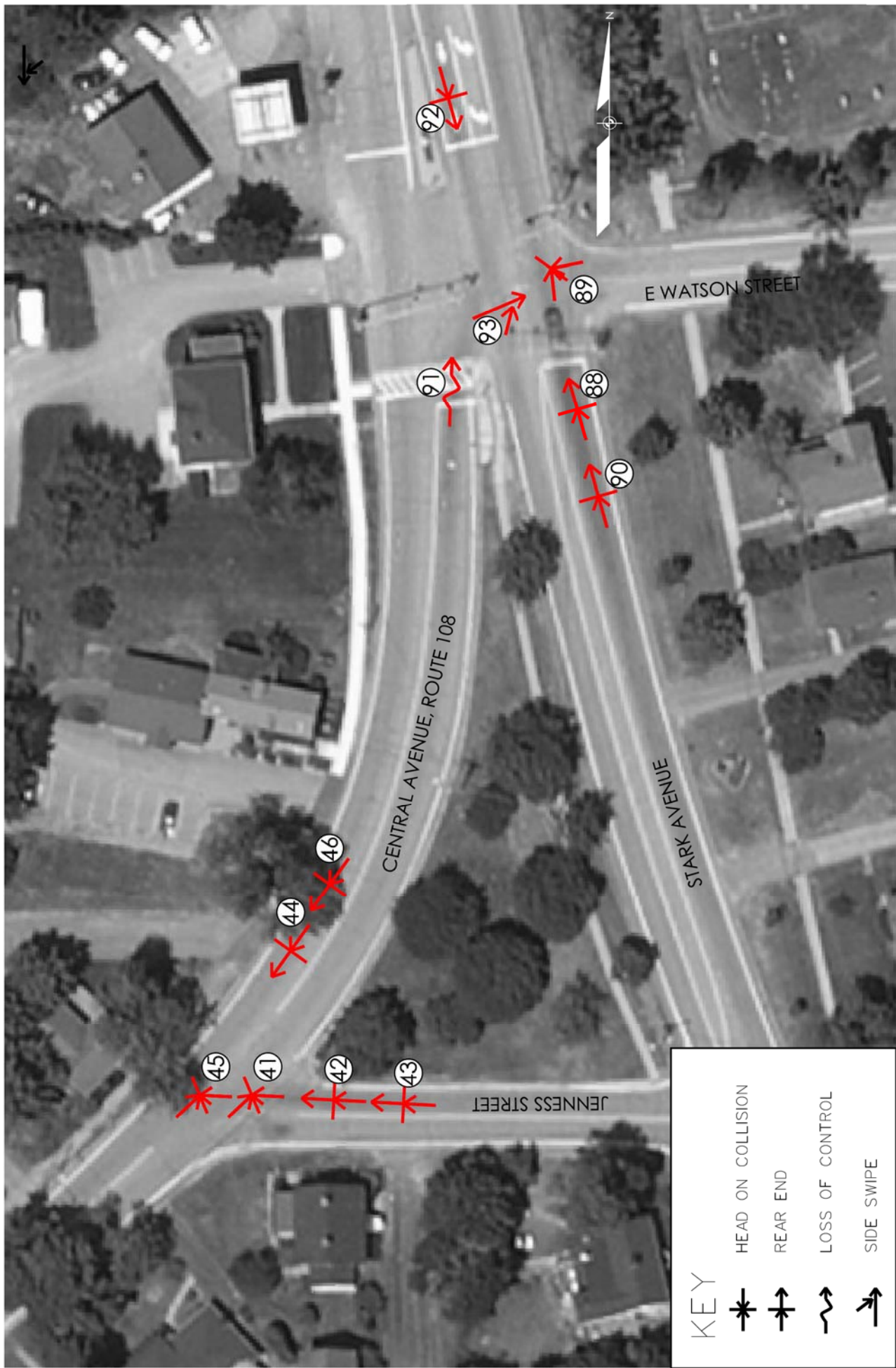
FOR: CITY OF DOVER
 288 CENTRAL AVE.
 DOVER, NH 03820

LOCATION: DOVER, NEW HAMPSHIRE

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KEY

	HEAD ON COLLISION
	REAR END
	LOSS OF CONTROL
	SIDE SWIPE

SCALE:	1" : 180'
DATE:	05/09/16
SHEET:	7 OF 12

ACCIDENT DIAGRAM
ROUTE 108 @ STARK AVENUE

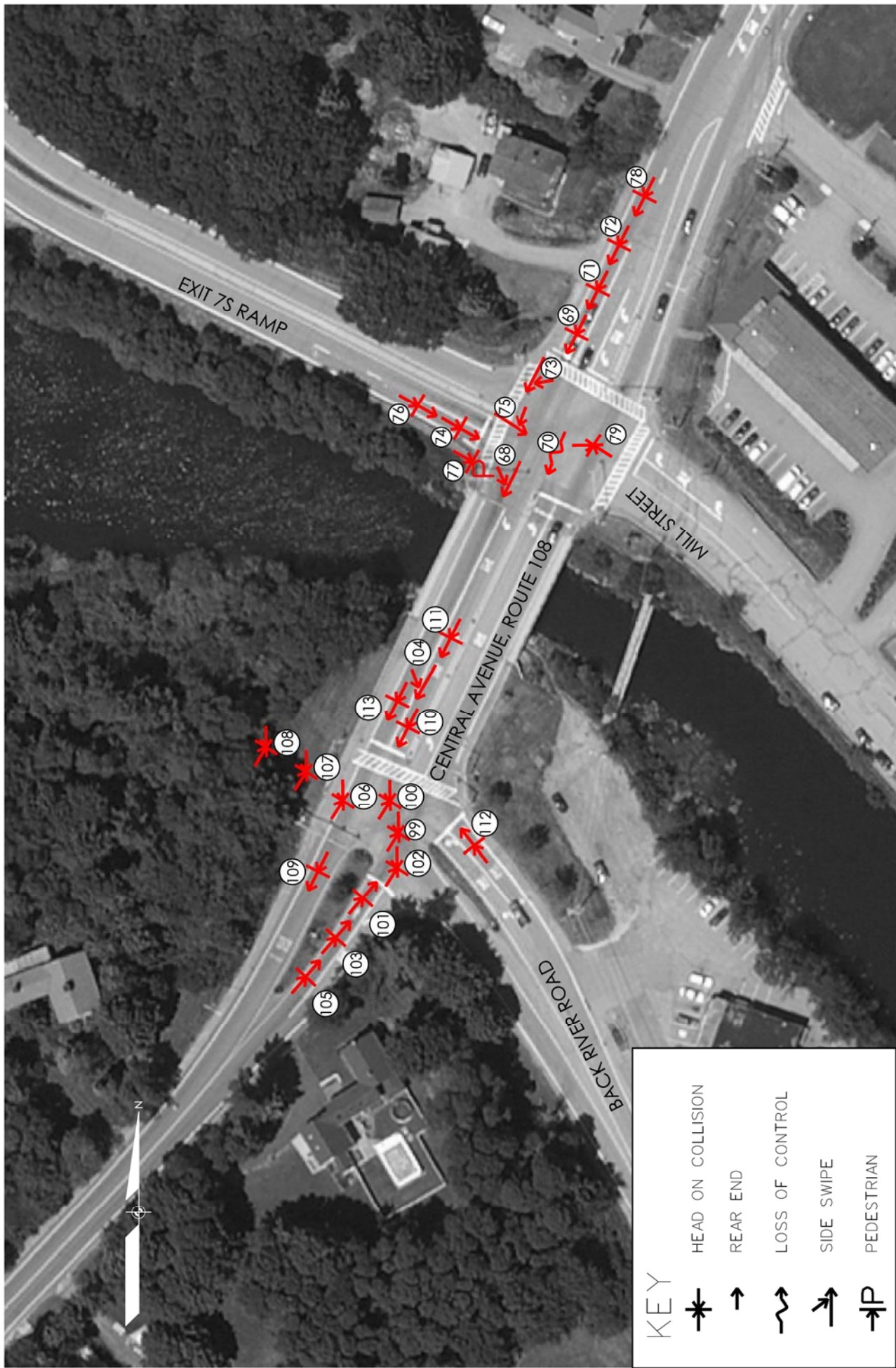
FOR: CITY OF DOVER
 288 CENTRAL AVE.
 DOVER, NH 03820

