

ROAD SAFETY AUDIT

Chandler Street Corridor

City of Worcester

August 4, 2020

Prepared For:
MassDOT



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Background

The Federal Highway Administration (FHWA), defines a Road Safety Audit (RSA) as the formal safety examination of an existing or future road or intersection by an independent, multidisciplinary team. The purpose of an RSA is to identify potential safety issues and possible countermeasures to improve safety considering all roadway users. As part of the Massachusetts Department of Transportation's (MassDOT) Road Safety Audit guidelines, RSAs are required for Highway Safety Improvement Program (HSIP) eligible locations and should be conducted prior to the development of the 25-percent design submission or prior to the submission of a Draft Environmental Impact Report for a project of regional impact. This RSA evaluates the portion of the Chandler Street corridor between Hadwen Road and the Chandler Magnet Elementary School in Worcester, Massachusetts, as shown in Figure 1. The intersection of Chandler Street and May Street (north) has been identified by MassDOT as HSIP High Crash Clusters for 2015-2017. A HSIP-eligible location is defined as a crash cluster based on crash incidence and severity that ranks within the top 5% of each Regional Planning Agency (Central Massachusetts Regional Planning Commission (CMRPC) for this location).

Project Data

A Road Safety Audit was conducted for the Chandler Street corridor on August 4, 2020. The RSA was held over teleconference due to the COVID-19 crisis. A copy of the agenda for the meeting is provided in Appendix A. The road safety audit team, as shown in Table 1, which was comprised of representatives from State, Regional, and local agencies as well as advocacy groups (Walk/Bike Worcester), included a cross-section of engineers and planners. Input was also solicited from emergency responders. A complete list of the contact information of all attendees can be found in Appendix B.

Table 1: Participating Audit Team Members

Audit Team Member	Agency/Affiliation
Brian Pigeon	Worcester Planning
Stephen Rolle	Worcester Planning
Gerald Powers	Walk/Bike Worcester
Yahaira Graxirena	Central Massachusetts Regional Planning Commission - CMRPC
Ana Fill	MassDOT Traffic & Safety
Kevin Fitzgerald	MassDOT Traffic & Safety
Ranjit Sivasubra	MassDOT Traffic & Safety
Alolade Campbell	MassDOT District 3
Nahrin Sangkagalo	CMRPC
Carl Herrin	Worcester State University
Matt Chase	VHB
Greg Russell	VHB
Jesse DiPersio	VHB
Amanda Bazinet	VHB
Peng Xu	Intern - MassDOT
Lieutenant Timothy Walsh	Worcester Police Department*
Captain Tom Bull	Worcester Fire Department*
Ali Khorasani	Worcester DPW&P – Traffic Engineering*

*Participants were unable to attend the audit meeting but provided input and comments on the draft report issued.

Prior to the meeting, VHB distributed a copy of the agenda, crash diagrams, crash summary tables, and video footage (with 360 degrees capability) of the corridor to all RSA attendees. Crash diagrams and summary tables for 2016-2018 crash data were compiled from local police crash reports obtained from the Worcester Police Department (WPD) and Massachusetts Department of Transportation (MassDOT). All attendees were encouraged to visit the study area intersection prior to the meeting.

The teleconference meeting started with a brief description of the agenda of the RSA meeting, followed by introductions and a description of the RSA process. During the pre-audit meeting, using the crash materials provided in advance, VHB facilitated the discussion of existing safety issues with all RSA attendees. RSA attendees were encouraged to bring their local knowledge and expertise to the discussion on existing safety and operational issues for the study area corridor.

Following the pre-audit meeting, the audit team watched video footage of the corridor to identify additional safety concerns. After watching the footage, the team discussed potential solutions, ranging from short-term to long-term, and low cost to high cost countermeasures for each identified safety concern.

As directed by MassDOT, additional comments were solicited from emergency responders and the City of Worcester Traffic Engineering Department. Assistant Director of Engineering, Ali Khorasani, Captain Tom Bull of the Worcester Fire Department and Lieutenant Timothy Walsh from the Worcester Police

Department were contacted after the virtual meeting and their comments were incorporated as part of this report.

Project Location and Description

Roadways

Chandler Street is a portion of Route 122, which runs northwest to southeast across the state of Massachusetts. The Chandler Street corridor within the study area is classified as an urban principal arterial under the City of Worcester's jurisdiction. Land use along Chandler Street within the study area is a mixture of residential and educational uses, including the main access to Worcester State University and the Chandler Magnet Elementary School. During the study period, Chandler Street was restriped. Previously, Chandler Street was striped for one wide lane in each direction. There was no bike lane striping in the previous geometry. The southern May Street intersection was largely unstructured, besides a raised median which remains today. With the updated striping, Chandler Street within the study area maintains one travel lane in each direction, except for a brief section where the southeast bound lane splits into two before diverging with one lane continuing left along Chandler Street and the other lane continuing onto May Street. Between the May Street intersections, there is a striped median dividing Chandler Street. There is also a large triangular striped median dividing the lane to continue left along Chandler Street from the lane continuing onto May Street. There is now a larger striped median area around the existing raised median. Pedestrian and bicycle accommodations are provided along both sides of the Chandler Street corridor, with eight crosswalks crossing Chandler Street in the study area and 4 crosswalks crossing side streets. There is striping to accommodate on street parking along both sides of Chandler Street from the northern limit of the study area to the southern May Street Intersection. The Worcester Regional Transit Authority (WRTA) routes 2, 3, and 6 services this area with six stops within the study area. Because the study area is considered thickly settled, the speed limit is 30 MPH.

May Street runs north to south and intersects Chandler Street at two locations within the study area. May Street is classified as an urban collector under the City of Worcester jurisdiction. Land use along May Street is mostly residential and educational. The May Street Elementary School is located on the south leg of May Street along with an entrance to Worcester State University. May Street provides one travel lane in each direction and sidewalks are provided, with the exception of a portion of the west side sidewalk north of the Chandler Street intersection. There is one crosswalk along May Street at the northern Chandler Street intersection. From the southern Chandler Street intersection through the Hamill Road intersection there are a total of six crosswalks- two at the Chandler Street intersection, one at the Hamill Road intersection, and three midblock crossings between. There are no bicycle accommodations along May Street. There is a designated school zone posted with a speed limit of 20 MPH along the southern portion of May Street adjacent to the May Street Elementary School.

Intersections

At the northern intersection of Chandler Street and May Street, Chaplin Square, the two roads meet at a Y intersection, with a stop sign on May Street. There is only one lane of travel in both the northwest and southeast travel directions of Chandler Street, with no exclusive turning lanes at the May Street intersection. While there is no striping delineating turning lanes on May Street, the curb cut is wide

enough to accommodate three lanes of traffic for vehicles turning left or right onto Chandler Street, as well as traveling across Chandler Street to the Worcester State University driveway. This driveway is entrance only. There is on street parking along both sides of May Street at this intersection, as well as along the western side of Chandler Street and on both sides of Chandler Street south of the intersection. Sidewalks are provided along all legs of the intersection except the western side of May Street. An uncontrolled crosswalk is provided only across the May Street approach to the intersection. Bicycle accommodations are provided through the Chandler Street portion of the intersection.

Claridge Drive intersects Chandler Street at a T intersection, with a stop sign on Claridge Drive. There is only one lane of travel in both the northwest and southeast travel directions along Chandler Street, with no exclusive turning lanes at the Claridge Drive intersection. A wide painted median is present on Chandler Street. Claridge Drive also provides only one shared right/left turn lane. There is on street parking along both sides of Chandler Street at this intersection. There is resident only on street parking along the southern side of Claridge Drive, with no on street parking permitted along the northern side of the roadway. Sidewalks are provided along all legs of the intersection except the northern side of Claridge Drive. Uncontrolled crosswalks are provided across all legs of the intersection. Bicycle accommodations are provided through the Chandler Street portion of the intersection. There is a southbound WRTA bus stop on Chandler Street directly across from Claridge Drive and a northbound stop north of the intersection.

At the southern intersection of Chandler Street and May Street, the two roads meet at a Y intersection, with a stop sign on May Street. The Chandler Street southeast bound approach provides a through lane and a right turn lane. Lanes are channelized with striping only. The Chandler Street northwest bound approach provides a shared left/through lane. The May Street approach provides a left-turn lane and a right-turn lane. Also located at this intersection is a Worcester State University parking lot (Parking Lot Q). Vehicles may access Parking Lot Q through an entrance/exit driveway across from May Street, or through an entrance/exit driveway further south on Chandler Street. There is on street parking along both sides of Chandler Street north of the intersection, as well as along the western side of Chandler Street south of the intersection. There is on street parking along both sides of May Street at this intersection. Sidewalks are provided along all legs of the intersection. Uncontrolled crosswalks are provided across both Chandler Street and across May Street. Bicycle accommodations are provided on the northwestern portion of the Chandler Street approach, but do not continue to the southeast on either Chandler Street or May Street.

Hadwen Road and Hamill Road meet Chandler Street at a four-way signalized intersection. All four approaches to the intersection provide one shared left/through/right-turn lane. Parking is not permitted within 50' of the intersection along either side of any leg. Pedestrian accommodations are provided across all four approach legs, with push buttons and solid hand/person walk signals. It is noted that the crosswalk across Hamill Road is no longer visible. Bicycle accommodations are not provided. There are two WRTA bus stops along Chandler Street at this intersection- one WRTA stop is located on the west side of Chandler Street north of the intersection, and the other is located on the east side of Chandler Street south of the intersection.

Hamill Road intersects May Street at a stop controlled T intersection. There is only one lane of travel in both the north and south travel directions along May Street, with no exclusive turning lanes at the Hamill Road intersection. Hamill Road also provides only one shared right/left turn lane. Parking is not permitted within 50' of the intersection along either side of any leg. Sidewalks are provided along all legs of the intersection. An uncontrolled crosswalk is provided across Hamill Road and across May Street south of the intersection. Bicycle accommodations are not provided.

Crash Data

Crash data provided by Worcester Police Department and MassDOT show 63 crashes occurred along the Chandler Street corridor from January 2016 through December 2018. Crash data summaries and collision diagrams are provided in the Appendix.

Chandler Street at May Street (Northern Intersection) (Chaplin Square)

The most prevalent crash types at the Chandler Street at May Street (northern) intersection were left turn crashes, accounting for 46% of the total crashes at the intersection. Out of the reported left turn crashes, the most frequent incident involved a northwest bound vehicle along Chandler Street striking a vehicle turning left when leaving May Street (4 instances). The second most prevalent crash type at the intersection were fixed object crashes, accounting for 31% of the total crashes at the intersection. There were no reported crashes involving pedestrians or bicyclists during the three-year period (2016 to 2018).

92% of crashes at Chandler Street at May Street (northern) intersection occurred during daylight periods and 69% of crashes occurred when the roadway surface was dry. Additionally, May, July, and October were the months with the highest number of crashes (each with 23%). The time period with the most crashes was from 8 am to 12 pm (50%). 23% of crashes involved an injury.

Chandler Street at Claridge Drive

The most prevalent crash type at the Chandler Street at Claridge Drive intersection were rear end crashes involving vehicles stopping for a pedestrian at a crosswalk, accounting for 67% of the total crashes at the intersection. The two most frequent crash incidents to occur involved a southeast bound vehicle along Chandler Street rear-ending another southeast bound travelling vehicle at a crosswalk (2 instances) and a northwest bound vehicle on Chandler Street rear-ending another northwest bound travelling vehicle at a crosswalk (2 instances). In late 2017, the Chandler Street at Claridge Drive intersection was restriped. Prior to the restriping, all crashes within the three-year period studied occurred north of Claridge Drive. Following the restriping, all crashes within the three-year period studied occurred south of Claridge Drive. One crash involved a bicyclist at the intersection during the three-year period (2016 to 2018). While no pedestrians were physically involved in crashes at this location, four crashes did involve rear-ends due to vehicles stopping for pedestrians in crosswalks.

83% of crashes at the Chandler Street at Claridge Drive intersection occurred during daylight and 100% of crashes occurred when the roadway surface was dry. Additionally, July was the month with the highest number of crashes (with 33%). The time period with the most crashes was from 4 pm to 7 pm (50%). 67% of crashes involved an injury.

Chandler Street at May Street (Southern Intersection)

The most prevalent crash type at the Chandler Street at May Street (southern) intersection were left turn crashes, accounting for 64% of the total crashes at the intersection. The second most prevalent crash type at the intersection were rear end crashes, accounting for 29% of the total crashes. One of the most frequent crash incidents to occur involved a southeast bound vehicle along Chandler Street striking a vehicle turning left from May Street onto Chandler Street (3 instances). The other most frequent crash

incident to occur involved a vehicle traveling on May Street approaching the intersection rear-ending another vehicle on May Street at the stop sign (3 instances). While no pedestrians were struck in any crashes at the intersection during the three-year period (2016 to 2018), one collision was due to a vehicle stopping for a pedestrian in the crosswalk. There were no bicycle involved crashes at the intersection during the three-year period (2016 to 2018).

