Public Facilities Committee Report

City of Newton
In City Council

Wednesday, May 4, 2022

Present: Councilors Leary (Chair), Gentile, Norton, Laredo, Kelley, Kalis, and Crossley

Also Present: Councilors Downs, Bowman, Markiewicz, Oliver, Malakie, Lipof and Lucas

Absent: Councilor Danberg

City Staff: Chief Operating Officer Jonathan Yeo, Commissioner of Public Works Jim McGonagle, Director of Transportation Planning Nicole Freedman and City Engineer Lou Taverna

#285-22 **Eversource petition for Grant of Location in JFK Circle and Green Street**
EVERSOURCE ENERGY petitioning for a grant of location to install and maintain 40' ± of conduit in a northeasterly direction from pole 182/3 and install and maintain 370' ± southeasterly from Green Street thence turning southwesterly to the private property at 100 John F. Kennedy Circle. (Ward 1)

Action: **Public Facilities Approved 6-0 (Councilor Kalis not voting)**

Note: Joanne Callender, Eversource representee, presented the request for a grant of location in JFK Circle and Green Street as shown above. This is to provide underground services to the 55 affordable housing units being built by the Newton Housing Authority.

Councilors asked the following questions:

Q: How will the undergrounding of the conduit be designed?

A: Ms. Callender explained that they will be installing a new manhole and it will go through JFK Circle to the pole on Green Street. There is currently overhead service.

Q: Will the poles be removed?

A: Ms. Callender explained that they are not removing the poles due to the fact that the current occupants in that area still need the overhead connection. If this were to be converted to underground, Eversource would need the buy-in from the residents, transformers would need to be added to their property and the residents would need to hire electricians to make their service underground.

A: What is the cost of undergrounding in this area to the new building and what are the costs for the homes in the surrounding area to underground?

Q: Ms. Callender noted that she would be able to provide this information after the conclusion of the meeting.

The public hearing was opened.

Donvito Dimercurio, 26 Green Street noted his concerns related to a pole that is on the west leg of JFK Circle. It was noted that the proposed project is happening on the east leg of JFK Circle at pole 182/3.

Christine Long, representative from the Newton Housing Authority expressed her support for this project. This will be supply power to the Haywood House for the 55 affordable housing units. She also noted that she has been working with Eversource on this project and this is the last step to connect to the system.

It was noted that the Newton Housing Authority is not a division of the City of Newton.

The public hearing was closed.

Councilor Crossley motioned to approve which passed 6-0 with Councilor Kalis not voting.

Referred to Public Facilities and Finance Committees

#292-22 **Appropriation of $1,500,000 for Transportation Network Improvement Program**
HER HONOR THE MAYOR requesting authorization to appropriate and expend the sum of one million five hundred dollars ($1,500,000) from June 30, 2021, Certified Free Cash for the Transportation Network Improvement Program to continue making progress on the City's roads, bike lanes, sidewalks and traffic calming efforts across the City.

Action: **Public Facilities Approved 6-0 (Councilor Kalis not voting)**

Note: Jim McGonagle, Commissioner of Public Works presented the request for $1,500,000 for the Transportation Network. Commissioner McGonagle explained that these funds will allow DPW to bid and award the road work for FY23. This is a typical request before the end of the fiscal year to be able to start this work. The goal is to begin work before the winter and continue in the spring and summer. He is also noted that the City does put aside 1.5 -2 million dollars a year for snow and ice removal. These funds were not needed this year so instead these funds will be spent on the Transportation Network Improvement Program.

It was questioned if this is the first allocation for next year. Commissioner McGonagle explained that this is the first allocation, in the past they have come to the Council with this request at the beginning of the calendar year. There also be additional requests for funds for the next fiscal year.

Councilor Crossley motioned to approve which passed 6-0 with Councilor Kalis not voting.

Referred to Public Facilities and Finance Committees

#291-22 **Appropriation of $500,000 to fund the design of the pilot program for Washington Street ~~from Lowell Ave to Newton Corner~~**

HER HONOR THE MAYOR requesting authorization to appropriate and expend the sum of five hundred thousand dollars ($500,00) from June 30, 2021 Certified Free Cash, derived from Host Community Agreement Funds, to fund the design of the pilot program/interim solution for Washington Street ~~from Lowell Ave to Newton Corner.~~

Action: **Public Facilities Approved as Amended 5-0-2 (Councilors Kelley and Gentile abstaining) on 05/04/22**

Note: Nicole Freedman, Director of Transportation Planning presented the request to appropriate and expend $500,000 to fund the design of the pilot program for Washington Street. The Committee received the attached updated request from the administration that removes the perimeters from Lowell Ave to Newton Corner. Jonathan Yeo, Chief Operating Officer explained that there is a phase 1A to this project from West Newton Square to Newtonville. The attached Request for Quotation (RFQ) also shows the sections of this proposed project.

Ms. Freedman explained that their goal is to create a meaningful and useful pilot that leads to the full reconstruction of Washington Street between Chestnut Street and Church Street. This will be a phased project which will begin with the design and implementation of the pilot. The purpose of pilot is to test out if the road can go from 4 lanes to 2 lanes with the addition of a bike lane. The pilot will also look at benefits that can be provided for transit, additional landscape and additional space for sidewalks. In the RFQ, the pilot is envisioned from Chestnut to Lowell but other limits may be chosen with the selected consultant. This does provide flexibility while going through the public process. Another phase for the project includes initiating a Transportation Improvement Program (TIP) project which is a standard way of receiving grants through MassDOT. After that point the consultant will take the lessons learned to the 25% design of the full reconstruction project.

Councilors asked the following questions:

Q: Is the intention to create a boulevard through the pilot with sandbags or trees?