LOCATION: DOVER, NEW HAMPSHIRE

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 Tel. 207-783-5656



SCALE: 1" : 300'
 DATE: 05/09/16
 SHEET: 8 OF 12

ACCIDENT DIAGRAM
 ROUTE 108 @ BACK RIVER ROAD

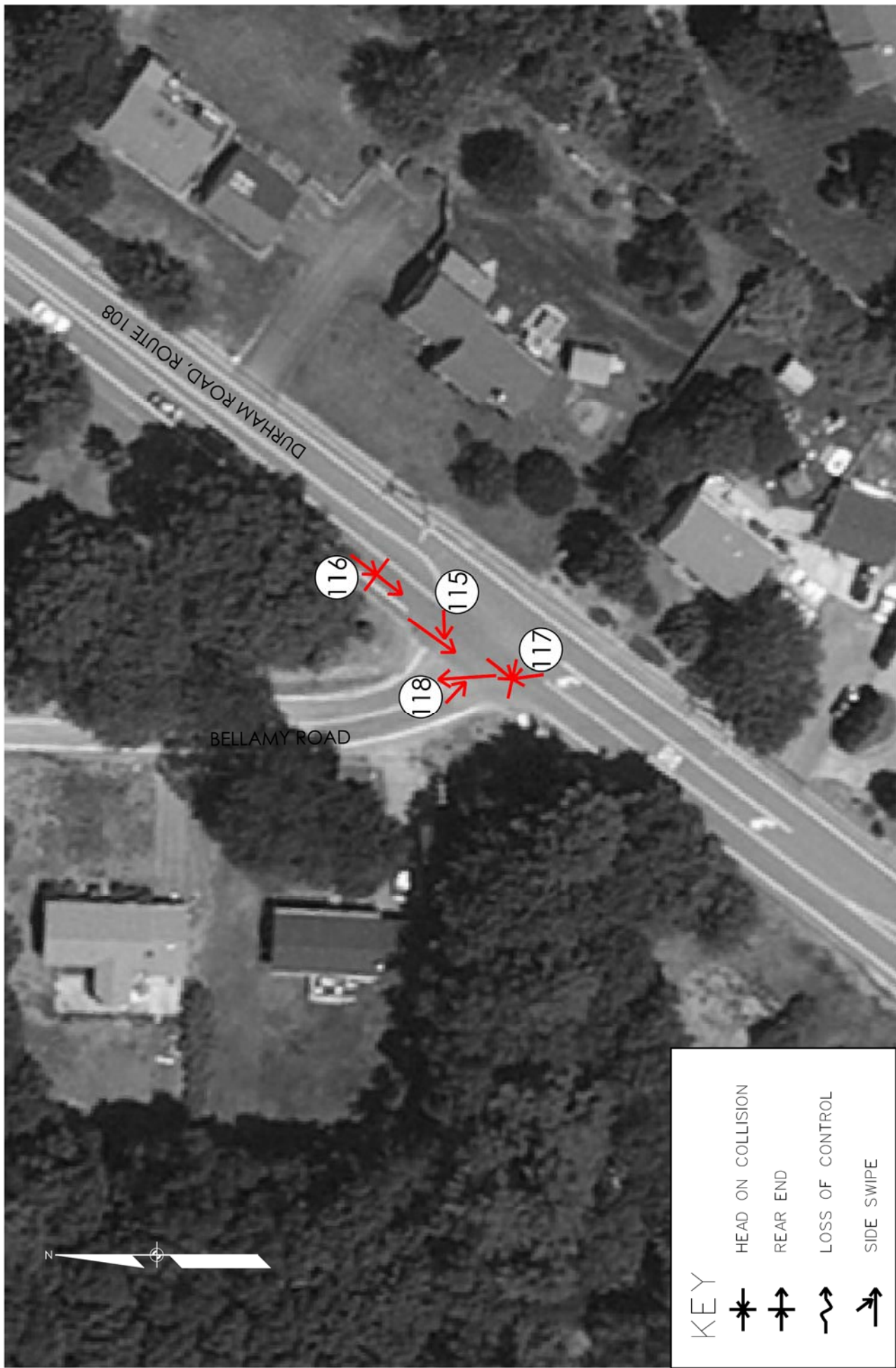
FOR: CITY OF DOVER
 288 CENTRAL AVE.
 DOVER, NH 03820

LOCATION: DOVER, NEW HAMPSHIRE

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 Lewiston, ME 04240
 Tel. 207-783-5656