64% of crashes at the Chandler Street at May Street (southern) intersection occurred during daylight and 64% of crashes occurred when the roadway surface was dry. Additionally, September and November were the months with the highest number of crashes (each with 29%). The time period with the most crashes was from 4 pm to 7 pm (36%). 14% of crashes involved an injury.

Chandler Street at Hadwen Road and Hamill Road

The most prevalent crash type at the Chandler Street at Hadwen Road and Hamill Road intersection were rear-end crashes, accounting for 63% of the total crashes at the intersection. The second most prevalent crash type at the intersection were angle crashes, accounting for 26% of the total crashes. The most frequent crash incident to occur involved a southeast bound vehicle along Chandler Street rear-ending another southeast bound travelling vehicle at the signal (8 instances). No crashes involved a pedestrian or bicycle at the intersection during the three-year period (2016 to 2018).

79% of crashes at the Chandler Street at Hadwen Road and Hamill Road intersection occurred during daylight and 79% of crashes occurred when the roadway surface was dry. Additionally, January was the month with the highest number of crashes (with 21%). The time period with the most crashes was from 7 am to 12 pm (63%). 26% of crashes involved an injury.

May Street at Hamill Road

The May Street at Hamill Road intersection had three crashes, one was an angle crash with a vehicle turning left on to Hamill Road, one a collision with a fixed object, and one vehicle backing into another. No crashes involved a pedestrian or bicycle at the intersection during the three-year period (2016 to 2018).

Two thirds of crashes at the May Street at Hamill Road intersection occurred during daylight and 100% of crashes occurred when the roadway surface was dry. Additionally, November was the month with the highest number of crashes (with 67%). No crash involved an injury.

Figure 1: Locus Map – Chandler Street at May Street



Worcester State University - Planned Future Developments

Worcester State University (WSU) purchased the former Temple Emanuel building located at 280 May Street and has plans to remove the existing structures and construct a mixed-use space with classrooms and offices. It is anticipated the number of pedestrian crossings will substantially increase at this intersection once redevelopment has been completed. Advancement of this work is currently on hold due to the current economic situation and ongoing Covid 19 pandemic, but it is anticipated to be completed in the near-term.

WSU is considering plans for a 2-3 deck parking garage adjacent to the existing parking lot Q located on Chandler Street. This work may be completed within the next 5-7 years.

As an alternative to placing a parking garage at the existing parking lot Q, two other sites– on either side of Chandler Street, at the location of lot O (Wellness Center lot) or across the street at 535 Chandler Street– are potential options. Neither site is considered likely in the coming 10 years.

Audit Observations and Potential Safety Enhancements

During the RSA meeting, a brief introduction of the RSA process was presented to the audit team members. Following this brief presentation, the members of the audit team were asked to discuss the existing issues that may affect safety at the intersection using the provided crash data and summaries. The audit team then watched footage of the study area intersections, at which time observations of various safety concerns and deficiencies were identified and documented. Provided below is a list of the safety concerns that were identified during the RSA for the intersections along with potential enhancements identified during the RSA.

Chandler Street at Chandler Magnet School

Safety Issue #1: On-Street Parking and Pedestrian/ Bicycle Accommodations

Audit team members noted that motorists utilize the fire lane in front of the Gosh building and park in the hatched areas where diagonal parking is prohibited. A crash resulting from a vehicle attempting to turn into this restricted parking area was recorded within the study period. Three rear end collisions occurred due to vehicles stopping for pedestrians on the crosswalk. Although there is advance pedestrian warning signage and a flashing beacon located at the midblock crossing adjacent to the north entrance of the WSU campus and in front of Chandler Magnet School, the pedestrians do not always activate the beacons before crossing. Although there are curb extensions at this crosswalk location, the illegal on street parking adjacent to the bumpouts still limit visibility. Additionally, insufficient lighting at this location also limits pedestrian visibility. Due to a lack of bike lane signage some motorists have been observed to be parked in the striped bicycle lane. While sidewalks are present along both sides of the roadway at this location, there is a gap in accessibility in front of a red garage on the northeast side of Chandler Street.

Potential Enhancements:

- Discourage illegal diagonal parking near the ball field by adjusting curb line.
- Consider on-street angle parking to alleviate the parking issues and provide legal alternatives. (It was noted that this option would not be supported by the City, whose policy discourages diagonal on-street parking.)
- Improve signage and striping to better define parking regulations and ensure that sight distance is maintained.
- Consider left turn lane into northern parking lot at Worcester State University.
- Provide bicycle lane signage to clarify bicycle lane use.
- Evaluate making sidewalk ADA compliant
- Educate pedestrians, particularly WSU students and Chandler Magnet School parents, on the use of RRFBS

Chandler Street at May Street (Northern Intersection) (Chaplin Square)

Safety Issue #1: Intersection Geometry

Audit team members noted several issues with the geometry of this intersection. It was noted that the May Street opening is over 100' wide with space for multiple vehicles to wait at the stop bar to turn, however no striping is currently provided to direct turning vehicles. May Street intersects Chandler Street at a curve in the Chandler Street baseline, limiting sight distance through the intersection. Additionally, the location of the stop line on May Street and on street parking close to the stop line limit the sight distance through the intersection. With reduced sight lines through the intersection, vehicles turning left out of May Street must cross two lanes of unrestricted traffic as well as a wide striped median. A majority of crashes at this location occurred when a vehicle traveling northwest on Chandler Street struck a vehicle making a left out of May Street. Audit team members also noted the potential for high speeds through this intersection along Chandler Street. Vehicles turning right onto May Street do not need to slow down to complete the turn due to the large radius at this corner of the intersection, which can make it more difficult for vehicles to gage the gaps to exit May Street. Additionally, it was noted that, while it functions as an entrance only driveway, the Worcester State University driveway located across May Street at this intersection is narrow and can occasionally be obstructed by on street parking. While no crashes were noted specifically to have involved movements at this driveway, its location still contributes to the overall issues with intersection geometry.

Potential Enhancements:

- Evaluate the need for alternative traffic control at this intersection. Alternatives to be evaluated should include a roundabout and a traffic signal.
- Consider "T"ing up the May Street leg of the intersection to improve the existing sight lines for vehicles exiting May Street.
- Consider narrowing the May Street opening at the intersection to improve the existing sight lines for vehicles exiting May Street, eliminate confusion on lane usage, and reduce the crossing distance for pedestrians.
- Consider adding a left turn lane on Chandler Street.
- Provide additional distinctions where parking is currently restricted on Chandler Street, including signage or pavement markings to improve the existing sight lines.
- Better define left, thru and right turning movements from May Street onto Chandler Street with pavement markings.
- Reduce curb radii at the intersection to promote slower turning speeds and reduce the crossing distance for pedestrians crossing May Street.
- Evaluate closing the Worcester State University driveway entrance opposite May Street.
- Evaluate curb extensions at the Worcester State University driveway entrance to preclude blockage by illegally parked vehicles.

Safety Issue #2: Pedestrian and Bicycle Accommodations

Audit team members noted that, due to its proximity to several schools, the Chandler Street at May Street intersection is a high pedestrian area. It was noted students commuting to Worcester State University will utilize on street parking along May Street and then be required to cross Chandler Street to access Worcester State University campus buildings. Currently, no crosswalks are provided across Chandler

Street. The crosswalk that is provided across May Street is very wide, at approximately 120', increasing pedestrian exposure through the intersection. Additionally, no sidewalk is provided on the north side of May Street. While bicycle lanes are provided along both sides of Chandler Street through this intersection, signage identifying the bicycle lanes as such is lacking. During the three-year study period (2016 to 2018), no pedestrian or bicycle involved crashes were recorded at this intersection.

Potential Enhancements:

- Consider providing crosswalks across Chandler Street to accommodate pedestrian desire lines.
- If crosswalks are implemented, evaluate the need for RRFB, lighting, enhanced signage, or raised crosswalks.
- If crosswalks are implemented, consider a raised pedestrian refuge on Chandler Street.
- If crosswalks are not provided across Chandler Street, evaluate restricting on-street parking on May Street or requiring resident permits.
- Consider supplemental bicycle lane markings and additional signage.
- Evaluate ways to shorten the pedestrian crossing distance on May Street, including whether providing a raised pedestrian refuge is feasible.
- Provide an ADA-compliant pedestrian path on the north side of May Street.

Chandler Street at Claridge Street

Safety Issue #1: Pedestrian and Bicycle Accommodations

It was noted during the audit that a pedestrian or bicyclist was present on all the crashes at the Chandler Street/ Claridge Street intersection. While crosswalks are provided across Chandler Street at this intersection, along with pedestrian signage at the crosswalks, advance signage is only provided in the northbound direction. It was also noted that Chandler Street is a wide roadway, and pedestrians in the crosswalks are only lit by overhead lighting lining the roadway. The area around the striped median of Chandler Street may not be well lit. While most of the crashes discussed at the audit occurred during daylight, there was one recorded incident of a driver striking a bicyclist in the crosswalk at night. Additionally, WRTA services this corridor with a bus stop located across from Chandler Street in this intersection. It is possible for pedestrians rushing to catch a bus to cross quickly in front of vehicles traveling along Chandler Street.

Potential Enhancements:

- Evaluate the need for rapid rectangular flashing beacons (RRFBs).
- Provide advanced warning signs to alert drivers to the crosswalk in the southbound direction of Chandler Street.
- Evaluate current lighting conditions at the intersection.
- Consider additional pedestrian scale lighting.

Safety Issue #2: Intersection Geometry

In late 2017, Chandler Street was restriped to provide a striped median and more lane definition south of Claridge Drive. Audit team members noted that prior to the restriping, all recorded crashes in the three-year time frame analyzed occurred north of Claridge Drive. Following the restriping, all recorded crashes within the 2016-2018 study time frame occurred south of Claridge Drive. Vehicles traveling through this

intersection have the perspective of a wide-open roadway. As indicated by the prevalence of rear-end crashes, vehicles traveling in either direction on Chandler Street are not prepared to stop quickly for pedestrians in the crosswalks which may be an indication of higher speeds coupled with the roadway geometry south of the intersection. While there were no crashes reported during the study period to be related to this issue, it was noted that there are sight distance issues relating to the baseline curve of Chandler Street and the presence of on street parking along Chandler Street at the Claridge Drive intersection. South of the intersection, Chandler Street southbound suddenly becomes two lanes, and it was noted that tapering may be inadequate. The abrupt geometry change may serve as a distraction for drivers that could prevent them from seeing pedestrians within the crosswalk.

Potential Enhancements:

- Consider making the Chandler Street at Claridge Drive intersection a tabled intersection or adding raised speed tables on Chandler Street.
- Evaluate the benefits of a pedestrian refuge versus a southbound left turn lane.
- Evaluate the pavement markings and signage for the lane divergence south of the intersection.
- Consider adding mountable aprons adjacent to a raised median or on the corners to visually narrow the roadway width while not impacting emergency response vehicles.
- Consider curb extensions to shorten pedestrian crossing distances across Chandler Street.
- Re-evaluate the striped taper on Chandler Street where travel lane splits. Consider new designs that feature a less abrupt lane taper.

Chandler Street at May Street (Southern Intersection)

Safety Issue #1: Intersection Geometry

Where May Street meets Chandler Street, May Street transitions abruptly from one lane before a crosswalk to two lanes after the crosswalk at the stop sign. A majority of crashes occurring at this intersection involved vehicles turning left. It is noted that sight distance may be obstructed due to curves through this intersection, as May Street meets Chandler Street at a skew which can contribute to angle and rear-end crashes. It was also noted that, despite the restriping initiative in 2017, the intersection still has a large footprint that may contribute to the frequency of angle crashes. Additionally, the intersection geometry is mostly defined by pavement markings, which may be difficult to see during inclement weather or outside daylight hours. 29% of crashes occurred during rain or snow and 36% during dark conditions.

Potential Enhancements:

- Evaluate traffic signal and roundabout options for a new intersection design.
- Improve sight lines by reducing the skew of the intersection.
- Consider a raised median or curbing to better define entrance to May Street.
- Consider adjusting westerly curb line to define Chandler Street as the primary through movement and reduce curb radii of May Street to better define entrance of May Street.
- Evaluate closing May Street between Hamill Road and Chandler Street. Improvements to Hamill Street and the Chandler Street at Hamill St intersection would need to be considered in conjunction with this measure.
- Evaluate realignment of May Street and Chandler Street to a "T" intersection.