A: Ms. Freedman explained that the most important parts of the pilot are that the public understands how the traffic flow will work and also so they can envision how the street will look. There will be some beautification and streetscape elements using temporary materials. The goal would not to use sandbags. Mr. Yeo also noted that more funds will be needed to fully implement the pilot.

Q: What are the deliverables for the $500,000?

A: Ms. Freedman explained that this will be the design plan for pilot that will be in the ground until the TIP project which could be in place for 10 years. Mr. Yeo explained that there will be an extensive public process while developing the plan. After the plan is created than it can go out to bid for construction.

Q: Why will it take 10 years?

A: Mr. Yeo explained that the hope is that the TIP project will take less than 10 years. They will be trying to apply for as many grants as possible.

Q: Why was the decision made to have an RFQ instead of an RFP (Request for Proposals)?

A: Ms. Freedman explained they went with an RFQ because the language can be more flexible. This also allows them to pick the consultant team with the best experience and vision for the project. Once the consultant on board they will help to figure out the specifics of the pilot.

Q: How much money has been spent on Washington Street from Chestnut to Lowell?

A: Jim McGonagle, Commissioner of Public Works explained that they have spent approximately $124,000 on the first portion on engineering and traffic studies. There will be an RFP for anything that is built and will need to come back to the Council for these funds.

Q: How much funds are available in the Host Community Agreement?

A: Mr. Yeo explained that there is over $500,000 in the account with 2 new stores that are starting to generate funds.

<u>Councilors made the following comments:</u>

A councilor noted that the City has already spent time on public input for the vision of Washington Street. It may be more productive to develop a couple of designs for people to look at then to get public input before the designs are produced.

There should be efforts made to reach out to state representatives as soon as possible and plan for a project that doesn't take 10 years.

Mr. Yeo explained that right now the focus is on the pilot because it will be in the ground for a significant amount of time. Ms. Freedman explained that the pilot will be important for receiving the grant funding.

A councilor noted that this project should move forward because there has already been a delay due to the pandemic. Additionally, this project will need to be done block by block due to changing road width and other aspects on the roads.

A councilor noted that there should be additional information giving regarding the project including the information about plantings.

There needs to be a design on Washington Street that protect all users, including pedestrians and bicyclists.

It was noted that ward councilors should have brought in before the RFQ was determined. A councilor also asked that before this item comes to the Finance Committee if there can be a working group for the project.

Mr. Yeo noted that they did incorporate all of the information from the conversations in 2019. It has not been determined yet how many meetings there will be but they will determine how they will work with the Council on this project.

Councilors also discussed how much this project will cost once the final bids come in.

Councilors Kelley and Gentile abstained from the vote to await further information for the project.

Councilor Crossley motioned to amend the item to strike out from Lowell Ave to Newton Corner which passed unanimously.

Councilor Norton motioned to approve as amended which passed 5-0-2 with Councilor Kelley and Gentile abstaining.

Referred to Public Facilities and Finance Committees

#294-22 **Appropriate $3,200,000 for water main improvements in FY23**
HER HONOR THE MAYOR requesting authorization to appropriate and expend the sum of three million two hundred thousand dollars ($3,200,000) and authorize a general obligation borrowing of an equal amount for water main improvements in FY23 as part of the City's Water Capital Improvement Plan and authorization to apply any premium received upon the sale of the bonds or notes, less the cost of preparing, issuing, and marketing them, and any accrued interest received upon the delivery of the bonds or notes to the costs of the project and to reduce the amount authorized to be borrowed for the project by like amount.

Action: **Public Facilities Approved 7-0**

Note: Jim McGonagle, Commissioner of Public Works presented the request to bond $3.2 million for water main improvements in FY23. Commissioner McGonagle explained that the balance of $2.1 million from an MWRA loan that the City receives annually.

Councilor Crossley motioned to approve which passed unanimously.

Chair's Note: *The Committee met jointly by the Public Safety & Transportation Committee for discussion on the following one item:*

Referred to Public Safety & Transportation and Public Facilities Committees

#243-22 Discussion regarding MassDOT's intersection project

HER HONOR THE MAYOR requesting a discussion of MassDOT's proposed modification to the roundabout design located at the Grove Street intersection from the I-95 SB off-ramp and Quinobequin Road consistent with the requirements of Riverside Special Permit #27-20(2), Condition 14c.

Public Facilities Held 7-0 on 04/06/22
Public Safety & Transportation Held 7-0 on 04/06/22
Public Safety & Transportation Held 7-0 on 05/04/22

Action: Public Facilities Held 7-0

Note: Jim McGonagle, Commissioner of Public Works explained that this is a discussion on MassDOT's proposed modifications to the roundabout design at the Grove Street intersection. Commissioner McGonagle read the attached language from the Riverside Special Permit #27-20(2). This required the developers to come before the appropriate committees of the City Council to discuss the modifications and then the Commissioner of Public Works would make the final determination. Representatives from Mark Development and their consultants were present for this discussion.

Randy Hart, from VHB which is a Civil engineering company, presented the attached presentation. He showed the previous and current versions of the proposed roundabout. Mr. Hart explained that this has changed through more through design with MassDOT. There is a desire to slow the traffic in the roundabout and as a result the roundabout had to be shifted which excluded Ashville from the roundabout. Mr. Hart explained that this created a larger bump out which will help with decreasing speeds.

Councilors asked the following questions:

Q: Where does MassDOT's land end on Grove Street?

A: The land goes up and over the bridge near Pierrepoint to the Indigo Hotel.

Q: What congestion will occur with the changes to the Ashville entrance?

A: Mr. Hart explained that they did a detailed traffic study to show the differences in traffic for the neighborhood which determined that there are no more than 6 vehicle changes. It was also noted that there is an option to move to a different side street to enter the roundabout.

Q: Were there sidewalks and crosswalks added to the current plan?