KEY

- HEAD ON COLLISION
- REAR END
- LOSS OF CONTROL
- SIDE SWIPE

SCALE: 1" : 180'
 DATE: 05/09/16
 SHEET: 9 OF 12

ACCIDENT DIAGRAM
 ROUTE 108 @ BELLAMY ROAD

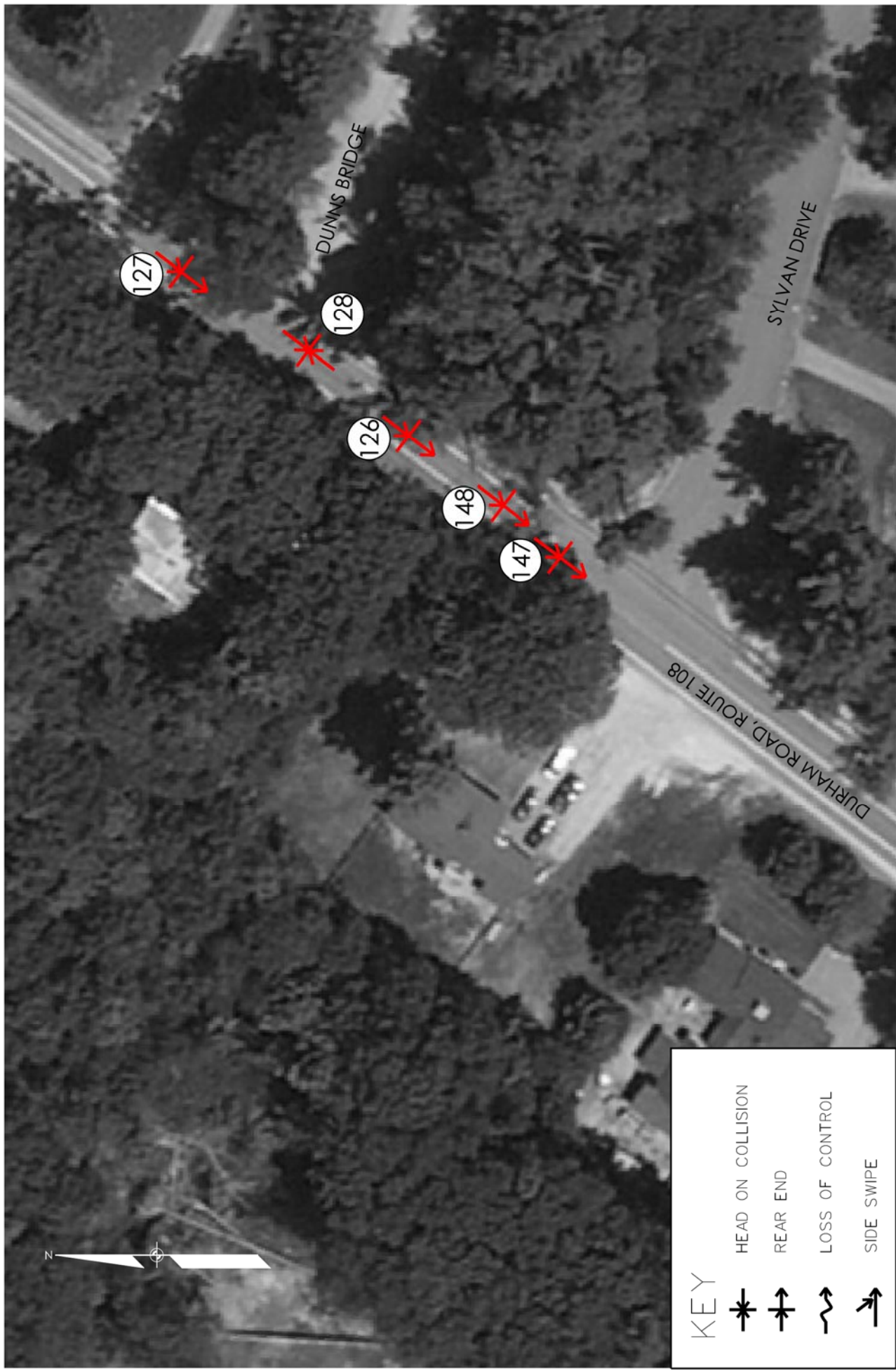
FOR: CITY OF DOVER
 288 CENTRAL AVE.
 DOVER, NH 03820

LOCATION: DOVER, NEW HAMPSHIRE

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KEY	HEAD ON COLLISION
✱	REAR END
⊕	LOSS OF CONTROL
⊖	SIDE SWIPE

SCALE: 1" : 180'
 DATE: 05/09/16
 SHEET: 10 OF 12

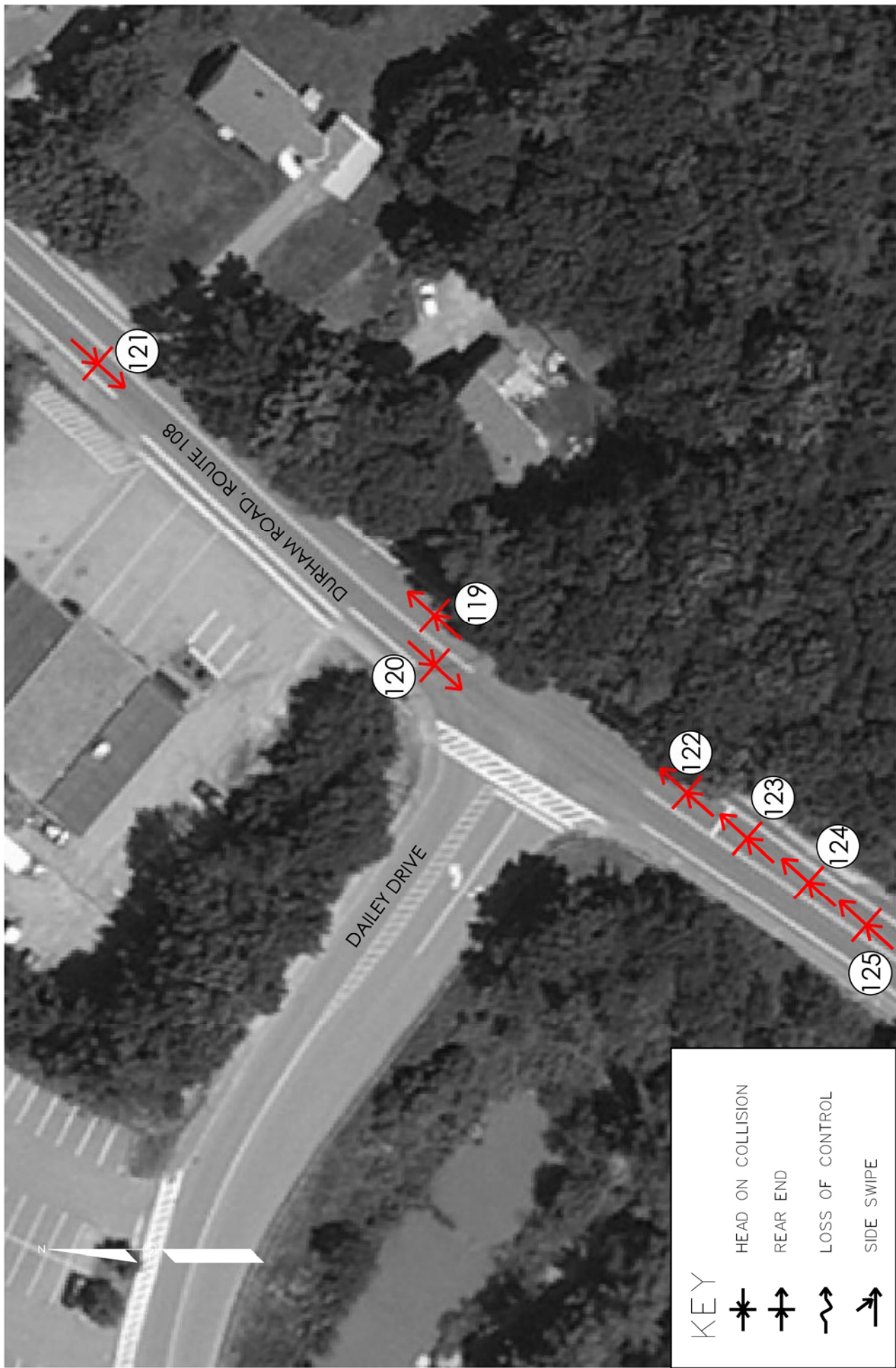
ACCIDENT DIAGRAM
 ROUTE 108 @ SYLVAN DRIVE