- Evaluate WRTA and school bus route options in order to potentially restrict left-turns from Chandler Street to May Street.
- Evaluate the efficacy of a raised median or stamped concrete median to discourage travel over the painted median.

Safety Issue #2: Lighting

The current geometry at the Chandler Street at May Street (south) intersection includes a wide, triangular striped median. While street lighting exists along the west side of May Street and the east side of Chandler Street, there are currently no streetlights in front of the May Street Building at the corner of Chandler Street and May Street. It is noted that 36% of the crashes during the three-year study window occurred during dark-lighted conditions.

Potential Enhancements:

- Conduct an existing lighting evaluation and address any lighting deficiencies, in particular pedestrian scale lighting.
- Evaluate additional lighting for the crosswalks.

Safety Issue #3: Pedestrian and Bicycle Accommodations

It was noted that while an RRFB is currently present at the Chandler Street at May Street (south) intersection, pedestrians do not always utilize the RRFB when crossing. Additionally, it was noted that drivers do not always stop when the RRFB is flashing. Audit team members discussed future plans by WSU for the area surrounding the Chandler Street at May Street (south) intersection that include a high-volume parking lot or garage and a new temple structure. Both facilities have the potential to increase pedestrian travel at this location. Under the current conditions, bicycle lanes are only provided along Chandler Street north of the intersection. While there were no pedestrian or bicycle crashes reported at the intersection during the three-year study period, it was noted that a pedestrian in the crosswalk contributed to one rear-end crash.

Potential Enhancements:

- Evaluate the need for buffered bicycle lanes or a separated shared use path on Chandler Street.
- Evaluate converting the painted median into a planted raised median on Chandler Street.
- Provide educational programs for students and drivers on the usage of RRFBs.

Chandler Street at Hamill Road and Hadwen Road

Safety Issue #1: Intersection Visibility and Traffic Operations

Audit team members noted that a majority of crashes occurring at the Chandler Street at Hamill Road and Hadwen Road intersection were rear-end crashes. It was also noted that under current conditions, the traffic signals at this location are post mounted, lack retroreflective backplates, and can become buried within tree branches making them difficult to see. Glare was mentioned as a contributing factor in three crashes reported at this location during the three-year study period. Poor signal visibility and the limited number of signals north of the intersection may contribute to southbound drivers not expecting a signal at

this location and may have contributed to the frequency of rear-end crashes and red light running at this location. Hadwen Road and Hamill Road are currently offset from one another at the intersection, with Hadwen Road approaching at a “Y” intersection and the westbound lane of Hamill Road aligning with the eastbound lane of Hadwen Road. The intersection alignment may have contributed to the crashes involving left-turns from Hadwen Road with through vehicles from Hamill Road. Additionally, it was noted that vehicles turning left from Chandler Street on to Hadwen Road do so at higher speeds. There is currently no exclusive left turn lane at this intersection and only a permissive phase, therefore vehicles stop before making a turn, which may also contribute to the frequency of rear-end crashes.

Potential Enhancements:

- Consider implementing mast arms.
- Consider implementing retroreflective backplates.
- Consider a realignment of Hadwen Road and Hamill Road to a more squared four-way intersection.
- Consider striping to improve travel lane definition along Hamill Road.
- Better define travel lane configurations on Chandler Street through pavement markings.
- Evaluate the need for exclusive left turn lanes from Chandler Street onto Hadwen Road and Hamill Road.
- Consider protected or protected/permissive phase for left turns.
- Consider time of day turn restrictions and/or other methods to discourage use of Hadwen Road as cut-through such as improving left-turns from Chandler Street to June Street
- Consider installing signal ahead signage on Chandler Street.

Safety Issue #2: Pedestrian and Bicycle Accommodations

It is noted that, while there are wheelchair ramps at either side of Hamill Road, there is currently no visible striping defining a crosswalk. The crosswalk currently provided across Chandler Street is set back south of the intersection. The crosswalk currently provided across Hadwen Road is approximately 70’ due to the skew of the roadway at the intersection. On street parking is allowed on all legs of the intersection. While no crashes at the intersection within the three-year study period involved a pedestrian, pedestrians waiting to cross within the wheelchair ramp may not be visible to drivers from behind parked vehicles. It is noted that there are no bicycle accommodations through the intersection, on any of the intersecting roadways and no bicycle crashes reported.

Potential Enhancements:

- Evaluate the need for bicycle lanes on Chandler Street on the approaches to the intersection. Consider striping bicycle lanes.
- Refresh pavement markings for crosswalk across Hamill Road. Consider other improvements to this crosswalk such as high visibility striping.
- Evaluate curb extensions on Chandler Street.
- Evaluate crosswalk locations and setbacks.

May Street at Hamill Road

Safety Issue #1: Intersection Geometry

The May Street elementary school is located on the westerly side of May Street. Vehicles, both parents and buses, pull off on the shoulder for pick-up and drop-off. It was noted that one crash has been reported to have occurred as a result of on street parking near the school.

Potential Enhancements:

- Consider making May Street at the southerly intersection of May Street at Chandler Street limited access.
- Consider adding bus bay in front of May Street Elementary School.

Corridor-Wide Study Area

Safety Issue #1: Pavement Markings and On-Street Parking

Audit team members noted that illegal parking has been regularly observed throughout the corridor. In addition, motorists are parking too close to driveway entrances and side streets, limiting sight distance at these locations. It was noted that throughout the three-year study period, six crashes were reported to have involved vehicles parked on-street. While there are currently signs and pavement markings to indicate proper and improper parking, it was also noted that the current measures are insufficient.

Potential Enhancements:

- Provide additional no parking signage or pavement markings near driveway entrances and side streets to discourage illegal parking.
- Evaluate restricting parking as necessary along Chandler Street to ensure adequate sight distance is provided.
- Conduct a comprehensive parking study to evaluate parking supply and demand and standardize parking designation.

Safety Issue #2: Pedestrian and Bicycle Accommodations

While ADA compliant sidewalks are provided throughout a majority of the study area, audit team members noted multiple locations where a sidewalk was not provided, particularly on side streets at the intersections. Throughout the study area, there are several midblock crossing locations. Even when an RRFB is present and functioning, it was noted that pedestrians did not always utilize the push button and that vehicles did not always stop when RRFBs were flashing to allow pedestrians to safely cross. Additionally, Chandler Street has a wide cross section for a two-lane roadway, with pedestrians traveling approximately 60' to cross the roadway. While there is a striped median, there are currently no pedestrian refuges. Streetlights are only provided along the sides of the roadway, leaving the middle of crosswalks poorly lit at night or during other low-light conditions. While no crashes during the study period were recorded to involve bicyclists, it was noted that vehicles tend to travel at high speeds on Chandler Street, potentially leaving bicyclists riding in the shoulder at greater risk.

Potential Enhancements:

- Provide a continuous ADA-compliant sidewalk along Chandler Street.
- Provide additional advance pedestrian warning.
- Consider the use of video detection for pedestrians instead of push button actuation.
- Enhance lighting along the corridor and consider pedestrian scale lighting at crosswalk locations.
- Consider the benefits of curb extensions or a median refuge at crosswalks.
- Consider a shared use path to provide separation between bicyclists and vehicles and minimize conflicts with on-street parking. Evaluate the impacts of a shared use path at the limits where transitioning to on-street bicycle accommodations.
- Evaluate protected bicycle lanes.

Safety Issue #3: Roadway Geometry

Under current conditions, Chandler Street and May Street are designed with wide travel lanes. Within the study area, Chandler Street and May Street are relatively straight roadways, and what curves do exist are smooth with large radii. Audit team members noted that, as a result of this geometry, vehicles traveling through the study area and continuing onto Chandler Street or May Street tended to travel at higher speeds than those recommended for the area per speed limits. It was also noted that there is a lack of street trees along the roadway through the study area, and that the addition of street trees may encourage drivers to execute greater caution.

Potential Enhancements:

- Evaluate traffic calming measures such as street trees, gateway treatments, identification of corridor as a University area among others.
- Consider plans for a long-term road diet project.

Summary of Road Safety Audit

Following the video footage and discussion of existing safety issues, audit team members were asked to consider various safety related improvements. The audit team members were encouraged to consider both short-term and long-term improvements for each of the existing safety issues. Each improvement considered has been categorized as short-term, mid-term, or long-term based on the definitions shown in Table 2. Additionally, a cost category has been assigned to each improvement based on the parameters set forth in Table 2. The safety payoff is a subjective judgement of the potential effectiveness of the safety recommendations listed below. Note: if a potential enhancement is under evaluation or consideration it will be listed as mid-term because the assessment must be finished before the project design is completed.

Table 2: Estimated Time Frame and Costs Breakdown

Short-Term	<1 Year	Low	≤\$10,000
Mid-Term	1-3 Years	Medium	\$10,001-\$50,000
Long-Term	>3 Years	High	>\$50,000

A list of each potential safety enhancement for each intersection are provided below in Tables 3 – 7.

Table 3: Potential Safety Enhancement Summary – Chandler Street at Chandler Magnet School

Table 3: Potential Safety Enhancement Summary - Chandler Street at Chandler Magnet School					
Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
On-Street Parking and Pedestrian/ Bicycle Accommodations	Discourage illegal diagonal parking near the ball field by adjusting curb line.	Medium	Long-Term	High	City of Worcester
	Consider on-street angle parking to alleviate the parking issues and provide legal alternatives. (It was noted that this option would not be supported by the City, whose policy discourages diagonal on-street parking.)	Low	Mid-Term	Medium	City of Worcester
	Improve signage and striping to better define regulations and ensure that sight distance is maintained.	Medium	Short-Term	Low	City of Worcester
	Consider left turn lane into northern parking lot at Worcester State University	Medium	Mid-Term	Medium	City of Worcester
	Provide bicycle lane signage to clarify bicycle lane use.	Low	Short-Term	Low	City of Worcester

Table 4: Potential Safety Enhancement Summary – Chandler Street at May Street (north)

Table 4: Potential Safety Enhancement Summary - Chandler Street at May Street Northern Intersection (Chaplin Square)					
Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Intersection Geometry	Evaluate the need for alternative traffic control at this intersection. Alternatives to be evaluated should include a roundabout and a traffic signal.	High	Long-Term	High	City of Worcester
	Consider “T”ing up the May Street leg of the intersection to improve the existing sight lines for vehicles exiting May Street.	Medium	Mid-Term	High	City of Worcester
	Consider narrowing the May Street opening at the intersection to improve the existing sight lines for vehicles exiting May Street, eliminate confusion on lane usage, and reduce the crossing distance for pedestrians.	Medium	Mid-Term	High	City of Worcester
	Consider adding a left turn lane on Chandler Street	Medium	Short-Term	Low	City of Worcester
	Provide additional distinctions where parking is currently restricted on Chandler Street, including signage or pavement markings.	Medium	Short-Term	Low	City of Worcester
	Better define left, thru and right turning movements from May Street onto Chandler Street with pavement markings.	Medium	Short-Term	Low	City of Worcester
	Reduce curb radii at the intersection to promote slower turning speeds and reduce the crossing distance for pedestrians crossing May Street.	Medium	Mid-Term	Medium	City of Worcester
	Evaluate closing the Worcester State University driveway entrance opposite May Street.	Low	Short-Term	Low	City of Worcester
	Evaluate curb extensions at the Worcester State University driveway entrance to preclude blockage by illegally parked vehicles.	High	Mid-Term	Medium	City of Worcester

Table 4: Potential Safety Enhancement Summary – Chandler Street at May Street (north) (cont'd)

Table 4: Potential Safety Enhancement Summary - Chandler Street at May Street Northern Intersection (Chaplin Square) (Cont'd)					
Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Pedestrian & Bicycle Accommodations	Consider providing crosswalks across Chandler Street to accommodate pedestrian desire lines.	Medium	Mid-Term	Low	City of Worcester
	If crosswalks are implemented, evaluate the need for RRFB, lighting, enhanced signage, or raised crosswalks	Medium	Mid-Term	Medium	City of Worcester
	If crosswalks are implemented, consider a raised pedestrian refuge on Chandler Street.	Medium	Mid-Term	Medium	City of Worcester
	Consider supplemental bicycle lane markings and additional signage.	Low	Short-Term	Low	City of Worcester
	Evaluate ways to shorten the pedestrian crossing distance on May Street, including whether providing a raised pedestrian refuge is feasible.	Medium	Mid-Term	Medium	City of Worcester
	Provide an ADA-compliant pedestrian path on the north side of May Street.	High	Long-Term	Medium	City of Worcester
	If crosswalks are not provided across Chandler Street, evaluate restricting on-street parking on May Street or requiring resident permits.	Medium	Mid-Term	Low	City of Worcester

Table 5: Potential Safety Enhancement Summary – Chandler Street at Claridge Drive