A: Mr. Hart explained that there were sidewalks added due to the Complete Streets guidance from MassDOT. Wayne Amico, VHB representative also noted that MassDOT requires all legs of the roundabout to have sidewalks. There have been many meetings with MassDOT but they have not vetted

every sidewalk location with them. There are concerns related to the crosswalk connected to a major highway.

Councilors made the following comments:

It was noted by a councilor that the question that is being asked is does the modified design achieve the same performance as the conceptual design. The attached responses were put together to explain the reasons why the new design does not achieve the same performance as the conceptual design. There should be other ways to slow the speeds down in the roundabout besides removing the Asheville resident's entry into the roundabout.

It was noted that when looking at traffic and pedestrian safety the revised design reached a much higher safety standard than the conceptual design.

Councilors raised concerns regarding the crosswalk at the exit of the major highway on one side of the roundabout. Mr. Hart noted that they will continue to discuss this with MassDOT.

A councilor noted that the Commissioner should try to mitigate the issues that were brought up in the attached responses.

Councilors did discuss holding the item until they can receive an update from Commissioner McGonagle regarding his ruling.

In Public Safety & Transportation, Councilor Markiewicz motioned to hold which passed unanimously.

In Public Facilities, Councilor Gentile motioned to hold which passed unanimously.

The Committees adjourned at 9:40 p.m.

Respectfully Submitted,

Alison Leary, Chair

291-22

Ruthanne Fuller
Mayor

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Barney S. Heath
Director

M E M O R A N D U M

Date: April 22, 2022

To: Mayor Ruthanne Fuller
Maureen Lemieux, Chief Financial Officer
Jonathan Yeo, Chief Operating Officer

From: Barney Heath, Director of Planning & Development

CC: Nicole Freedman, Director of Transportation Planning

Subject: Request to Docket Item for Washington Street Design

At this time, we respectfully request that you docket with the Honorable City Council a request of $500,000 to complete the design and engineering for a pilot redesign concept plan of Washington Street from Chestnut Street east to Church Street.

The envisioned project is a multi-phased complete streets "pilot" redesign of Washington Street, looking specifically at ensuring safe and accessible pedestrian crossings, providing safe linear bicycle access, slowing vehicle speeds, optimizing bus operations, and improving the public realm. The Designer will work under Planning, in concert with the Department of Public Works (DPW), the Mayor's Office, Public Safety, and other departments and the City Council, to provide planning/scoping, engineering analysis, concept design, construction plans, specifications, construction management services and evaluation for the redesign of Washington Street via a phased approach.

The project will build off previous work of the City's 2019 Washington Street Vision Plan and the Boston Region MPO's 2015 technical memorandum Washington Street Subregional Priority Roadway Study in Newton.

Project benefits will include:

- Improve the safety conditions for all road users, with particular focus on vulnerable users such as people with disabilities as well as older and younger users.
- Improve substantially biking, walking, pedestrian safety, and accessibility including increasing pedestrian crossings, ensuring accessibility, and providing protected bike lanes.

- Support public transit service, particularly optimizing bus operations and enhancing access to the commuter rail.
- Manage traffic flow including optimizing traffic signal operations.
- Create a vibrant, welcoming and inviting public realm and boulevard through streetscape enhancements, sidewalk improvements, improved street lighting, stormwater management, plantings, and street furniture.

The design process will take place in the following phases:

Phase 1a – Develop design concept and Evaluation Criteria for Trial
The consultant will assist the City in designing an initial roadway redesign pilot for Washington Street from Chestnut Street to Lowell Avenue (other limits may be chosen in concert with the selected consultant) to demonstrate proof of concept to the public for the re-alignment of Washington Street from 4 to 3 lanes (with turn lanes). Public process and outreach will include:

- ~4 public meetings
- ~5 small meetings with Ward Councilors
- ~6 Group sessions with the City's Complete Streets Working Group
- ~2-3 City Council meetings (Public Facilities and/or Public Safety and Transportation)
- Bi-weekly project team meetings with internal team including Planning and DPW
- Meeting with MassDOT, as needed

Phase 1b – TIP Project Planning and Initiation–Determine a phased approach to design and implementation for a Mass DOT Transportation Improvement Program (TIP) funded project to reconstruct Washington Street from Chestnut Street to no farther east than Church Street.

Phase 2: 25% Design TIP Project– Details to be determined at completion of Phase 1B.

Phase 3: 25-100% Engineering Design TIP Project– Details to be determined at completion of prior phases.

Phase 4: Construction Phase Services - Details to be determined at completion of prior phases

291-22

City of Newton, Massachusetts
Office of the Mayor

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April 25, 2022

Honorable City Council
Newton City Hall
1000 Commonwealth Avenue
Newton Centre, MA 02459

Councilors:

I respectfully submit a docket item to your Honorable Council requesting the authorization to appropriate and expend the amount of $500,000 from June 30, 2021 Certified Free Cash, derived from Host Community Agreement (HCA) Funds, to fund the design of the pilot program/interim solution for Washington Street.

Host Community Agreement funds are received as General Fund Revenues. If unspent, the HCA funds drop to Free Cash. Prior to the start of Fiscal Year 2022, the City had accumulated $577,460 of unspent HCA funds. Two of Newton's three active marijuana retail establishments, and two of the three delivery operators with signed HCAs, are located either right on Washington Street or directly off this major thoroughfare.

The envisioned project is a multi-phased complete streets "pilot" redesign of Washington Street, looking specifically at ensuring safe and accessible pedestrian crossings, providing safe linear bicycle access, slowing vehicle speeds, optimizing bus operations, and improving the public realm. The Designer will work under Planning, in concert with the Department of Public Works (DPW), the Mayor's Office, Public Safety, and other departments and the City Council, to provide planning/scoping, engineering analysis, concept design, construction plans, specifications, construction management services and evaluation for the redesign of Washington Street via a phased approach.

The project will build off previous work of the City's 2019 Washington Street Vision Plan and the Boston Region MPO's 2015 technical memorandum Washington Street Subregional Priority Roadway Study in Newton.