FOR: CITY OF DOVER
 288 CENTRAL AVE.
 DOVER, NH 03820

LOCATION: DOVER, NEW HAMPSHIRE

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 Suite 1A Suite B
 South Portland, ME 04106 Lewiston, ME 04240
 Tel. 207-200-2100 Tel. 207-783-5656



KEY

- HEAD ON COLLISION
- REAR END
- LOSS OF CONTROL
- SIDE SWIPE

SCALE: 1" : 180'
 DATE: 05/09/16
 SHEET: 11 OF 12

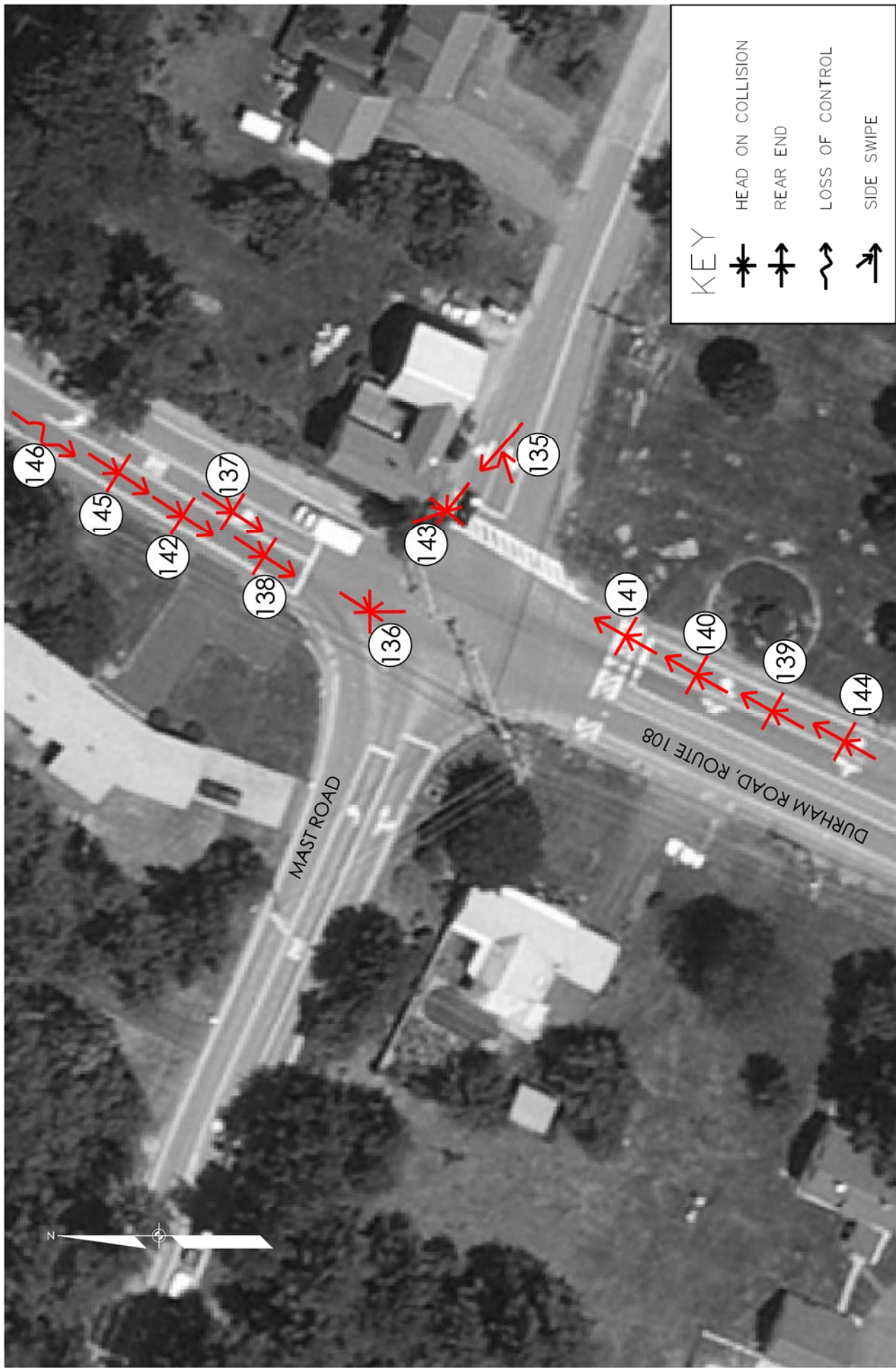
ACCIDENT DIAGRAM
 DURHAM ROAD @ DAILEY DRIVE

FOR: CITY OF DOVER
 288 CENTRAL AVE.
 DOVER, NH 03820

LOCATION: DOVER, NEW HAMPSHIRE

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 Tel. 207-200-2100 Tel. 207-783-5656



KEY	
	HEAD ON COLLISION
	REAR END
	LOSS OF CONTROL
	SIDE SWIPE

SCALE:	1" : 180'
DATE:	05/09/16
SHEET:	12 OF 12

ACCIDENT DIAGRAM
 ROUTE 108 @ MAST ROAD

FOR: CITY OF DOVER
 288 CENTRAL AVE.
 DOVER, NH 03820

LOCATION: DOVER, NEW HAMPSHIRE

SEBAGO
 T E C H N I C S

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 Tel. 207-200-2100 Tel. 207-783-5656