Table 5: Potential Safety Enhancement Summary - Chandler Street at Claridge Drive					
Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Pedestrian & Bicycle Accommodations	Evaluate the need for rapid rectangular flashing beacons (RRFBs).	High	Mid-Term	Medium	City of Worcester
	Provide advanced warning signs to alert drivers to the crosswalk in the southbound direction of Chandler St.	Medium	Short-Term	Low	City of Worcester
	Evaluate current lighting conditions at the intersection.	High	Mid-Term	High	City of Worcester
	Consider additional pedestrian scale lighting.	High	Mid-Term	High	City of Worcester
Intersection Geometry	Consider making the Chandler Street at Claridge Drive intersection a tabled intersection or adding raised speed tables on Chandler Street.	Medium	Long-Term	High	City of Worcester
	Evaluate the benefits of pedestrian refuge versus a southbound left turn lane.	Medium	Short-Term	Low	City of Worcester
	Evaluate the pavement markings and signage for the lane divergence south of the intersection.	Medium	Short-Term	Low	City of Worcester
	Consider adding mountable aprons adjacent to a raised median or on the corners to visually narrow the roadway width while not impacting emergency response vehicles.	Low	Mid-Term	Medium	City of Worcester
	Consider curb extensions to shorten pedestrian crossing distances across Chandler Street.	High	Mid-Term	Medium	City of Worcester
	Re-evaluate the striped taper on Chandler Street where travel lane splits. Consider new designs that feature a less abrupt lane taper.	Medium	Short-Term	Low	City of Worcester

Table 6: Potential Safety Enhancement Summary - Chandler Street at May Street (south)

Table 6: Potential Safety Enhancement Summary - Chandler Street at May Street Southern Intersection					
Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Intersection Geometry	Evaluate traffic signal and roundabout options for a new intersection design.	High	Long-Term	High	City of Worcester
	Improve sight lines by reducing the skew of the intersection.	Medium	Long-Term	High	City of Worcester
	Consider a raised median or curbing to better define entrance to May Street.	Medium	Mid-Term	Medium	City of Worcester
	Consider adjusting westerly curb line to define Chandler Street as the primary through movement and reduce curb radii of May Street to better define entrance of May Street.	High	Long-Term	High	City of Worcester
	Evaluate closing May Street between Hamill Road and Chandler Street. Improvements to Hamill Street and the Chandler Street at Hamill Street intersection would need to be considered in conjunction with this measure.	High	Long-Term	High	City of Worcester
	Evaluate realignment of May Street and Chandler Street to a "T" intersection.	Medium	Mid-Term	High	City of Worcester
	Evaluate WRTA and school bus route options in order to potentially restrict left-turns from Chandler Street to May Street.	High	Mid-Term	Medium	City of Worcester
	Evaluate the efficacy of a raised median or stamped concrete median to discourage travel over the painted median.	Medium	Short-Term	Medium	City of Worcester
Lighting	Conduct an existing lighting evaluation and address any lighting deficiencies in particular pedestrian scale lighting.	High	Mid-Term	High	City of Worcester

Table 6: Potential Safety Enhancement Summary – Chandler Street at May Street (south) (cont’d)

Table 6: Potential Safety Enhancement Summary - Chandler Street at May Street Southern Intersection (cont'd)					
Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Lighting	Evaluate additional lighting for the crosswalks.	High	Mid-Term	High	City of Worcester
Pedestrian & Bicycle Accommodations	Evaluate the need for buffered bicycle lanes or a separated shared use path on Chandler Street.	High	Long-Term	High	City of Worcester
	Evaluate converting the painted median into a planted raised median on Chandler Street.	Medium	Long-Term	High	City of Worcester
	Provide educational programs for students and drivers on the usage of RRFBs.	Low	Short-Term	Low	City of Worcester

Table 7: Potential Safety Enhancement Summary - Chandler Street at Hamill Road & Hadwen Road

Table 7: Potential Safety Enhancement Summary - Chandler Street at Hamill Road & Hadwen Road					
Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Intersection Visibility & Traffic Operations	Consider implementing mast arms.	High	Long-Term	High	City of Worcester
	Consider implementing retroreflective backplates.	Medium	Short-Term	Low	City of Worcester
	Consider a realignment of Hadwen Road and Hamill Road to a more squared four-way intersection.	Medium	Long-Term	High	City of Worcester
	Consider striping to improve travel lane definition along Hamill Road.	Medium	Short-Term	Low	City of Worcester
	Better define travel lane configurations on Chandler Street through pavement markings.	Medium	Short-Term	Low	City of Worcester
	Evaluate the need for exclusive left turn lanes from Chandler Street onto Hadwen Road and Hamill Road.	Medium	Short-Term	Low	City of Worcester
	Consider protected or protected/permissive phase for left turns.	High	Mid-Term	Medium	City of Worcester
	Consider time of day turn restrictions and/or other methods to discourage use of Hadwen Road as cut-through.	Medium	Mid-Term	Low	City of Worcester
	Consider installing signal ahead signage on Chandler Street	Medium	Short-Term	Low	City of Worcester

Table 7: Potential Safety Enhancement Summary - Chandler Street at Hamill Road & Hadwen Road (cont'd)

Table 7: Potential Safety Enhancement Summary - Chandler Street at Hamill Road & Hadwen Road (cont'd)					
Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Pedestrian & Bicycle Accommodations	Evaluate the need for bicycle lanes on Chandler Street on the approaches to the intersection. Consider striping bicycle lanes.	Medium	Mid-Term	Medium	City of Worcester
	Refresh pavement markings for crosswalk across Hamill Road. Consider other improvements to this crosswalk such as high visibility striping.	High	Short-Term	Low	City of Worcester
	Evaluate curb extensions on Chandler Street.	High	Mid-Term	Medium	City of Worcester
	Evaluate crosswalk locations and setbacks.	High	Mid-Term	Medium	City of Worcester

Table 8: Potential Safety Enhancement Summary - May Street at Hamill Road

Table 8: Potential Safety Enhancement Summary - May Street at Hamill Road					
Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Intersection Geometry	Consider making May Street at the southerly intersection of May Street at Chandler Street limited access.	Low	Mid-Term	Low	City of Worcester
	Consider adding bus bay in front of May Street Elementary School.	Medium	Mid-Term	Medium	City of Worcester

Table 9: Potential Safety Enhancement Summary – Corridor-Wide Study Area

Table 9: Potential Safety Enhancement Summary - Corridor-Wide Study Area					
Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Pavement Markings and On-Street Parking	Provide additional no parking signage or pavement markings near driveway entrances and side streets to discourage illegal parking.	Medium	Short-Term	Low	City of Worcester
	Evaluate restricting parking in more locations along Chandler Street to ensure adequate sight distance is provided.	Medium	Mid-Term	Low	City of Worcester
	Conduct a comprehensive parking study to evaluate parking supply and demand and standardize parking designation.	Medium	Short-Term	Low	City of Worcester
Pedestrian & Bicycle Accommodations	Provide a continuous ADA-compliant sidewalk along Chandler Street.	High	Long-Term	High	City of Worcester
	Provide additional advance pedestrian warning.	High	Short-Term	Low	City of Worcester
	Consider the use of video detection for pedestrians instead of push button actuation.	High	Long-Term	High	City of Worcester
	Enhance lighting along the corridor and consider pedestrian scale lighting at crosswalk locations.	High	Mid-Term	High	City of Worcester
	Consider the benefits of curb extensions or a median refuge at crosswalks.	High	Mid-Term	Medium	City of Worcester
	Consider a shared use path to provide separation between bicyclists and vehicles and minimize conflicts with on-street parking. Evaluate the impacts of a shared use path at the limits where transitioning to on-street bicycle accommodations.	High	Long-Term	High	City of Worcester
	Evaluate protected bicycle lanes.	High	Long-Term	High	City of Worcester

Table 9: Potential Safety Enhancement Summary – Corridor-Wide Study Area (cont'd)

Table 9: Potential Safety Enhancement Summary - Corridor-Wide Study Area (cont'd)					
Safety Issue	Potential Safety Enhancement	Safety Payoff	Time Frame	Cost	Jurisdiction
Roadway Geometry	Evaluate traffic calming measures such as street trees, gateway treatments, identification of corridor as a University area, among others.	Medium	Long-Term	Medium	City of Worcester
	Consider plans for a long-term road diet project.	High	Long-Term	High	City of Worcester

Appendix A. RSA Meeting Agenda

Agenda

Road Safety Audit

Worcester, MA

**Chandler Street (Route 122) at May Street and
Chandler Street (Route 122) at Claridge Drive**

Meeting Location: Virtual Meeting

August 4, 2020

10:00 AM – 1:00 PM

Type of meeting:	Road Safety Audit
Attendees:	Invited participants to comprise a multidisciplinary team
Please bring:	Thoughts and enthusiasm!!
10:00 AM – 10:15 AM	Welcome/ Introductions & Zoom Meeting Tutorial
10:15 AM – 11:00 AM	Chandler Street (Route 122) & Claridge Drive <ul style="list-style-type: none">• Discussion of Safety Issues<ul style="list-style-type: none">• Crash history, recent and existing projects (provided in advance)• Existing geometries and conditions• Virtual Site Visit<ul style="list-style-type: none">• Virtual site visit using videos taken previously (provided in advance)• As a group, identify areas for improvement• Discussion of Potential Improvements<ul style="list-style-type: none">• Discuss observations and finalize safety issue areas• Discuss potential improvements and finalize recommendations
11:00 AM -11:05 AM	Break
11:05 AM - 1:00 PM	Chandler Street (Route 122) & May Street (south & north intersections) <ul style="list-style-type: none">• Crash Information<ul style="list-style-type: none">• Crash history, Speed regulations, recent and existing projects Crash history, speed regulations, recent and existing projects (provided in advance)• Existing geometries and conditions• Virtual Site Visit<ul style="list-style-type: none">• Virtual site visit using videos taken previously (provided in advance)• As a group, identify areas for improvement• Discussion of Potential Improvements<ul style="list-style-type: none">• Discuss observations and finalize safety issue areas• Discuss potential improvements and finalize recommendations
1:00 PM	Adjourn for the Day – but the RSA has not ended

Instructions for Participants:

- Before attending the RSA virtually on August 4, participants are encouraged to drive through the intersection virtually and complete/consider elements on the RSA Prompt List with a focus on safety.
- All participants will be actively involved in the process throughout. Participants are encouraged to come with thoughts and ideas, but are reminded that the synergy that develops and respect for others' opinions are key elements to the success of the overall RSA process.
- After the RSA meeting, participants will be asked to comment and respond to the document materials to assure it is reflective of the RSA completed by the multidisciplinary team.

Appendix B. RSA Audit Team Contact List

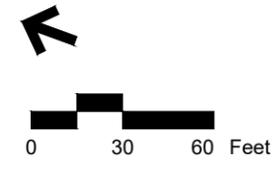
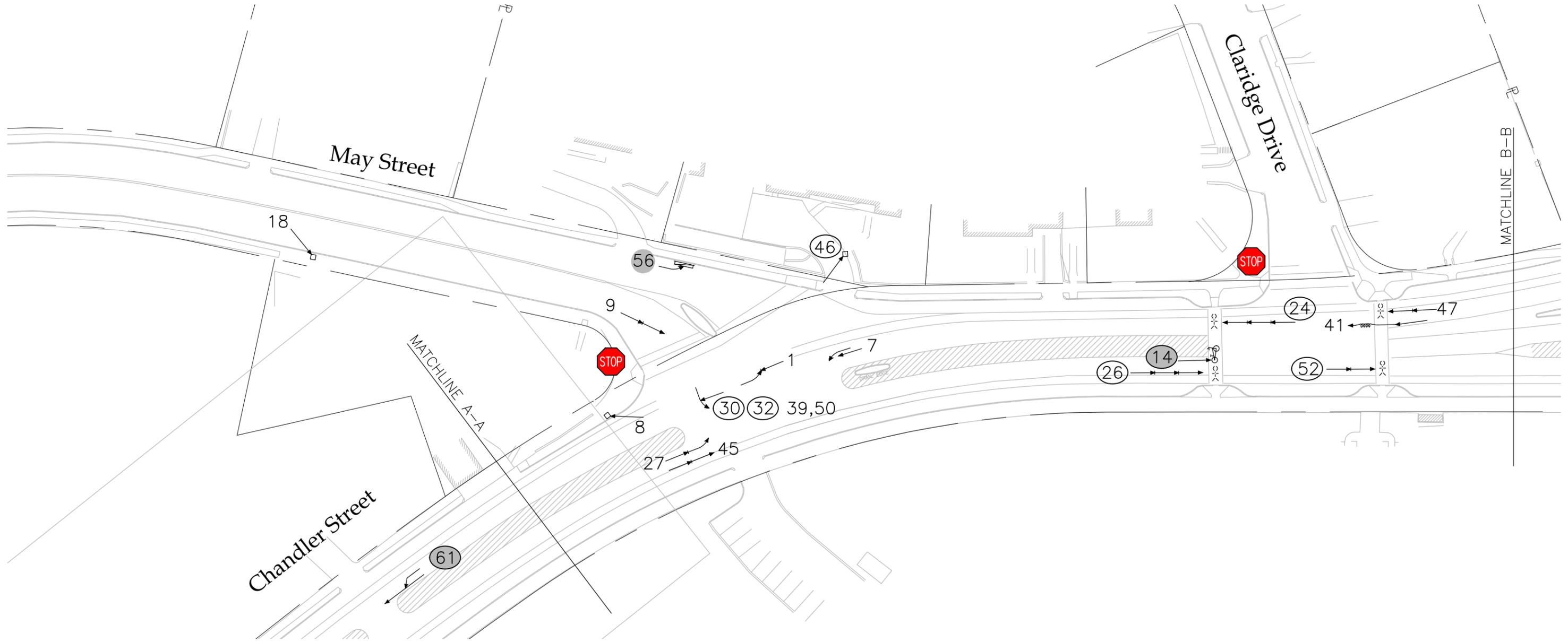
Participating Audit Team Members