Project benefits will include:

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- Improve substantially biking, walking, pedestrian safety, and accessibility including increasing pedestrian crossings, ensuring accessibility, and providing protected bike lanes.
- Support public transit service, particularly optimizing bus operations and enhancing access to the commuter rail.
- Manage traffic flow including optimizing traffic signal operations.

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Phase 1a – Develop design concept and Evaluation Criteria for Trial
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- ~4 public meetings
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- Meeting with MassDOT, as needed

Phase 1b – TIP Project Planning and Initiation–Determine a phased approach to design and implementation for a Mass DOT Transportation Improvement Program (TIP) funded project to reconstruct Washington Street from Chestnut Street to no farther east than Church Street.

Phase 2: 25% Design TIP Project– Details to be determined at completion of Phase 1B.

Phase 3: 25-100% Engineering Design TIP Project– Details to be determined at completion of prior phases.

Phase 4: Construction Phase Services - Details to be determined at completion of prior phases

Please see the attached memo from Nicole Freedman, Director of Transportation Planning, for further details on the project.

Thank you for your consideration of this matter.

Sincerely,

Ruthanne Fuller

Ruthanne Fuller
Mayor

243-22

Ruthanne Fuller
Mayor

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March 28, 2022

Honorable City Council
Newton City Hall
1000 Commonwealth Avenue
Newton, MA 02459

Honorable City Councilors:

I respectfully submit this docket item to this Honorable Council requesting a discussion of MassDOT's proposed modification to the roundabout design located at the Grove Street intersection with the I-95 SB off-ramp and Quinobequin Road consistent with the requirements of Riverside Special Permit #27-20 (2), Condition 14c.

The relevant language from the Riverside Special Permit states:

Any material modifications to the final design of the Interchange Improvements by either MassDOT or FHWA will be considered consistent with the conceptually approved plan if, in the opinion of the Commissioner of Public Works, after consultation with the appropriate committee(s) of the City Council, the modified design achieves the same performance objectives as the conceptually approved design.

Please see the attached memo from Commissioner of Public Works James McGonagle and the detailed report from VHB on behalf of the project proponents.

Thank you for your consideration of this matter.

Sincerely,

Ruthanne Fuller

Mayor Ruthanne Fuller

City of Newton
Ruthanne
Fuller

DEPARTMENT OF PUBLIC WORKS

OFFICE OF THE COMMISSIONER
1000 Commonwealth Avenue
Newton Centre, MA 02459-1449

March 25, 2022

To: Jonathan Yeo, Chief Operating Officer

From: James McGonagle, Commissioner

Subject: Request for Docket Item for Discussion of Riverside Station Off-site Transportation Improvements

Consistent the requirements of Special Permit #27-20(2), Condition 14.c., DPW would like to discuss MassDOT's proposed modification to the roundabout design located at the Grove Street intersection with the I-95 SB off-ramp and Quinobequin Road.

The relevant language from the Riverside Special Permit states:

Any material modifications to the final design of the Interchange Improvements by either MassDOT or FHWA will be considered consistent with the conceptually approved plan if, in the opinion of the Commissioner of Public Works, after consultation with the appropriate committee(s) of the City Council, the modified design achieves the same performance objectives as the conceptually approved design.

Sincerely,

James McGonagle
Commissioner of Public Works

cc: Shawna Sullivan, DPW Deputy Commissioner
Louis M. Taverna, P.E., City Engineer
Jason Sobel, P.E., PTOE, Director of Transportation Operations
Isaac Prizant, Transportation Engineer

Memorandum

To: City of Newton

Date: 02/04/2022

Project #: 10865.03

From: Randy Hart, Principal
Matthew Duranleau, PE

Re: Grove Street at I-95 Southbound Ramps
Potential Intersection Treatments

VHB, on behalf of Mark Development (the Proponent) has prepared this memorandum to discuss the evaluation of the various different treatments that were done for the intersection of Grove Street at the I-95 Southbound Ramps in Newton, Massachusetts. This intersection will be reconstructed as part of the approved Riverside redevelopment, which will include the construction of approximately 1,025,000 of new development on the existing site of the MBTA Riverside station parking lot and the Hotel Indigo. As part of the development, significant roadway improvements will be implemented, including the reconstruction of the I-95 Northbound Exit 38 off-ramp to Grove Street, an extension of Recreation Road to Grove Street, the installation of three adaptive traffic signals, and improvements at the intersection of Grove Street at the I-95 Southbound Ramps.

In the local and state filings, the intersection of Grove Street at the I-95 Southbound Ramps was proposed to be replaced with a single-lane roundabout with four approaches: Grove Street from the east and west, the I-95 Southbound Ramps from the south, and Asheville Road from the north. As development of the 25-percent design plans began, the Proponent has been in close coordination with MassDOT regarding all aspects of the offsite design. During these detailed consultations, MassDOT has stressed the need to create more deflection on the various approaches to the proposed intersection reconstruction, specifically the Grove Street westbound and I-95 Southbound Off-Ramp approaches to the intersection. Increasing deflection will slow the traffic entering the roundabout thereby enhancing the pedestrian environment.

Revised Roundabout Concept

To meet the requests of MassDOT, the roundabout has been shifted a short distance to the northeast and by doing so, the geometry and right-of-way doesn't allow for Asheville Road to be included in the roundabout. Under this scenario, Ashville Road becomes a right-in/right-out at Grove Street south of the roundabout and drivers exiting Asheville Road would only be able to take a right turn onto Grove Street. To access Grove Street eastbound, drivers would need to use Pine Grove Avenue or Pierrepont Road to turn left onto Grove Street instead. Alternatively, drivers could use Pierrepont Road to turn right onto Grove Street and reverse direction at the roundabout. The proposed roundabout would consist of three approaches: Grove Street from the east and west and the I-95 Southbound Ramps from the south.