**ROUTE 108 SOUTH CORRIDOR STUDY CRASHES
2013 - 2015
DOVER POLICE DEPARTMENT**

	Location	DPD cc#	Date	Time	DOW	Crash Type	# veh	Severity	Causation	Surface	Details
1	Alumni Drive	14003960	2/19/2014	0700	Wed	Rear end	2	Property	Inattention	Clear	EB v. EB stopped in traffic
2	Alumni Drive	14006825	3/28/2014	1400	Fri	Pedestrian	1	Injury	Pedestrian FTY	Clear	WB v. 2 Peds crossing suddenly w/o crosswalk in heavy traffic
3	Alumni/Bellamy	13021645	9/6/2013	0700	Fri	Rear end	2	Property	Inattention	Clear	SB v. SB waiting for LT onto Alumni
4	Alumni/Bellamy	15000669	1/9/2015	1300	Fri	Angle	2	Property	Misjudgment/geometry	Wet	SB School bus left turn from Bellamy v. EB stopped at stop sign
5	Alumni/Durham	13011317	5/13/2013	1400	Mon	Rear end	2	Property	Inattention	Clear	EB v. EB stopped at stop sign on Alumni
6	Alumni/Durham	14022200	9/18/2014	0700	Thu	Pedestrian	1	Injury	FTY to ped in crosswalk	Clear	NB on Durham Road v. Ped crossing east to west
7	Alumni/Durham	15006112	3/19/2015	1300	Thu	Angle	2	Property	Failure to yield	Clear	EB making LT from Alumni FTY to NB making LT onto Alumni
8	Bellamy @ 40	14022188	9/18/2014	0700	Thu	Fixed object	1	Property	Inattention	Clear	NB texting strikes fire hydrant
9	Bellamy @ 40	14025985	11/4/2014	1700	Tue	Fixed object	1	Property	DWI	Clear	SB impaired strikes fire hydrant
10	Bellamy @ 43	13018660	8/5/2013	1700	Mon	Fixed object	1	Injury	DWI	Clear	SB impaired strikes utility pole
11	Bellamy @ 44	13001218	1/14/2013	1100	Mon	Parked veh	2	Property	Inattention	Clear	SB v. parked veh of flagger in work zone
12	Bellamy/Cataract	13026635	10/2/2013	0700	Wed	Rear end	2	Property	Unsafe backing	Clear	WB at stop sign on Cataract backs into WB
13	Bellamy/Cataract	14007684	4/7/2014	1600	Mon	Rear end	3	Property	Inattention	Clear	SB v. SB waiting for left turn
14	Bellamy/Cataract	14020213	8/27/2014	1400	Wed	Rear end	2	Property	Inattention	Clear	NB v. NB stopped in heavy traffic (end of DHS school day)
15	Bellamy/Cataract	14024953	10/22/2014	1600	Wed	Rear end	2	Property	Inattention	Clear	SB v. SB waiting for left turn
16	Bellamy/DHS crosswalk	14028503	12/8/2014	1400	Mon	Rear end	2	Property	Inattention	Clear	NB v. NB stopped for pedestrians in crosswalk
17	Central/Birchwood	14008137	4/12/2014	1400	Sat	Fixed object	1	Property	Defective equipment	Clear	WB approaching Central brakes fail, strikes tree
18	Central/Birchwood	14011356	5/19/2014	1100	Mon	Fixed object	1	Injury	Medical problem	Clear	NB strikes utility pole
19	Central/Birchwood	15017020	7/17/2015	1400	Fri	Rear end	2	Property	Following Too Closely	Clear	SB v. SB stopped in traffic
20	Central/Charles	13020744	8/27/2013	1700	Tue	Rear end	2	Property	Following Too Closely	Clear	NB v. NB stopping in heavy traffic
21	Central/Charles	13020753	8/27/2013	1800	Tue	Rear end	2	Property	Following Too Closely	Clear	NB v. NB stopping in heavy traffic
22	Central/Charles	14003369	2/11/2014	0700	Tue	Angle	2	Property	Failure to yield	Clear	WB making LT from Charles FTY to SB
23	Central/Exit 7N ramp	13024624	10/11/2013	1600	Fri	Rear end	2	Property	Following Too Closely	Clear	SB v. SB stopped in traffic
24	Central/Exit 7N ramp	13026421	11/2/2013	1900	Sat	Angle	2	Injury	Red light violation	Clear	NB v. WB exiting ramp (conflicting claims on who had green)
25	Central/Exit 7N ramp	13027973	11/22/2013	1900	Fri	Angle	2	Property	Failure to yield	Clear	NB v. SB making permissive LT onto ramp
26	Central/Exit 7N ramp	14004155	2/21/2014	2300	Fri	Fixed object	1	Property	Speed (road conditions)	Icy	WB exiting ramp v. curb
27	Central/Exit 7N ramp	14004731	2/21/2014	2300	Fri	Rear end	2	Property	Speed (road conditions)	Icy	WB v. WB stopped at red light
28	Central/Exit 7N ramp	14004832	3/2/2014	1500	Sun	Angle	2	Property	Failure to yield	Clear	EB exiting #52 Central v. SB that had green
29	Central/Exit 7N ramp	14006096	3/19/2014	1700	Wed	Angle	2	Property	Failure to yield	Clear	EB making RT from #52 Central v. SB that had green
30	Central/Exit 7N ramp	15006666	3/25/2015	1700	Wed	Angle	2	Property	Failure to yield	Clear	NB v. SB making permissive LT onto ramp
31	Central/Exit 7N ramp	15012039	5/24/2015	2100	Sun	Angle	2	Property	Failure to yield	Clear	NB v. SB making permissive LT onto ramp
32	Central/Exit 7N ramp	15021674	5/30/2015	0100	Sat	Fixed object	1	Property	Inattention	Clear	NB v. traffic signal pole
33	Central/Exit 7N ramp	15013124	6/3/2015	1500	Wed	Rear end	3	Property	Inattention	Clear	SB v. SB stopped in traffic
34	Central/Exit 7N ramp	15016857	7/15/2015	1800	Wed	Angle	2	Property	Failure to yield	Clear	NB v. SB making permissive LT onto ramp
35	Central/Exit 7N ramp	15018242	7/30/2015	2100	Thu	Angle	2	Property	Failure to yield	Clear	SB v. NB making LT into #52 Central
36	Central/Exit 7N ramp	15018648	8/4/2015	0800	Tue	Angle	2	Injury	Failure to yield	Clear	NB v. SB making permissive LT onto ramp
37	Central/Exit 7N ramp	15018923	8/6/2015	1700	Thu	Rear end	2	Property	Following Too Closely	Clear	SB v. SB stopped in traffic