Audit Team Member	Agency/Affiliation	Email
Brian Pigeon	Worcester Planning	pigeonb@worcesterma.gov
Stephen Rolle	Worcester Planning	rolles@worcesterma.gov
Gerald Powers	Walk/Bike Worcester	gerald.powers@charter.net
Yahaira Graxirena	Central Massachusetts Regional Planning Commission - CMRPC	ygraxirena@cmrpc.org
Nahrin Sangkagalo	Central Massachusetts Regional Planning Commission – CMRPC	nsangkagalo@cmrpc.org
Ana Fill	MassDOT Traffic & Safety	ana.fill@state.ma.us
Kevin Fitzgerald	MassDOT Traffic & Safety	kevin.t.fitzgerald@state.ma.us
Ranjit Sivasubra	MassDOT Traffic & Safety	n/a
Alolade Campbell	MassDOT District 3	alolade.campbell@state.ma.us
Peng Xu	MassDOT - Intern	n/a
Matt Chase	VHB	mchase@vhb.com
Greg Russell	VHB	grussell@vhb.com
Amanda Bazinet	VHB	abazinet@vhb.com
Jessica DiPersio	VHB	jdipersio@vhb.com
Ali Khorasani	Worcester DPW&P – Traffic Eng.	KhorasaniA@worcesterma.gov
Capt. Tom Bull	Worcester Fire Department	Bullt@worcesterma.gov
Lt. Tim Walsh	Worcester Police Department	walshtp@worcesterma.gov

Appendix C. Detailed Crash Data

TYPES OF COLLISION	SYMBOLS	SEVERITY	ACCIDENT SUMMARY										TRAFFIC CONTROL				
			TYPE	DAYLIGHT			NIGHT			TOTALS				TRAFFIC SIGNAL	STOP SIGN	YIELD SIGN	
				FATAL	INJURY	PROP. DAM.	FATAL	INJURY	PROP. DAM.	FATAL	INJURY	PROP. DAM.	TOTAL				
REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	MOVING VEHICLE BACKING VEHICLE PARKED VEHICLE FIXED OBJECT PEDESTRIAN (INVOLVED) PEDESTRIAN (NOT INVOLVED) BICYCLIST (INVOLVED) ANIMAL	FATAL CRASH INJURY CRASH															
		LIGHTING CONDITION															
		DAYLIGHT															
		DARK-LIGHTED ROADWAY															
			ANGLE	4	7		1	2		5	9	14					
			REAR-END	7	17		2	2		9	19	28					
			HEAD-ON														
			LEFT TURN		7			1			8	8					
			SIDESWIPE		1		1	1		1	2	3					
			FIXED OBJECT	1	2			1		1	3	4					
			PARKED CAR		3			1			4	4					
			OTHER		1		1			1	1	2					
			TOTAL	12	38		5	8		17	46	63					

1. CRASH SUMMARY JANUARY 2016 - DECEMBER 2018
- 2.



vhb **Figure 1B**
 Collision Diagram
 Chandler Street at May Street
 Worcester, Massachusetts

TYPES OF COLLISION	SYMBOLS	SEVERITY	ACCIDENT SUMMARY										TRAFFIC CONTROL			
			TYPE	DAYLIGHT			NIGHT			TOTALS			TRAFFIC SIGNAL	STOP SIGN	YIELD SIGN	
				FATAL	INJURY	PROP. DAM.	FATAL	INJURY	PROP. DAM.	FATAL	INJURY	PROP. DAM.				TOTAL
REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	MOVING VEHICLE BACKING VEHICLE PARKED VEHICLE FIXED OBJECT PEDESTRIAN (INVOLVED) PEDESTRIAN (NOT INVOLVED) BICYCLIST (INVOLVED) ANIMAL	FATAL CRASH INJURY CRASH														
		LIGHTING CONDITION DAYLIGHT DARK-LIGHTED ROADWAY														
			ANGLE		4	7		1	2		5	9	14			
			REAR-END		7	17		2	2		9	19	28			
			HEAD-ON													
			LEFT TURN			7			1			8	8			
			SIDESWIPE			1		1	1		1	2	3			
			FIXED OBJECT		1	2			1		1	3	4			
			PARKED CAR			3			1			4	4			
			OTHER			1		1			1	1	2			
			TOTAL		12	38		5	8		17	46	63			



NOTES

1. CRASH SUMMARY JANUARY 2016 - DECEMBER 2018
- 2.

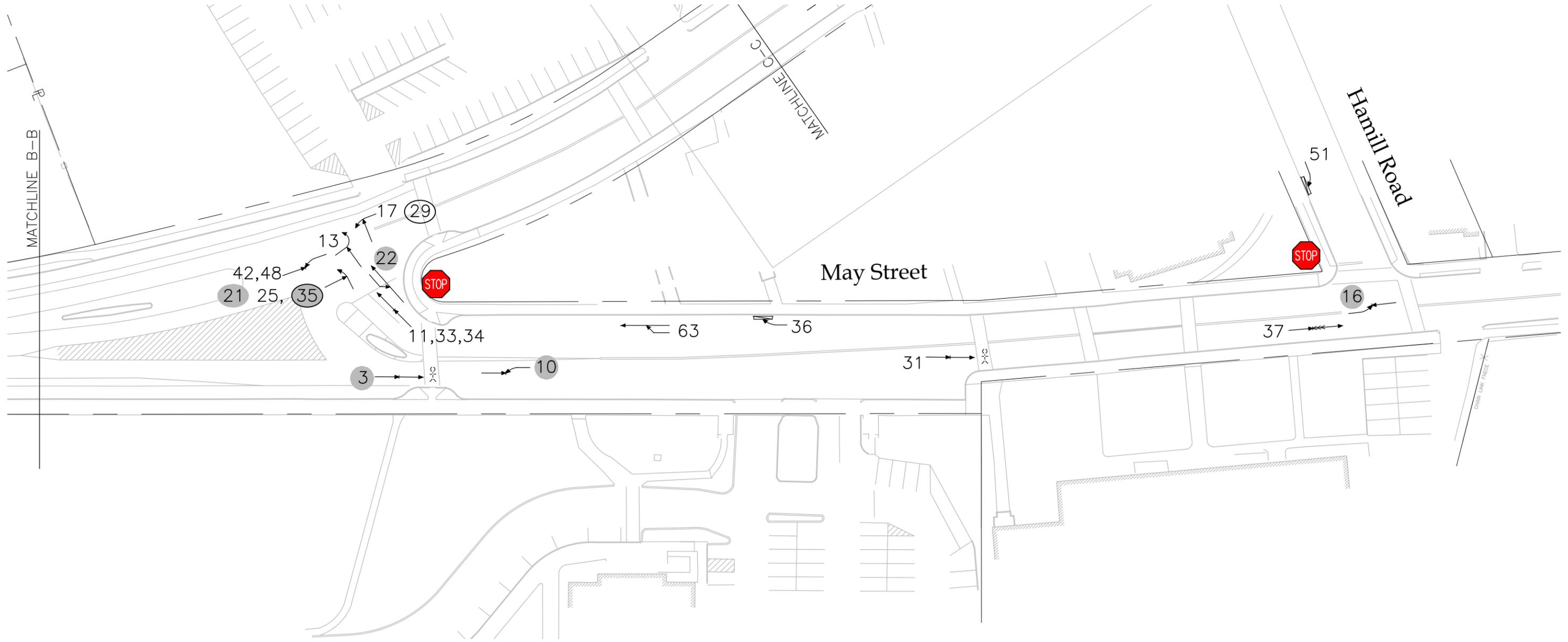
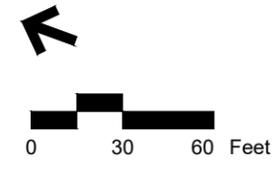


Figure 1C
 Collision Diagram
 Chandler Street at May Street
 Worcester, Massachusetts



TYPES OF COLLISION	SYMBOLS	SEVERITY	ACCIDENT SUMMARY										TRAFFIC CONTROL				
			TYPE	DAYLIGHT			NIGHT			TOTALS				TRAFFIC SIGNAL	STOP SIGN	YIELD SIGN	
				FATAL	INJURY	PROP. DAM.	FATAL	INJURY	PROP. DAM.	FATAL	INJURY	PROP. DAM.	TOTAL				
REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	MOVING VEHICLE BACKING VEHICLE PARKED VEHICLE FIXED OBJECT PEDESTRIAN (INVOLVED) PEDESTRIAN (NOT INVOLVED) BICYCLIST (INVOLVED) ANIMAL	FATAL CRASH INJURY CRASH LIGHTING CONDITION: DAYLIGHT DARK-LIGHTED ROADWAY	ANGLE		4	7		1	2		5	9	14	TRAFFIC SIGNAL STOP SIGN YIELD SIGN	NOTES		
REAR-END		7	17		2	2		9	19	28	1. CRASH SUMMARY JANUARY 2016 - DECEMBER 2018 2.						
HEAD-ON																	
LEFT TURN						7			1						8	8	
SIDESWIPE						1		1	1					1	2	3	
FIXED OBJECT						1			1					1	3	4	
PARKED CAR									1						4	4	
OTHER						1		1						1	1	2	
TOTAL						12	38		5	8		17	46	63			