The shifting of the roundabout is a minor change from what was previously contemplated for the design of this intersection, and the only significant change is the shifting of the Roundabout easterly and the treatment of Asheville Road. There are benefits and disadvantages associated with this change, which include the following:

Benefits

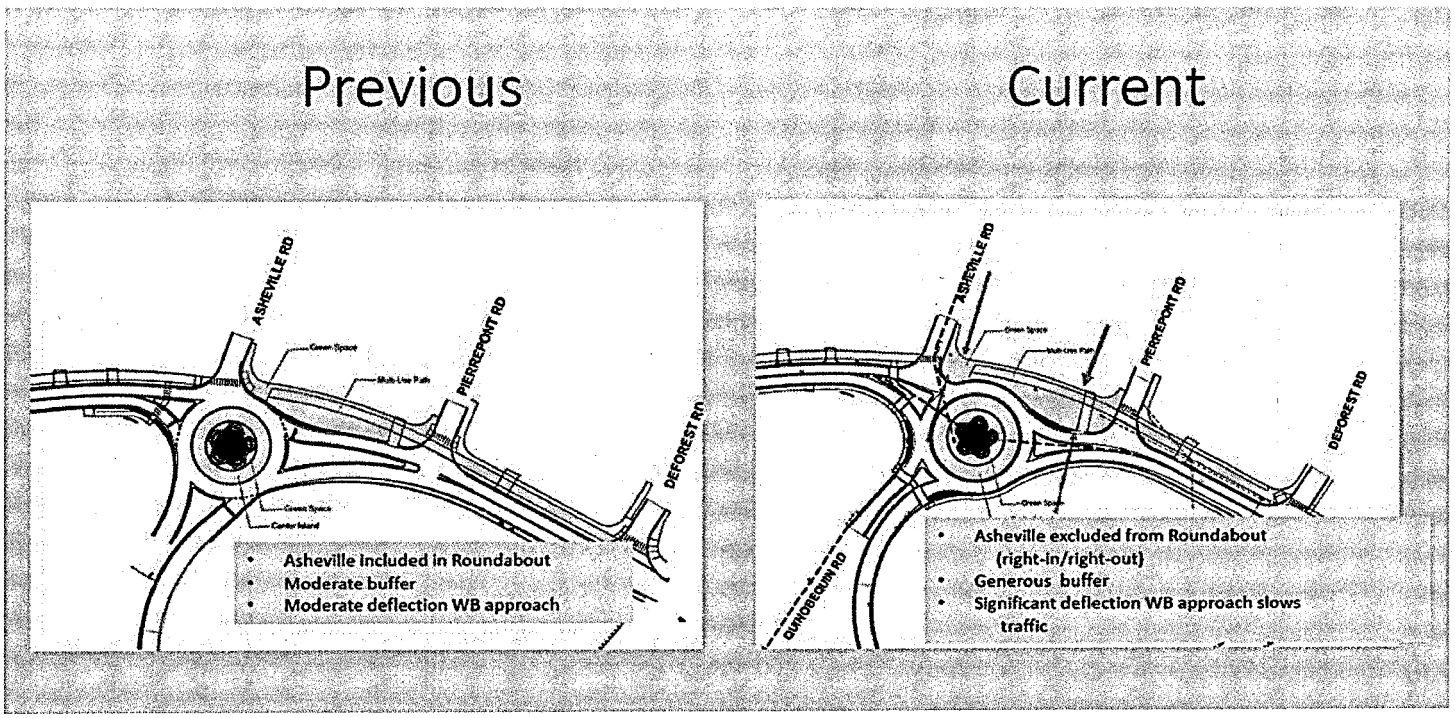
- Increased deflection of the approaches will slow traffic even more than former concepts
- Increased (substantially) green buffer between Grove Street and residents in northwest quadrant of intersection
- Deemphasizes traffic movements onto Asheville Road (northern neighborhood traffic will likely not use Asheville to gain access to the roundabout)
- Lower speed and more green space results in enhanced pedestrian environment

Detriments

- Residents on Asheville Road will not be able to turn left at Grove Street from Ashville's intersection with Grove.

To demonstrate the two roundabout options that have been considered, Figure 1 provides a side-by-side comparison of the previous four-legged roundabout concept and the currently proposed three-legged roundabout concept.

Figure 1 Comparison of Previous and Current Roundabout Concepts



Additional Intersection Concepts

At the initial Riverside Redevelopment Liaison Committee meeting on Tuesday January 25, 2022, the revised concept for the roundabout was presented. The initial feedback from members of the community was concern for the changes that would be introduced to Asheville Road. As a result of the comments and concerns, additional review of potential options has been considered and further discussion is being planned with MassDOT and the City of Newton.

To aid in those conversations, this memorandum has been prepared to evaluate various options that have been considered. These include:

- Original Four-Legged Roundabout Concept (with Asheville Road included)
- Revised Three-Legged Roundabout Concept (with Asheville Road excluded)
- Signalized intersection with slight shift of northbound approach (the I-95 Southbound Ramps approach is shifted slightly west from its current location to directly align with Asheville Road)
- Signalized intersection in current location (each approach has the same geometry as existing conditions with the I-95 Southbound Ramps and Asheville Road slightly offset from each other)

Concept plans for the two signalized scenarios are provided in the Attachments to this memorandum.

The following section summarizes the intersection capacity results of the proposed roundabout and signalized intersection concepts.

Intersection Operations

To demonstrate future traffic operations at the intersection under different concept alternatives, intersection capacity analyses have been conducted based on the 2031 Build Conditions with mitigation traffic volumes as presented in the most recent MEPA filings for the Riverside redevelopment project[1]. The traffic volumes present a future condition that includes a growth in traffic over existing conditions due to the Riverside redevelopment as well as due to other background projects. The intersection capacity analyses have been conducted for the weekday morning, weekday evening, and Saturday midday peak hours using Synchro 10 software for the signalized concepts and using Sidra 8 software for the roundabout concepts.