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	Location	DPD cc#	Date	Time	DOW	Crash Type	# veh	Severity	Causation	Surface	Details
38	Central/Exit 7N ramp	15023285	9/18/2015	2300	Fri	Angle	2	Property	Failure to yield	Clear	NB v. SB making permissive LT onto ramp
39	Central/Exit 7N ramp	15026332	10/26/2015	1900	Mon	Angle	2	Property	Failure to yield	Clear	NB v. SB making permissive LT onto ramp
40	Central/Exit 7N ramp	15020083	12/13/2015	1600	Sun	Angle	2	Injury	Failure to yield	Clear	NB v. SB making permissive LT onto ramp
41	Central/Jenness	13006042	3/15/2013	1300	Fri	Angle	2	Property	Failure to yield	Clear	WB making LT from Jenness FTY to NB
42	Central/Jenness	13025281	10/19/2013	1200	Sat	Rear end	2	Property	Following Too Closely	Clear	WB v. WB waiting/yielding to make LT from Jenness
43	Central/Jenness	14028594	12/9/2014	1600	Tue	Rear end	2	Property	Following Too Closely	Clear	WB v. WB waiting/yielding to make LT from Jenness
44	Central/Jenness	15000381	1/6/2015	0700	Tue	Rear end	2	Property	Following Too Closely	Clear	SB v. SB which stopped abruptly to yield to emergency vehicle
45	Central/Jenness	15000469	1/7/2015	0700	Wed	Angle	2	Property	Failure to yield	Clear	WB making LT from Jenness FTY to NB
46	Central/Jenness	15024324	10/2/2015	1800	Fri	Rear end	2	Property	Following Too Closely	Clear	SB v. SB stopped in traffic
47	Central/Locust	13000380	1/5/2013	1200	Sat	Angle	2	Property	Misjudgment	Clear	EB making LT strikes SB waiting at red light
48	Central/Locust	13005934	3/14/2013	1100	Thu	Rear end	2	Property	Inattention	Clear	EB v. EB stopped in traffic
49	Central/Locust	13014988	6/23/2013	1200	Sun	Angle	2	Injury	Failure to yield	Clear	NB making LT into #46 Central FTY to SB
50	Central/Locust	13015676	7/1/2013	1600	Mon	Rear end	2	Injury	Following Too Closely	Wet	SB v. SB stopped in traffic
51	Central/Locust	13029805	12/17/2013	2100	Tue	Angle	2	Property	Failure to yield	Snow	WB plow truck crossing from #45 to #46 Central FTY to SB
52	Central/Locust	14000133	1/3/2014	1100	Fri	Angle	2	Property	Red light violation	Snow	NB v. WB exiting #47 Central (conflicting claims RE: green)
53	Central/Locust	14001959	1/23/2014	1400	Thu	Angle	2	Property	Failure to yield	Clear	EB making RT on red v. SB that had green
54	Central/Locust	14009040	4/22/2014	0800	Tue	Rear end	2	Injury	Inattention	Clear	NB v. NB stopped at red light
55	Central/Locust	14013867	6/17/2014	0800	Tue	Rear end	2	Property	Inattention	Clear	NB at red struck by NB who saw light change for adjacent lane
56	Central/Locust	14014495	6/23/2014	1700	Mon	Angle	2	Property	Failure to yield	Clear	SB exiting rear driveway of #52 Central v. EB on Locust
57	Central/Locust	14017166	7/23/2014	1900	Wed	Rear end	2	Property	Inattention	Clear	SB v. SB stopped in traffic
58	Central/Locust	14017537	7/28/2014	1100	Mon	Rear end	2	Property	Inattention	Clear	NB v. NB stopped at red light
59	Central/Locust	14018961	8/13/2014	0900	Wed	Rear end	2	Property	Following Too Closely	Clear	NB v. NB stopped in traffic
60	Central/Locust	14027348	11/22/2014	0600	Sat	Angle	2	Property	Failure to yield	Clear	NB making LT into #46 Central v. SB
61	Central/Locust	15000418	1/6/2015	1600	Tue	Sideswipe	2	Property	Improper turn	Clear	NB making LT onto Locust from wrong lane v. NB making LT
62	Central/Locust	15001084	1/14/2015	0600	Wed	Head on	2	Injury	Failure to yield	Clear	NB making LT into #46 Central v. SB
63	Central/Locust	15013767	6/10/2015	1600	Wed	Angle	2	Property	Failure to yield	Clear	EB making right on red from Locust v. SB
64	Central/Locust	15014191	6/15/2015	1700	Mon	Rear end	3	Property	Following Too Closely	Clear	NB v. NB stopped in traffic
65	Central/Locust	15023676	9/23/2015	1200	Wed	Angle	2	Property	Failure to yield	Clear	NB making permissive LT onto Locust v. SB
66	Central/Locust	15024756	10/7/2015	1800	Wed	Angle	2	Property	Failure to yield	Clear	EB making right on red from Locust v. SB
67	Central/Locust	15025608	10/17/2015	1400	Sat	Sideswipe	2	Property	Improper turn	Clear	WB exiting #47 Central making RT in wrong lane v. WB exiting #47
68	Central/Mill/Exit 7S ramp	13024120	10/5/2013	1700	Sat	Angle	2	Property	Red light violation	Clear	EB exiting ramp v. SB that ran red (focused on next set of signals)
69	Central/Mill/Exit 7S ramp	14004000	2/19/2014	1600	Wed	Rear end	2	Property	Following Too Closely	Snow	SB slides on icy road v. SB stopped at red light
70	Central/Mill/Exit 7S ramp	14004410	2/25/2014	2400	Tue	Fixed object	1	Property	Improper turn	Snow	SB slides and strikes traffic signal pole in median
71	Central/Mill/Exit 7S ramp	14008696	4/18/2014	1000	Fri	Rear end	2	Property	Following Too Closely	Clear	SB v. SB stopped in traffic
72	Central/Mill/Exit 7S ramp	14013530	6/13/2014	0700	Fri	Rear end	2	Property	Inattention	Wet	SB v. SB stopped in traffic
73	Central/Mill/Exit 7S ramp	14018114	8/3/2014	1800	Sun	Sideswipe	2	Injury	Misjudgment	Clear	Two SB MC's, miscommunication, one makes RT onto ramp
74	Central/Mill/Exit 7S ramp	14020912	9/4/2014	0800	Thu	Rear end	2	Property	Inattention	Clear	EB v. EB making LT from ramp