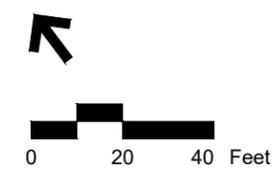
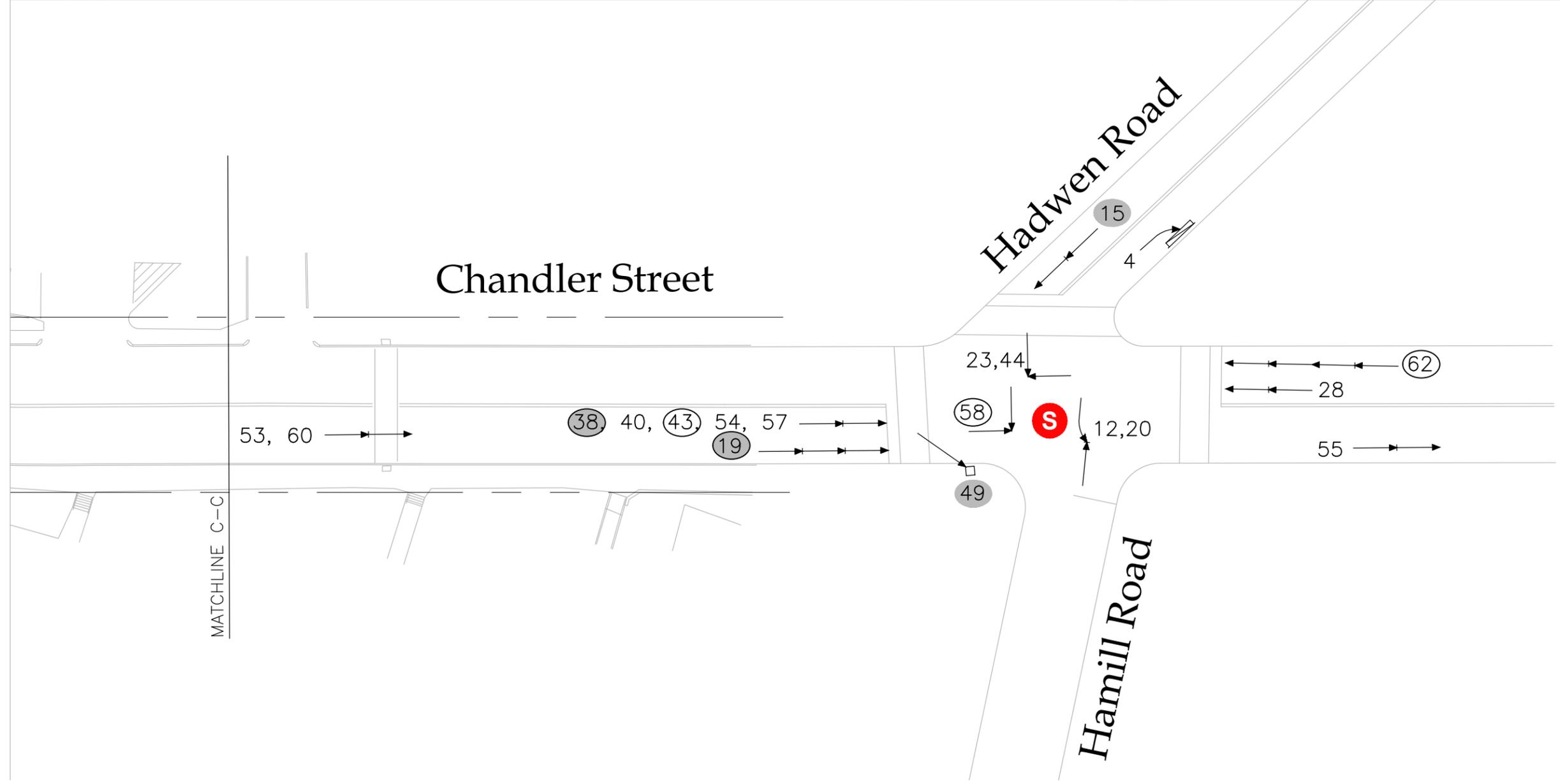
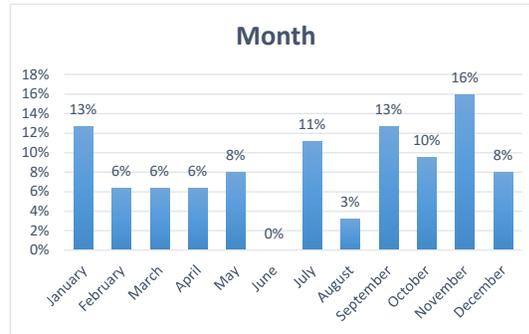


Figure 1D
 Collision Diagram
 Chandler Street at May Street
 Worcester, Massachusetts

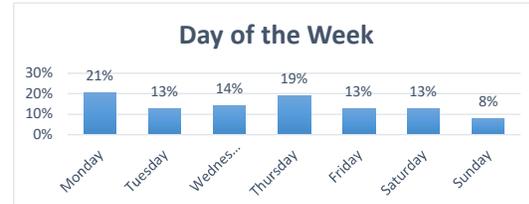
**Chandler Street at WSU
2016 to 2018**

Month	#	%
January	8	13%
February	4	6%
March	4	6%
April	4	6%
May	5	8%
June	0	0%
July	7	11%
August	2	3%
September	8	13%
October	6	10%
November	10	16%
December	5	8%



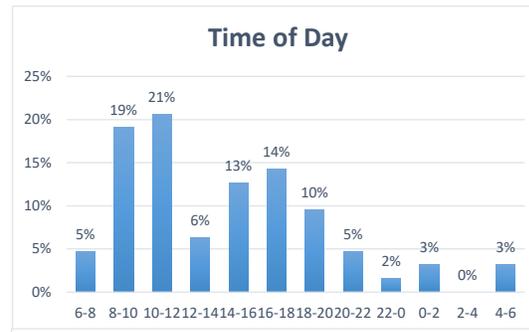
63

Day of Week	#	%
Monday	13	21%
Tuesday	8	13%
Wednesday	9	14%
Thursday	12	19%
Friday	8	13%
Saturday	8	13%
Sunday	5	8%



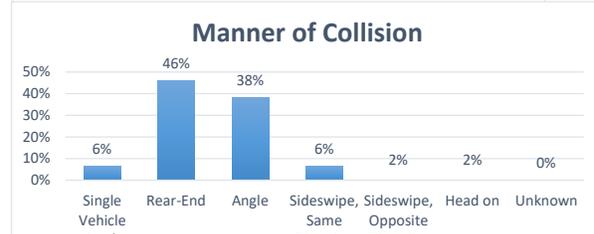
63

Time of Day	#	%
6:00-8:00	3	5%
8:00-10:00	12	19%
10:00-12:00	13	21%
12:00-14:00	4	6%
14:00-16:00	8	13%
16:00-18:00	9	14%
18:00-20:00	6	10%
20:00-22:00	3	5%
22:00-0:00	1	2%
0:00-2:00	2	3%
2:00-4:00	0	0%
4:00-6:00	2	3%



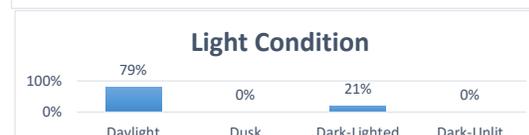
63

Manner of Collision	#	%
Single Vehicle Crash	4	6%
Rear-End	29	46%
Angle	24	38%
Sideswipe, Same Direction	4	6%
Sideswipe, Opposite Direction	1	2%
Head on	1	2%
Unknown	0	0%



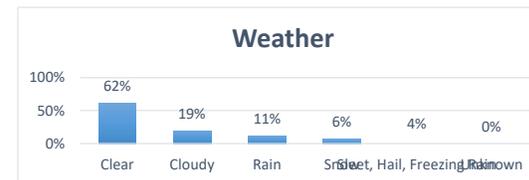
63

Light Condition	#	%
Daylight	50	79%
Dusk	0	0%
Dark - lighted roadway	13	21%
Dark - Roadway not lit	0	0%



63

Weather Condition	#	%
Clear	39	62%
Cloudy	12	19%
Rain	7	11%
Snow	4	6%
Sleet, Hail, Freezing Rain	1	4%
Unknown	0	0%



63

Road Surface	#	%
Dry	48	76%
Wet	9	14%
Snow	6	10%
Ice	0	0%
Unknown	0	0%



63

2016 to 2018

Crash Report#	Crash #	Date	Crash Month	Crash Day	Time of Day	Manner of collision	Light Condition Type	Weather Condition Type	Road Surface Type	Driver Contributing Code	Ages	Type	Description	Timecode	Score		
16-4044	1	1/13/2016	January	Wednesday	8:22 AM	Angle	Daylight	Clear	Snow	Failed to yield right of way	Glare	25-34	55-64	No Injury	EB V2 turned left onto May St from Chandler St but did not see WB V1 due to snow and glare	1601130822	1
16-8921	2	1/28/2016	January	Thursday	11:15 AM	Rear-end	Daylight	Clear	Dry	Inattention		21-24	35-44	No Injury	V1 stopped for a pedestrian in crosswalk at Chandler/May, V2 did not notice V1 stopped so rear end, V1 was pushed forward and hit V3 which fled the scene	1601281115	1
16-17472	3	2/23/2016	February	Tuesday	6:38 PM	Rear-end	Dark - lighted roadway	Snow	Wet	No Improper Driving		45-54	16-20	No Injury	EB V1 stopped at May St S for pedestrian and V2 rear ended	1602231838	1
16-22780	4	3/10/2016	March	Thursday	2:31 PM	Sideswipe, same direction	Daylight	Cloudy	Wet	Inattention		35-44	35-44	No Injury	V2 turned onto Hadwen Rd from Chandler St and swerved to avoid oncoming traffic, sideswiping parked unoccupied V1	1603101431	1
16-31348	5	4/3/2016	April	Sunday	2:31 PM	Angle	Daylight	Cloudy	Dry	No Improper Driving		16-20	21-24	No Injury	NB V1 tried to turn left onto the parking spaces on Chandler St but struck NB V2	1604031431	1
16-40914	6	4/29/2016	April	Friday	12:30 PM	Rear-end	Daylight	Clear	Dry	No Improper Driving		25-34	35-44	Possible	NB V1 stopped for pedestrian but V3 rear ended V2 which rear ended V1	1604291230	5
16-43716	7	5/7/2016	May	Saturday	11:55 AM	Angle	Daylight	Cloudy	Dry	Other improper action		35-44	21-24	No Injury	SB V1 tried to turn left in front of SB V2 on Chandler St by May St S and V2 struck V1	1605071155	1
16-65911	8	7/2/2016	July	Saturday	1:22 AM	Single Vehicle Crash	Daylight	Clear	Snow	Failure to keep in proper lane or running off road		25-34	>84	No Injury	V1 was eating and struck median sign at Chandler/May N	1607020122	1
16-677009	9	7/4/2016	July	Monday	6:43 PM	Rear-end	Daylight	Clear	Dry	No Improper Driving		16-20	16-20	No Injury	WB V1 stopped at stop sign on May St N and V2 rear ended	1607041843	1
16-72299	10	7/16/2016	July	Saturday	8:19 PM	Angle	Dark - lighted roadway	Clear	Dry	Other improper action		55-64	55-64	No Injury	NB V1 crossed over median and struck SB V2 at 275 May St	1607162019	1
16-101495	11	9/22/2016	September	Thursday	5:20 PM	Rear-end	Daylight	Clear	Dry	Other improper action		25-34	55-64	No Injury	V2 stopped at Chandler/May stop sign and V1 rear ended V2	1609221720	1
16-101808	12	9/23/2016	September	Friday	11:48 AM	Angle	Daylight	Clear	Dry	Inattention		21-24	45-54	No Injury	SB V1 turned left onto Chandler from Hadwen into NB V2	1609231148	1
16-104300	13	9/29/2016	September	Thursday	11:50 AM	Angle	Daylight	Clear	Dry	Other improper action		21-24	25-34	No Injury	V1 attempted a U-turn at Chandler/May S and V2 stopped at the stop sign on May St was struck from behind and was pushed into V1	1609291150	1
16-112169	14	10/20/2016	October	Thursday	7:07 PM	Single Vehicle Crash	Dark - lighted roadway	Cloudy	Dry	Visibility Obstructed		65-74	21-24	Non-incapacitating	SB V1 did not see pedestrian on bicycle in crosswalk and struck	1610201907	5
16-113107	15	10/23/2016	October	Sunday	1:32 AM	Rear-end	Dark - lighted roadway	Rain	Wet	Other improper action		16-20	45-54	No Injury	WB V2 rear ended V1 on Hadwen	1610230132	1

2016 to 2018

Crash Report#	Crash #	Date	Crash Month	Crash Day	Time of Day	Manner of collision	Light Condition Type	Weather Condition Type	Road Surface Type	Driver Contributing Code	Ages	Type	Description	Timecode	Score	
16-118818	16	11/8/2016	November	Tuesday	5:15 PM	Head on	Dark - lighted roadway	Clear	Dry	Other improper action	21-24	21-24	No Injury	EB V2 on May St attempted to turn left onto Hamill Rd striking WB V1	1611081715	1
16-125381	17	11/28/2016	November	Monday	11:27 AM	Angle	Daylight	Clear	Snow	Other improper action	21-24	>84	No Injury	NB V1 turning left onto May St S was struck by NB V2	1611281127	1
16-133969	18	12/23/2016	December	Friday	9:44 AM	Single Vehicle Crash	Daylight	Cloudy	Dry	Driving too fast for conditions	35-44	55-64	No Injury	V1 SB on May St ran off road and struck fire hydrant and pole	1612230944	1
17-3592	19	1/11/2017	January	Wednesday	5:28 PM	Rear-end	Dark - lighted roadway	Clear	Dry	Failed to yield right of way	21-24	55-64	Possible	V2 and V1 were stopped at the light at Hamill, Hadwen, and Chandler. V3 struck V1 which then struck V2.	1701111728	5
17-16324	20	2/17/2017	February	Friday	7:15 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	21-24	25-34	No Injury	SB V2 on Hadwen Rd tried turning left onto Chandler and did not yield to NB V1	1702170715	1
17-22519	21	3/6/2017	March	Monday	8:07 PM	Angle	Dark - lighted roadway	Cloudy	Dry	Inattention	75-84	>84	No Injury	SB V2 proceeded through stop sign at May Street and hit NB V1 on Chandler St	1703062007	1
17-30763	22	3/29/2017	March	Wednesday	8:00 PM	Sideswipe, opposite direction	Dark - lighted roadway	Clear	Dry	Other improper action	35-44	21-24	No Injury	NB V1 turned from May Street S onto Chandler St when V2 turned near V2 and sideswiped and fled the scene	1703292000	1
17-37126	23	4/16/2017	April	Sunday	11:40 AM	Angle	Daylight	Rain	Dry	Disregarded traffic signs, signals, road markings	16-20	45-54	No Injury	NB V2 and WB V1 at Chandler and Hadwen both believed they had green light and collided	1704161140	1
17-42729	24	5/1/2017	May	Monday	8:37 AM	Rear-end	Daylight	Cloudy	Dry	Followed too closely	45-54	25-34	Possible	NB V1 stopped for a pedestrian at Claridge and Chandler and V2 rear ended	1705010837	5
17-52116	25	5/25/2017	May	Thursday	4:37 PM	Angle	Daylight	Rain	Wet	No Improper Driving	45-54	45-54	No Injury	NB V1 did a u-turn at May St S and V2 tried turning left from May St and struck V1	1705251637	1
17-67577	26	7/2/2017	July	Sunday	5:33 PM	Rear-end	Daylight	Clear	Dry	No Improper Driving	25-34	16-20	Possible	SB V1 stopped for pedestrian and then V2 and V3 rear ended	1707021733	5
17-77528	27	7/25/2017	July	Tuesday	5:46 PM	Rear-end	Daylight	Cloudy	Dry	No Improper Driving	25-34	21-24	No Injury	SB V1 rear ended V2 trying to turn left, SB V1 fled the scene	1707251746	1
17-86274	28	8/15/2017	August	Tuesday	10:15 AM	Rear-end	Daylight	Clear	Dry	No Improper Driving	21-24	55-64	No Injury	NB V2 rear ended V1 on Chandler St before Hadwen Rd	1708151015	1