Roundabout Concepts

Table 1 presents a summary of the capacity analyses for intersection under the four-legged and three-legged roundabout alternatives. The intersection capacity worksheets are included in the Attachments to this memorandum.

[1] Supplemental Draft Environmental Impact Report, EEA No. 16024, Riverside Station Redevelopment; Prepared by VHB; May 17, 2021.

Table 1 Roundabout Intersection Capacity Analysis Summary

Location	2031 Build Conditions w/ Mitigation Original Four-Legged Concept					2031 Build Conditions w/ Mitigation Revised Three-Legged Concept				
	D [a]	v/c [b]	Delay [c]	LOS [d]	95th Q [e]	D	v/c	Delay	LOS	95th Q
Grove Street at I-95 Southbound Ramps / Asheville Road										
Weekday Morning										
Grove Street EB LTR	575	0.75	20	C	321	590	0.76	20	C	339
Grove Street WB LTR	380	0.38	7	A	50	380	0.38	7	A	50
I-95 SB Off-Ramp NB LTR	375	0.67	20	C	143	375	0.66	20	C	142
Asheville Road SB LTR	15	0.03	6	A	2	n/a	n/a	n/a	n/a	n/a
Overall			**16**	**C**				**16**	**C**	
Weekday Evening										
Grove Street EB LTR	260	0.43	12	B	56	265	0.43	12	B	57
Grove Street WB LTR	730	0.76	17	C	212	730	0.75	17	C	212
I-95 SB Off-Ramp NB LTR	190	0.25	7	A	25	190	0.25	7	A	25
Asheville Road SB LTR	10	0.02	8	A	1	n/a	n/a	n/a	n/a	n/a
Overall			**14**	**B**				**14**	**B**	
Saturday Midday										
Grove Street EB LTR	220	0.28	7	A	29	235	0.29	7	A	31
Grove Street WB LTR	350	0.36	7	A	45	350	0.36	7	A	45
I-95 SB Off-Ramp NB LTR	280	0.33	7	A	37	280	0.32	7	A	37
Asheville Road SB LTR	15	0.02	5	A	2	n/a	n/a	n/a	n/a	n/a
Overall			**7**	**A**				7	**A**	

Source: analyzed with Sidra 8 software.
a Demand (input)
b volume-to-capacity ratio
c average total delay, in seconds per vehicle
d level of service
e 95th percentile queue length, measured in feet

As shown in Table 1, the intersection with either roundabout concept is proposed to operate at overall LOS C or better during each peak hour. Each approach is also expected to operate at LOS C or better and the queues on each approach are expected to be less than 350 feet during each peak hour. Operations are expected to be comparable between the four-legged and the three-legged roundabout concepts.

Signalized Intersection Concepts

Table 2 presents a summary of the capacity analyses for intersection under the two different signalized alternatives (Concept 1 assumes the I-95 Southbound Ramps approach is shifted slightly west to directly align with Asheville Road and Concept 2 assumes each approach has the same geometry as under existing conditions). The intersection capacity worksheets are included in the Attachments to this memorandum.

Table 2 Four-Legged Signalized Intersection Capacity Analysis

Location	2031 Build Conditions w/ Mitigation Concept 1					2031 Build Conditions w/ Mitigation Concept 2				
	v/c [a]	Delay [b]	LOS [c]	50th Q [d]	95th Q [e]	v/c	Delay	LOS	50th Q	95th Q
Grove Street at I-95 Southbound Ramps / Asheville Road										
Weekday Morning										
Grove Street EB LTR	0.80	27	C	192	#526	0.73	24	C	158	#587
Grove Street WB L	0.45	7	A	22	103	0.50	11	B	22	148
Grove Street WB TR	0.12	5	A	12	61	0.12	6	A	12	81
I-95 SB Off-Ramp NB LT	0.03	33	C	2	15	0.03	31	C	2	15
I-95 SB Off-Ramp NB R	0.64	25	C	115	#374	0.74	32	C	120	#426
Asheville Road SB LTR	0.10	35	C	6	28	0.10	34	C	5	29
Overall		**21**	**C**				**22**	**C**		
Weekday Evening										
Grove Street EB LTR	0.58	27	C	81	220	0.64	32	C	86	#302
Grove Street WB L	0.56	8	A	46	212	0.61	13	B	47	#344
Grove Street WB TR	0.23	5	A	26	122	0.25	7	A	26	162
I-95 SB Off-Ramp NB LT	0.25	33	C	14	62	0.28	34	C	15	62
I-95 SB Off-Ramp NB R	0.20	10	B	19	102	0.19	11	B	22	104
Asheville Road SB LTR	0.04	31	C	2	18	0.04	33	C	3	18
Overall		**13**	**B**				**16**	**B**		
Saturday Midday										
Grove Street EB LTR	0.51	23	C	51	173	0.50	23	C	49	188
Grove Street WB L	0.36	7	A	22	104	0.36	9	A	20	131
Grove Street WB TR	0.12	6	A	11	56	0.12	7	A	10	71
I-95 SB Off-Ramp NB LT	0.16	25	C	9	52	0.18	28	C	9	56
I-95 SB Off-Ramp NB R	0.32	11	B	28	157	0.33	14	B	28	194
Asheville Road SB LTR	0.08	26	C	4	27	0.07	30	C	4	30
Overall		**13**	**B**				**15**	**B**		

Source: analyzed with Synchro 10 software.
Note: analyzed with right turns on red prohibited on all approaches to provide a conservative analysis.

a volume-to-capacity ratio
b average delay in seconds per vehicle
c level of service
d 50th percentile queue length, measured in feet
e 95th percentile queue length, measured in feet
95th percentile volume exceeds capacity, queue may be longer

As shown in Table 2, the intersection with the four-legged signalized concept is proposed to operate at overall LOS C or better during each peak hour under both concepts. Each approach is also expected to operate at LOS C or better during each peak hour under both concepts.