prepared by: Sgt. Marn Speidel

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	Location	DPD cc#	Date	Time	DOW	Crash Type	# veh	Severity	Causation	Surface	Details
75	Central/Mill/Exit 7S ramp	14026755	11/14/2014	1900	Fri	Angle	2	Property	Red light violation	Clear	EB exiting ramp v. SB that ran red (focused on next set of signals)
76	Central/Mill/Exit 7S ramp	15000658	1/9/2015	0900	Fri	Rear end	2	Property	Speed (road conditions)	Snow	EB v. EB stopping at bottom of ramp
77	Central/Mill/Exit 7S ramp	15022573	9/11/2015	1400	Fri	Pedestrian	1	No injury	Failure to yield	Clear	EB from ramp RT on red FTY to pedestrian crossing w/ walk signal
78	Central/Mill/Exit 7S ramp	15024222	10/1/2015	0700	Thu	Rear end	2	Property	Inattention	Clear	SB v. SB stopped in traffic
79	Central/Mill/Exit 7S ramp	15029583	12/7/2015	1900	Mon	Angle	2	Property	Failure to yield	Clear	EB making LT from ramp on permissive green FTY to WB from Mill
80	Central/Rutland	13000397	1/5/2013	1600	Sat	Angle	2	Property	Failure to yield	Clear	EB making LT from Rutland v. SB
81	Central/Rutland	13011318	5/13/2013	1500	Mon	Rear end	2	Injury	Inattention	Clear	SB v. SB stopped in traffic
82	Central/Rutland	13017707	7/25/2013	1500	Thu	Sideswipe	2	Property	Misjudgment	Clear	NB changing lanes for left turn lane v. NB stopped in traffic
83	Central/Rutland	13020252	8/22/2013	1500	Thu	Rear end	3	Property	Inattention	Clear	NB v. NB stopped in line of traffic at light
84	Central/Rutland	13025193	10/18/2013	1500	Fri	Angle	2	Property	Failure to yield	Clear	EB making LT from Rutland v. SB (heavy traffic)
85	Central/Rutland	14023829	10/9/2014	1500	Thu	Angle	2	Property	Failure to yield	Clear	EB making LT from Rutland v. NB (heavy traffic)
86	Central/Rutland	14029430	12/19/2014	1800	Fri	Sideswipe	2	Property	Unsafe lane change	Clear	NB in left lane attempts to merge to right lane v. NB
87	Central/Rutland	15014472	6/18/2015	1200	Thu	Angle	2	Property	Failure to yield	Clear	EB making LT from Rutland v. SB
88	Central/Stark/East Watson	13008237	4/8/2013	2200	Mon	Rear end	2	Property	Inattention	Clear	NB on Stark v. NB stopped at red light
89	Central/Stark/East Watson	13029147	12/9/2013	1100	Mon	Angle	2	Property	Weather conditions	Snow	WB on East Watson slides down hill v. NB
90	Central/Stark/East Watson	14003526	2/13/2014	2400	Thu	Rear end	2	Property	DWI	Clear	NB v. NB stopped at red light
91	Central/Stark/East Watson	14022497	9/21/2014	1700	Sun	Fixed object	1	Property	Improper turn	Clear	TT unit NB on Central U-turns to Stark SB, strikes signal pole
92	Central/Stark/East Watson	15008693	4/16/2015	0800	Thu	Rear end	2	Property	Following Too Closely	Clear	SB v. SB stopped in traffic
93	Central/Stark/East Watson	15023680	9/23/2015	1300	Wed	Bicycle	2	Injury	Cyclist violation	Clear	NB on Central w/ green light entering East Watson v. NB on Stark
94	Durham @ 105	15023812	9/25/2015	0900	Fri	Angle	2	Property	Failure to yield	Clear	EB making LT from driveway FTY to SB
95	Durham @ 300	15017775	7/26/2015	1000	Sun	Animal	1	Property	Deer crossing	Clear	NB v. deer
96	Durham @ 300	15017777	7/26/2015	1000	Sun	Animal	1	Injury	Deer crossing	Clear	SB (motorcycle) v. deer
97	Durham @ 64	14015294	7/2/2014	1400	Wed	Fixed object	1	Injury	Medical problem	Clear	NB strikes utility pole
98	Durham @ 81	13004541	2/25/2013	1100	Mon	Angle	2	Property	Failure to yield	Snow	Private plow truck backing out of driveway FTY to SB
99	Durham/Back River	13013666	6/7/2013	2100	Fri	Angle	2	Property	Failure to yield	Clear	SB making permissive LT onto Back River FTY to NB
100	Durham/Back River	13016874	7/15/2013	2000	Mon	Angle	2	Property	Failure to yield	Clear	SB making permissive LT onto Back River FTY to NB
101	Durham/Back River	13018327	8/1/2013	1700	Thu	Rear end	2	Injury	Following Too Closely	Clear	NB v. NB stopped in traffic
102	Durham/Back River	13024200	10/6/2013	1900	Sun	Angle	2	Injury	Failure to yield	Wet	SB making permissive LT onto Back River FTY to NB
103	Durham/Back River	13024248	10/7/2013	1400	Mon	Rear end	2	Property	Following Too Closely	Clear	NB v. NB stopping in heavy traffic at red light
104	Durham/Back River	13027253	11/13/2013	1800	Wed	Sideswipe	2	Property	Unsafe lane change	Clear	SB changing lanes to approach LT onto Back River v. SB
105	Durham/Back River	14005510	3/11/2014	1500	Tue	Rear end	2	Property	Following Too Closely	Clear	NB v. NB stopping in heavy traffic at red light
106	Durham/Back River	14025747	11/1/2014	2000	Sat	Angle	2	Property	Failure to yield	Clear	SB making permissive LT onto Back River FTY to NB
107	Durham/Back River	15000764	1/10/2015	1300	Sat	Angle	2	Property	Failure to yield	Clear	SB making permissive LT onto Back River FTY to NB
108	Durham/Back River	15000945	1/12/2015	1300	Mon	Angle	2	Injury	Failure to yield	Clear	SB making permissive LT onto Back River FTY to NB
109	Durham/Back River	15004980	3/6/2015	0100	Fri	Angle	3	Injury	DWI	Wet	SB impaired strikes backhoe/truck engaged in snow removal
110	Durham/Back River	15017358	7/21/2015	1600	Tue	Rear end	2	Property	Following Too Closely	Clear	SB v. SB waiting for left turn
111	Durham/Back River	15021467	9/1/2015	1300	Tue	Rear end	2	Property	Inattention	Clear	SB v. SB waiting for left turn