2016 to 2018

Crash Report#	Crash #	Date	Crash Month	Crash Day	Time of Day	Manner of collision	Light Condition Type	Weather Condition Type	Road Surface Type	Driver Contributing Code	Ages	Type	Description	Timecode	Score	
17-96279	29	9/8/2017	September	Friday	9:50 AM	Angle	Daylight	Clear	Dry	No Improper Driving	75-84	16-20	Possible	SB V1 turned right from Chandler onto May St while V2 turned left from May onto Chandler and struck V1 due to heavy traffic	1709080950	5
17-97501	30	9/11/2017	September	Monday	3:57 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	45-54	21-24	Possible	WB V1 turned from May St N to Chandler SB but struck NB V2	1709111557	5
17-100101	31	9/18/2017	September	Monday	5:25 AM	Rear-end	Daylight	Cloudy	Dry	No Improper Driving	25-34	16-20	No Injury	SB V1 stopped at crosswalk and SB V2 rear ended V1	1709180525	1
17-117110	32	10/30/2017	October	Monday	2:01 PM	Angle	Daylight	Clear	Dry	Other improper action	55-64	>84	Possible	SB V1 turned left from May St and NB V2 on Chandler St struck V1	1710301401	5
17-118620	33	11/2/2017	November	Thursday	12:00 PM	Rear-end	Daylight	Clear	Dry	No Improper Driving	21-24	>84	No Injury	V1 NB May Street was rear ended by V2 which fled the scene	1711021200	1
17-121069	34	11/9/2017	November	Thursday	2:25 PM	Rear-end	Daylight	Clear	Dry	No Improper Driving	25-34	65-74	No Injury	V1 NB May Street at Chandler St was rear ended by V2 which fled the scene	1711091425	1
17-123695	35	11/16/2017	November	Thursday	4:44 PM	Angle	Dark - lighted roadway	Rain	Wet	No Improper Driving	55-64	45-54	Incapacitating	Motorcycle V1 approached Chandler from May St S and SB V2 did not see V1 from Chandler St and struck V1 due to rain and dark conditions	1711161644	5
17-124320	36	11/18/2017	November	Saturday	10:10 AM	Sideswipe, same direction	Daylight	Clear	Dry	No Improper Driving	21-24	55-64	No Injury	NB V1 sideswiped parked V2	1711181010	1
17-129515	37	12/2/2017	December	Saturday	10:17 AM	Angle	Daylight	Clear	Dry	Visibility Obstructed	16-20	35-44	No Injury	Articulated truck NB V2 on Chandler at Hamill did not see V2 behind it and stopped and backed into it	1712021017	1
17-132386	38	12/9/2017	December	Saturday	7:00 PM	Rear-end	Dark - lighted roadway	Snow	Snow	Other improper action	21-24	25-34	Non-incapacitating	EB V2 stopped on Chandler St before Hadwen St and V1 rear ended	1712091900	5
17-133257	39	12/12/2017	December	Tuesday	10:30 AM	Angle	Daylight	Sleet, Hail, Freezing Rain	Snow	No Improper Driving	25-34	75-84	No Injury	WB V2 on May St N tried turning onto Chandler Street but struck NB V1	1712121030	1
18-3417	40	1/10/2018	January	Wednesday	7:59 AM	Rear-end	Daylight	Cloudy	Dry	Glare	21-24	35-44	No Injury	NB V2 rear ended V1 near 474 Chandler Street due to glare	1801100759	1
18-5366	41	1/15/2018	January	Monday	6:34 AM	Rear-end	Daylight	Clear	Dry	No Improper Driving	21-24	55-64	No Injury	NB V1 tried to pass V2 on Chandler St but struck it and caused V2 to lose control of the car	1801150634	1
18-17157	42	2/14/2018	February	Wednesday	9:30 AM	Angle	Daylight	Clear	Dry	No Improper Driving	21-24	55-64	No Injury	NB V1 tried to turn left onto May St S but struck SB V2	1802140930	1
18-24915	43	3/6/2018	March	Tuesday	10:10 AM	Rear-end	Daylight	Cloudy	Dry	Followed to closely	45-54	55-64	Possible	NB V1 struck V2 at the light at Hadwen on Chandler	1803061010	5
18-44919	44	4/28/2018	April	Saturday	8:57 AM	Angle	Daylight	Clear	Dry	Other improper action			No Injury	NB V1 ran through red light at Hadwen and struck left turning V2	1804280857	1

Appendix D. Additional Information

To: Road Safety Audit Participants

Date: July 28, 2020
Project #: 13294.01

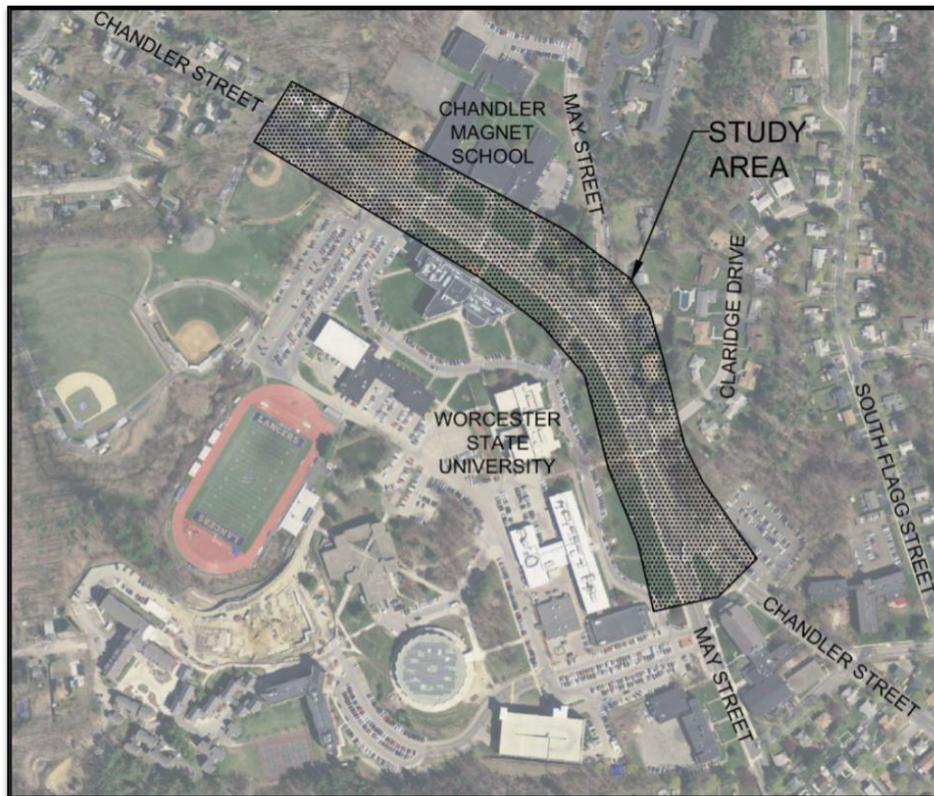
Memorandum

From: Amanda Bazinet

Re: 608961 - Road Safety Audit
Existing Conditions

Summary of Existing Conditions

Chandler Street is classified as an NHS Principal Arterial and designated as Route 122. It provides an access route to Worcester Airport, the Tatnuck neighborhood, and as a commuter route between the western suburbs and downtown Worcester. The surrounding land uses include a suburban type residential neighborhood and in the project area includes the May Street Elementary School, the Chandler Magnet Elementary School and Worcester State University (WSU).



Chandler Street at May Street (Southern Intersection)

The southern intersection is a Y-type intersection with May Street being stop-controlled. Chandler Street southbound traffic splits into two lanes at Claridge Drive, with each lane providing uninterrupted flow through to May Street or Chandler Street. These lanes are not formally channelized and instead are designated through line striping as shown in the aerial image below.

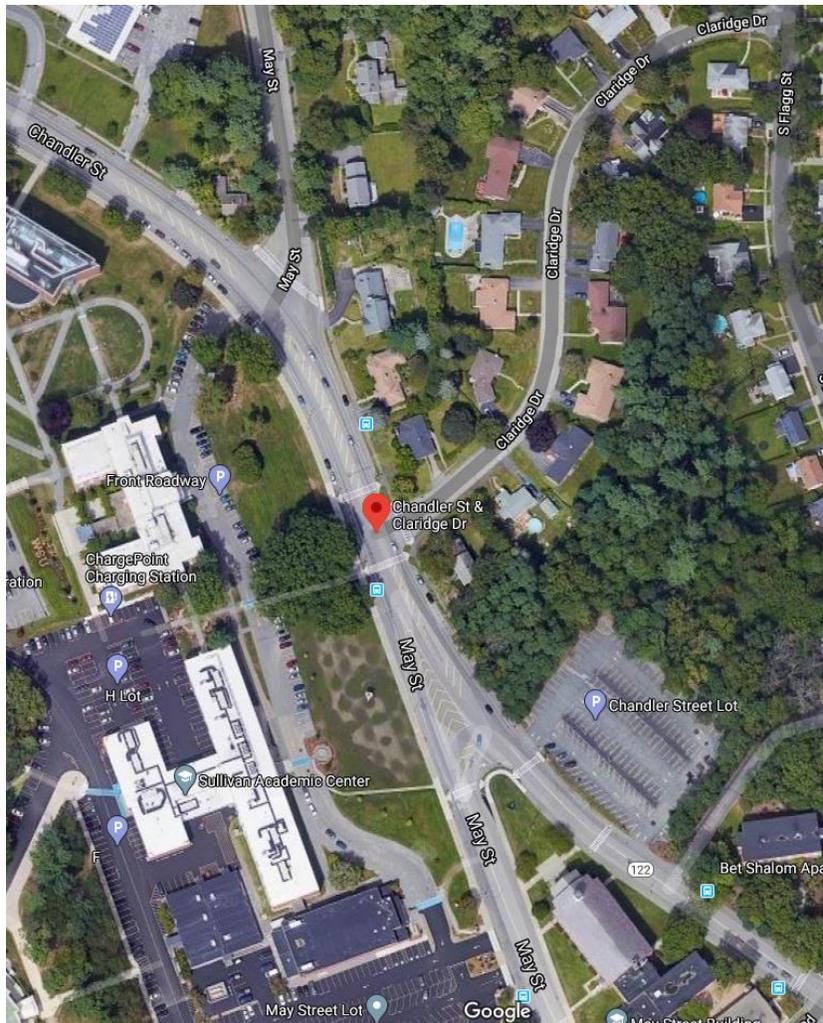
120 Front Street
Suite 500
Worcester, MA 01608
P 508.752.1001

Chandler Street at May Street (Northern Intersection)

The northern intersection of May Street and Chandler Street is a Y-type intersection with May Street having the stop controlled approach. The May Street throat is nearly 120 feet wide with a marked crosswalk spanning the width. There is a small splitter island.

Claridge Drive Intersection

The intersection of Claridge Drive is a T-type intersection with Claridge Drive having the stop controlled approach. There is a marked crosswalk across Claridge Drive and two marked crosswalks across Chandler Street on either side.