Overall, operations are slightly better under signalized Concept 1 compared to signalized Concept 2. Under Concept 1, the I-95 Southbound Ramps is shifted slightly west to directly align with Asheville Road. This means that the Asheville Road and the I-95 Southbound Ramps approaches can run concurrently and have green lights at the same time. Under Concept 2, the two approaches cannot run concurrently and have green lights at different times due to the

approaches being offset from each other. By not allowing the two approaches to run at the same time, there is additional lost time at the intersection with the needed yellow and all-red time for the additional signal phase, which causes slightly higher delays and queues for all the approaches.

It should be noted that under both signalized concepts the queues are expected to be longer then compared to the roundabout concepts. For example, during the weekday morning peak hour, the 95th-percentile queue on the Grove Street eastbound approach is expected to be approximately 526 feet or 587 feet under the two signalized concepts but only 339 feet under the three-legged roundabout concept. In addition, the 95th-percentile queue on the I-95 Southbound Off-Ramp is expected to be approximately 374 feet or 426 feet during the weekday morning peak hour under the two signalized concepts but only 142 feet under the three-legged roundabout option.

Comparison of Options

The operational analyses presented above show the difference in operations between a roundabout and traffic signal options. As highlighted, there is significant difference in vehicle queuing along Grove Street northbound and on the Southbound Ramp. To demonstrate, visually, the differences in options the following two graphics have been created to demonstrate the difference between the two critical periods. Figure 2 and Figure 3 provide illustrative comparisons of the 95th-percentile queues during the weekday morning peak hour on the Grove Street eastbound and I-95 SB Off-Ramp northbound approaches, respectively.

Figure 2 Grove Street Eastbound Approach Weekday Morning Peak Hour 95th Percentile Queues

Figure 3 I-95 SB Off-Ramp Northbound Approach Weekday Morning Peak Hour 95th Percentile Queues

As shown in Figures 1 and 2, queues on critical approaches to the intersection are substantially shorter with the roundabout proposed. This is particularly true along the I-95 Southbound Off-Ramp, where the queue under the proposed roundabout concept is less than one-third the length of the queue under the potential signalized options.

As part of the proposed Project, the Proponent is being required to do clearing in the interior of the I-95 Southbound Grove Street Off-Ramp to increase sight lines to ensure visibility to back of queue is available. This is a very important safety consideration for MassDOT and therefore treatments that minimize ramp queues should be considered preferable.

In addition, a major difference between the proposed roundabout concept and the signalized options is the elimination of the right-turn slip lane from the I-95 Southbound Off-Ramp to Grove Street eastbound. Under existing conditions, the slip lane does not provide adequate deflection to significantly reduce the speed of drivers exiting the interstate. Although the signalized options would include a signal on the slip lane, drivers will still be able to travel at high speeds onto Grove Street without significantly slowing down when the signal is green. Under the roundabout concept, the slip lane is eliminated, and all right-turning traffic must travel through the roundabout. The deflection provided in the three-legged roundabout will force drivers to slow down as they turn onto Grove Street.

Conclusion

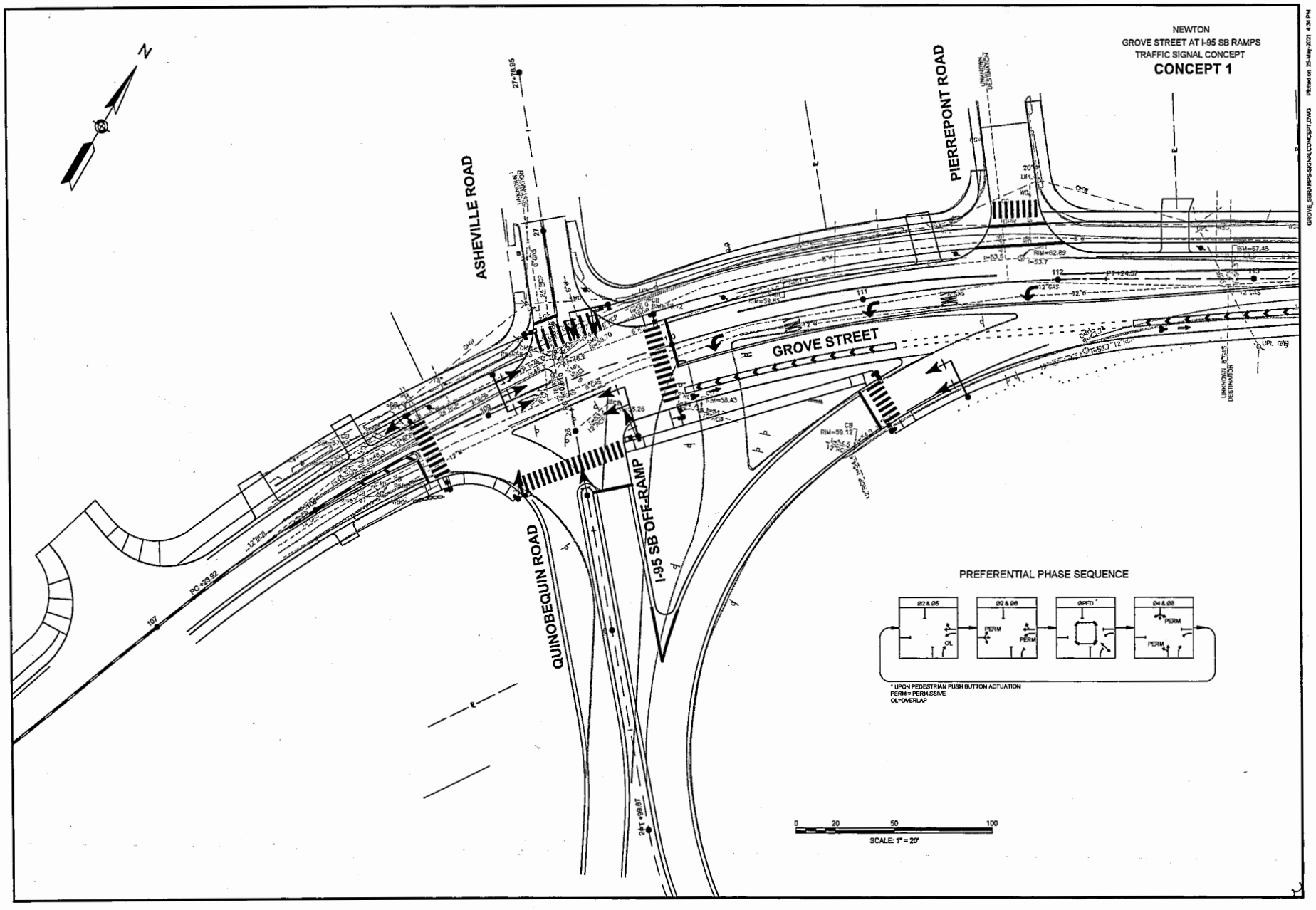
As outlined in this memorandum, future traffic conditions at the intersection of Grove Street at the I-95 Southbound Ramps are expected to operate at acceptable levels-of-service under both the roundabout concepts and the four-legged signalized concepts. However, the queues on each approach are expected to be much shorter under the roundabout concepts than under the signalized concepts. In addition, the three-legged roundabout concept is expected to provide improved safety for all users over the signalized concepts with lower vehicle speeds through the intersection and the elimination of the right-turn slip lane from the I-95 Southbound Off-Ramp to Grove Street eastbound.