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	Location	DPD cc#	Date	Time	DOW	Crash Type	# veh	Severity	Causation	Surface	Details
112	Durham/Back River	15022588	9/11/2015	1600	Fri	Rear end	2	Property	Following Too Closely	Clear	WB v. WB (on Back River) stopping in heavy traffic at red light
113	Durham/Back River	15025546	10/16/2015	1600	Fri	Rear end	2	Property	Inattention	Clear	SB v. SB stopped in traffic
114	Durham/Back River	15030481	12/18/2015	1500	Fri	Rear end	2	Property	Inattention	Clear	SB v. SB waiting for left turn
115	Durham/Bellamy	13011013	5/10/2013	0700	Fri	Angle	2	Property	Unlawful passing	Clear	SB attempts to overtake SB garbage truck making RT onto Bellamy
116	Durham/Bellamy	13019968	8/19/2013	2100	Mon	Sideswipe	2	Property	Improper turn	Clear	SB making RT onto Bellamy, improper signal, v. SB making RT
117	Durham/Bellamy	14022918	9/27/2014	1400	Sat	Angle	2	Property	Failure to yield	Clear	NB making LT onto Bellamy FTY to SB
118	Durham/Bellamy	14028528	12/8/2014	1800	Mon	Sideswipe	2	Property	Misjudgment/geometry	Clear	NB making LT onto Bellamy sideswipes EB making RT
119	Durham/Daley	13025816	10/26/2013	1300	Sat	Rear end	2	Property	Following Too Closely	Clear	NB v. NB stopping for red light at fire station
120	Durham/Daley	14012253	5/29/2014	0700	Thu	Rear end	2	Property	Following Too Closely	Clear	SB v. SB stopped in traffic
121	Durham/Daley	14020460	8/30/2014	0700	Sat	Rear end	2	Property	Following Too Closely	Clear	SB v. SB stopping for red light at fire station
122	Durham/Daley	15003610	2/16/2015	1500	Mon	Rear end	4	Property	Following Too Closely	Clear	NB v. NB stopping in heavy traffic
123	Durham/Daley	15005370	3/10/2015	1700	Tue	Rear end	2	Property	Following Too Closely	Clear	NB v. NB stopping in heavy traffic
124	Durham/Daley	15006123	3/19/2015	1700	Thu	Rear end	2	Property	Inattention	Clear	NB v. NB stopping in heavy traffic
125	Durham/Daley	15023700	9/23/2015	1800	Wed	Rear end	2	Property	Inattention	Clear	NB v. NB stopping in heavy traffic
126	Durham/Dunns Bridge	14027100	11/18/2014	2100	Tue	Rear end	2	Property	Following Too Closely	Clear	SB v. SB that stopped suddenly for deer
127	Durham/Dunns Bridge	15006299	3/21/2015	1600	Sat	Rear end	2	Property	Inattention	Clear	SB v. SB waiting for LT onto Dunns Bridge
128	Durham/Dunns Bridge	15028299	11/20/2015	1800	Fri	Sideswipe	2	Property	Misjudgment	Clear	NB v. SB that encroached while overtaking stopped FedEx truck
129	Durham/Grapevine	13003313	2/9/2013	1500	Sat	Fixed object	1	Property	Speed (road conditions)	Snow	SB making RT onto Grapevine, slides into sign post
130	Durham/Grapevine	14003410	2/11/2014	1700	Tue	Angle	2	Fatal	Failure to yield	Clear	EB making LT from Grapevine FTY to SB
131	Durham/Grapevine	14003998	2/19/2014	1600	Wed	Fixed object	1	Property	Speed (road conditions)	Snow	SB making RT onto Grapevine, slides into sign post
132	Durham/Grapevine	14021475	9/9/2014	2100	Tue	Angle	2	Property	Failure to yield	Clear	EB making LT from Grapevine FTY to NB
133	Durham/Grapevine	14024066	10/12/2014	1100	Sun	Angle	2	Property	Failure to yield	Clear	EB making LT from Grapevine FTY to SB
134	Durham/Grapevine	15014365	6/17/2015	1400	Wed	Fixed object	1	Property	Inattention	Clear	Veh on shoulder backs into sign post
135	Durham/Mast	13002475	1/29/2013	0800	Tue	Angle	2	Property	Speed (road conditions)	Snow	NB making RT onto Mast slides, strikes WB stopped at red light
136	Durham/Mast	13003139	2/6/2013	2100	Wed	Head on	2	Injury	Failure to yield	Clear	NB making permissive LT onto Mast FTY to SB
137	Durham/Mast	13007098	3/27/2013	1500	Wed	Rear end	2	Property	Inattention	Clear	SB v. SB waiting for left turn
138	Durham/Mast	13008117	4/7/2013	1500	Sun	Rear end	2	Property	Inattention	Clear	SB v. SB stopped in traffic
139	Durham/Mast	13009646	4/24/2013	1100	Wed	Rear end	2	Property	Inattention	Clear	NB v. NB stopped in traffic
140	Durham/Mast	14022590	9/23/2014	0700	Tue	Rear end	2	Property	Inattention	Clear	NB v. NB stopped in line of traffic at light
141	Durham/Mast	15000930	1/12/2015	0800	Mon	Rear end	2	Property	FTY/Follow Too Close	Clear	NB v. NB stopped in traffic (stopped short for SB veh FTY making LT)
142	Durham/Mast	15011181	5/15/2015	1500	Fri	Rear end	2	Property	Following Too Closely	Clear	SB v. SB stopped in traffic
143	Durham/Mast	15016042	7/6/2015	1600	Mon	Sideswipe	2	Property	Improper turn	Clear	SB making LT onto Mast strikes WB waiting at red light
144	Durham/Mast	15016318	7/9/2015	1000	Thu	Rear end	2	Property	Inattention	Clear	NB v. NB stopped in traffic
145	Durham/Mast	15026102	10/23/2015	0800	Fri	Rear end	2	Property	Following Too Closely	Clear	SB v. SB stopped in traffic
146	Durham/Mast	15031340	12/29/2015	1100	Tue	Fixed object	1	Property	Weather conditions	Snow	SB skids to avoid stuck car, strikes utility pole
147	Durham/Sylvan	13013058	6/1/2013	1000	Sat	Rear end	2	Property	Following Too Closely	Clear	SB v. SB stopping for LT onto Sylvan
148	Durham/Sylvan	15015410	6/30/2015	0800	Tue	Rear end	3	Property	Following Too Closely	Clear	SB v. SB stopping for LT onto Sylvan