120 Front Street

Suite 500

Worcester, MA 01608

P 508.752.1001

July 28, 1971

THE COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

Mr Sullivan

SPECIAL SPEED REGULATION NO. 628

Highway Location:

BLACKSTONE, MILLVILLE, UXBRIDGE,
NORTHBRIDGE, GRAFTON, MILLBURY,
WORCESTER, PAXTON, RUTLAND,
OAKHAM, BARRE, PETERSHAM, NEW
SALEM, ORANGE

Authority in Control:

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

Name of Highways:

Blackstone - State Highway - Route 122				
Millville	"	"	"	"
Uxbridge	"	"	"	"
Northbridge	"	"	"	"
Grafton	"	"	"	"
Millbury	"	"	"	"
Worcester	"	"	"	"
Paxton	"	"	"	"
Rutland	"	"	"	"
Oakham	"	"	"	"
Barre	"	"	"	"
Petersham	"	"	"	"
New Salem	"	"	"	"
Orange	"	"	"	"

In accordance with the provisions of Section 18 of Chapter 90 of the General Laws (Ter. Ed.) the following Special Speed Regulation is hereby promulgated:

Special Speed Regulation numbered 230 dated April 3, 1962 and number 230-A dated June 2, 1964 is hereby amended by striking out the Regulations in their entirety, inserting in place thereof the following revision and addenda.

The following designated speed limits are established at which motor vehicles may be operated in the areas described:

NORTHBOUND

Beginning in Blackstone at the beginning of State Highway,
thence northerly

0.52 miles at 25 miles per hour
0.75 " " 30 " " "
0.83 " " 40 " " " to the Millville line

Thence northerly in Millville

0.30 miles at 40 miles per hour
0.29 " " 25 " " "

0.67 miles at 35 miles per hour
 0.40 " " 40 " " " to the Uxbridge line,

Thence northerly in Uxbridge

0.06 miles at 40 miles per hour
 2.22 " " 50 " " "
 0.62 " " 40 " " "
 0.56 " " 35 " " "
 0.24 " " 30 " " " to the end of State

Highway, south of town.

And beginning again in Uxbridge, at the beginning of State Highway,
 north of town,
 thence northerly

0.83 miles at 30 miles per hour
 0.28 " " 35 " " "
 0.11 " " 30 " " " to the Northbridge line,

Thence northerly in Northbridge

0.08 miles at 30 miles per hour
 0.48 " " 35 " " "
 0.55 " " 40 " " "
 0.28 " " 45 " " "
 0.62 " " 40 " " "
 0.21 " " 30 " " "
 0.87 " " 40 " " "
 0.26 " " 35 " " "
 0.55 " " 40 " " " ending 7 feet south of

the end of State Highway.

And beginning again in Northbridge, at the beginning of State Highway,
 north of town,
 thence northerly

0.51 miles at 40 miles per hour
 0.27 " " 45 " " " to the Grafton line,

Thence northerly in Grafton

0.39 miles at 45 miles per hour
~~0.32 " " 40 " " " 0.32 mi @ 35 - Rev~~
 0.39 " " 30 " " "
 0.29 " " 35 " " "
 0.27 " " 40 " " "
 1.45 " " 45 " " "
 0.58 " " 40 " " "
 0.92 " " 35 " " "
 0.38 " " 40 " " "
 0.42 " " 30 " " "
 1.07 " " 35 " " " to the Millbury line,

Thence northerly in Millbury
0.80 miles at 35 miles per hour to the end of State Highway,

Beginning again in Worcester, at the beginning of State Highway, thence northerly

0.40 miles at 40 miles per hour
0.85 " " 35 " " "
0.11 " " 40 " " " to the Paxton line,

Thence northerly in Paxton

*Rev. 3.07 mi
40*

0.50 miles at 40 miles per hour
2.27 " " 45 " " "
0.30 " " 40 " " "
0.30 0.42 " " 30 " " "
0.50 0.47 " " 40 " " "
1.39 " " 50 45 625-B " " "
0.01 " " 45 " " " to the Rutland line,

*2/15/00
3.07 @ 40
0.42 @ 30
0.47 @ 40
1.40 @ 45*

Thence northerly in Rutland

0.57 miles at 45 miles per hour
2.38 " " 50 " " "
0.81 " " 45 " " "
0.67 " " 50 " " "
0.04 " " 45 " " " to the Oakham line,

Thence northerly in Oakham

1.69 miles at 45 miles per hour
1.14 " " 50 " " " to the Barre line,

Thence northerly in Barre

1.26 miles at 50 miles per hour
1.34 " " 45 " " "
0.47 " " 40 " " "
0.30 " " 30 " " "
0.64 " " 40 " " "
0.34 " " 30 " " " to the end of State Highway,

south of town.

And beginning in Barre, at the beginning of State Highway, north of town, thence northerly

0.32 miles at 35 miles per hour
1.33 " " 45 " " "
0.57 " " 50 " " "
1.58 " " 45 " " " to the Petersham line,

Thence northerly in Petersham

3.21 miles at 45 miles per hour
0.29 " " 25 " " "
3.71 " " 45 " " "
0.43 " " 50 " " " to the New Salem line,

Thence northerly in New Salem

2.50 miles at 50 miles per hour

1.04 " " 45 " " "

0.10 " " 30 " " " to the junction of

Route 202.

Beginning again in Orange, at the junction of Route 202,

Thence northerly 0.35 miles at 45 miles per hour

0.59 miles at 50 miles per hour

0.31 " " 45 " " "

0.91 " " 40 " " " ending at the end of
State Highway; the total distance being 56.25 miles.

SOUTHBOUND

Beginning in Orange 194 feet south of the beginning of State Highway,
thence southerly

0.91 miles at 40 miles per hour

0.31 " " 45 " " "

0.59 " " 50 " " "

0.31 " " 45 " " "

0.04 " " 30 " " " to the junction of
Route 202.

Beginning again in New Salem, 148 feet south of the junction of
Route 202,
thence southerly

1.11 miles at 45 miles per hour

2.50 " " 50 " " " to the Petersham line,

Thence southerly in Petersham

0.43 miles at 50 miles per hour

3.71 " " 45 " " "

0.25 " " 25 " " "

3.21 " " 45 " " " to the Barre line,

Thence southerly in Barre

1.58 miles at 45 miles per hour

0.57 " " 50 " " "

1.33 " " 45 " " "

0.32 " " 35 " " " to 50 feet north of the
end of State Highway.

And beginning again in Barre at the beginning of State Highway,
south of town,
thence southerly

0.34 miles at 30 miles per hour

0.64 " " 40 " " "

0.30 " " 30 " " "

0.46 " " 40 " " "

1.34 miles at 45 miles per hour
 1.26 " " 50 " " " to the Oakham line,

Thence southerly in Oakham

1.14 miles at 50 miles per hour
 1.69 " " 45 " " " to the Rutland line,

Thence southerly in Rutland

0.04 miles at 45 miles per hour
 0.67 " " 50 " " "
 0.81 " " 45 " " "
 2.38 " " 50 " " "
 0.57 " " 45 " " " to the Paxton line,

Thence southerly in Paxton

0.01 miles at 45 miles per hour
 1.39 " " 50 ⁴⁰ ^{628-B} " " *Rev*
 0.50 ⁴⁷ " " 40 " " "
 0.20 ⁴² " " 30 " " "
 0.30 " " 40 " " "
 2.27 " " 45 ⁴⁰ " " "
 0.50 " " 40 " " " to the Worcester line,

2/15/60

*0.41 @ 45
 1.39 @ 40
 0.47 @ 40
 0.42 @ 30
 30.7 @ 40*

Det 3.07 Mi @ 40

Thence southerly in Worcester

0.11 miles at 40 miles per hour
 0.85 " " 35 " " *Det 30*
 0.36 " " 40 " " " to 125 feet north of
 the end of State Highway. *Rev to 35*

Beginning again in Millbury at the beginning of State Highway, thence southerly

0.80 miles at 35 miles per hour to the Grafton line,

Thence southerly in Grafton

1.07 miles at 35 miles per hour
 0.42 " " 30 " " "
 0.38 " " 40 " " "
 0.92 " " 35 " " "
 0.58 " " 40 " " "
 1.45 " " 45 " " "
 0.27 " " 40 " " "
 0.29 " " 35 " " "
 0.39 " " 30 " " "
 0.32 " " 40 " " "
 0.39 " " 45 " " " to the Northbridge line,

0.32 Mi @ 35 M.P.H. Rev

Thence southerly in Northbridge

0.27 miles at 45 miles per hour
 0.51 " " 40 " " " to the end of State

Highway, north of town.

And beginning again at the beginning of State highway, south of town,
thence southerly

0.56	miles	at	40	miles	per	hour	
0.26	"	"	35	"	"	"	
0.87	"	"	40	"	"	"	
0.21	"	"	30	"	"	"	
0.62	"	"	40	"	"	"	
0.28	"	"	45	"	"	"	
0.55	"	"	40	"	"	"	
0.57	"	"	35	"	"	"	to the Uxbridge line

Thence southerly in Uxbridge

0.11	miles	at	30	miles	per	hour	
0.28	"	"	35	"	"	"	
0.81	"	"	30	"	"	"	ending 99 feet north of

the end of State highway.

And beginning in Uxbridge, at the beginning of State Highway,
south of town,
thence southerly

0.24	miles	at	30	miles	per	hour	
0.56	"	"	35	"	"	"	
0.62	"	"	40	"	"	"	
2.22	"	"	50	"	"	"	
0.06	"	"	40	"	"	"	to the Millville line,

Thence southerly in Millville

0.40	miles	at	40	miles	per	hour	
0.67	"	"	35	"	"	"	
0.29	"	"	25	"	"	"	
0.30	"	"	40	"	"	"	to the Blackstone line,

Thence southerly in Blackstone

0.83	miles	at	40	miles	per	hour	
0.75	"	"	30	"	"	"	
0.52	"	"	25	"	"	"	ending at the end of

State Highway; the total distance being 56.01 miles.

Operation of a motor vehicle at a rate of speed in excess of these limits shall be prima facie evidence that such speed is greater than is reasonable and proper.

The provisions of this regulation shall not, however, abrogate in any sense Section 14 of Chapter 90.

The Department of Public Works and the Registrar of Motor Vehicles, acting jointly, do hereby certify in writing that this regulation is consistent with the public interest.

Standard signs must be erected at the beginning of each zone.

FOR THE DEPARTMENT

Date: July 28, 1971

By: *Edward J. Ribbs*
EDWARD J. RIBBS
COMMISSIONER

for Highway Engineering

Richard M. Laughlin
Registrar of Motor Vehicles

Mr. Sullivan

THE COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

SPECIAL SPEED REGULATION NO. 628-C

Highway Location:	GRAFTON
Authority In Control:	COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS
Name of Highway:	GRAFTON-STATE HIGHWAY-ROUTE 122

In accordance with the provisions of Section 18 Chapter 90 of the General Laws (Ter. Ed.) the following Special Speed Regulation is hereby promulgated:

Special Speed Regulation number 628 dated July 28, 1971 is hereby amended in Grafton as follows:

The following designated speed limits are established at which motor vehicles may be operated in the areas described.

GRAFTON-NORTHBOUND

By striking out the clause reading:
0.32 miles at 40 miles per hour

And inserting in place thereof:
0.32 miles at 35 miles per hour

GRAFTON-SOUTHBOUND

By striking out the clause reading:
0.32 miles at 40 miles per hour

And inserting in place thereof:
0.32 miles at 35 miles per hour

Operation of a motor vehicle at a rate of speed in excess of these limits shall be prima facie evidence that such speed is greater than is reasonable and proper.

The provision of this regulation shall not, however, abrogate in any sense, Section 14 of Chapter 90.

The Department of Public Works and the Registrar of Motor Vehicles, acting jointly do hereby certify in writing, that this regulation is consistent with the public interest.

Standard signs must be erected at the beginning of each zone.

DATE: January 17, 1979

DEPARTMENT OF PUBLIC WORKS

BY:

[Handwritten Signature]
Traffic Engineer

[Handwritten Signature]
Chief Deputy Registrar

Appendix E. Road Safety Audit References

Road Safety Audit References

FHWA Office of Safety - Proven Safety Countermeasures, U.S. Department of Transportation, Federal Highway Administration <https://safety.fhwa.dot.gov/provencountermeasures/>.

Road Safety Audits, A Synthesis of Highway Practice. NCHRP Synthesis 336. Transportation Research Board, National Cooperative Highway Research Program, 2004.

Road Safety Audits. U.S. Department of Transportation, Federal Highway Administration, <https://safety.fhwa.dot.gov/rsa/>

FHWA Road Safety Audit Guidelines. U.S. Department of Transportation, Federal Highway Administration, 2006.

Road Safety Audit, 2nd edition. Austroads, 2000.

Road Safety Audits. ITE Technical Council Committee 4S-7. Institute of Transportation Engineers, February 1995.