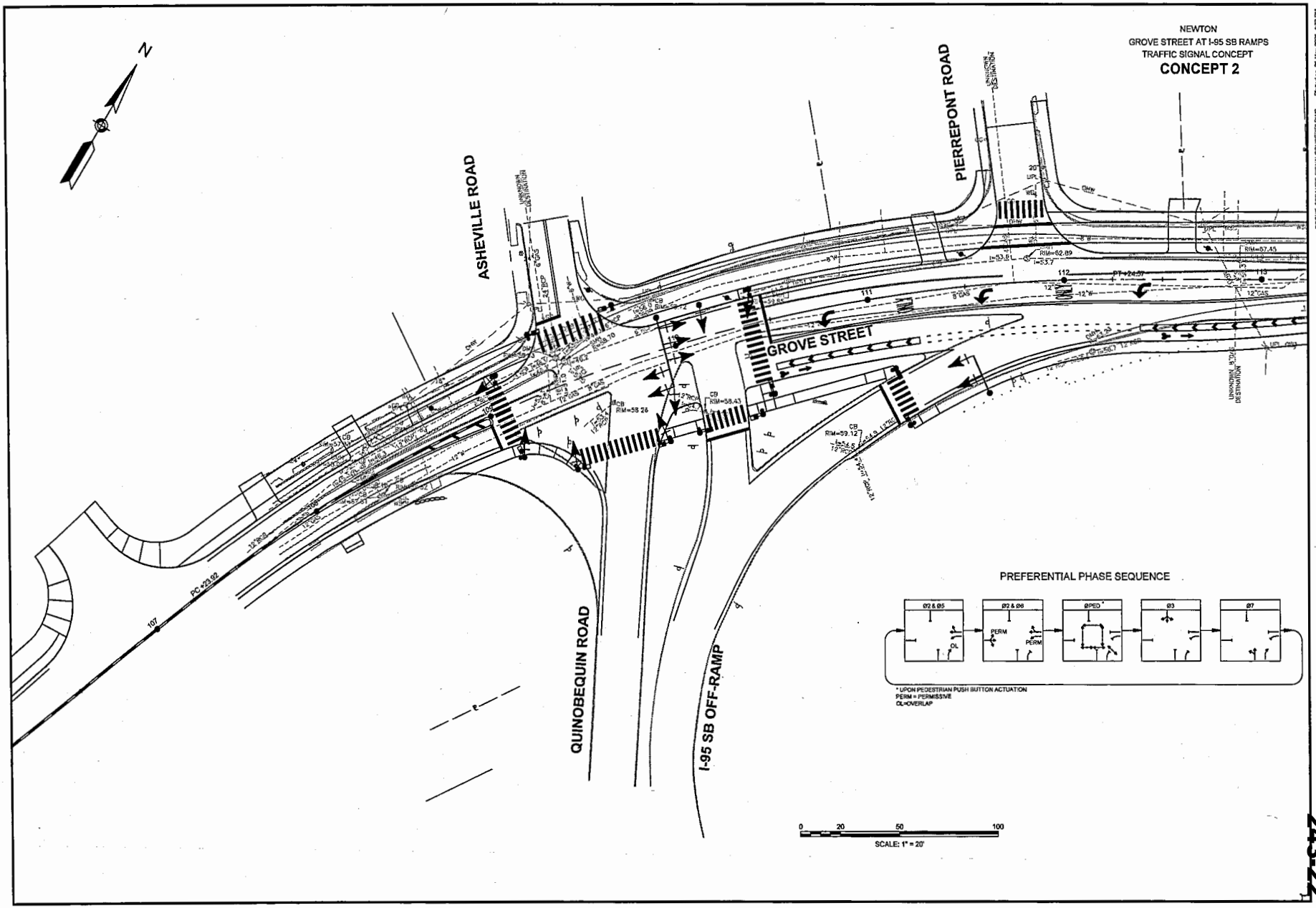
City of Newton
Ref: 10865.03
02/04/2022
Attachments

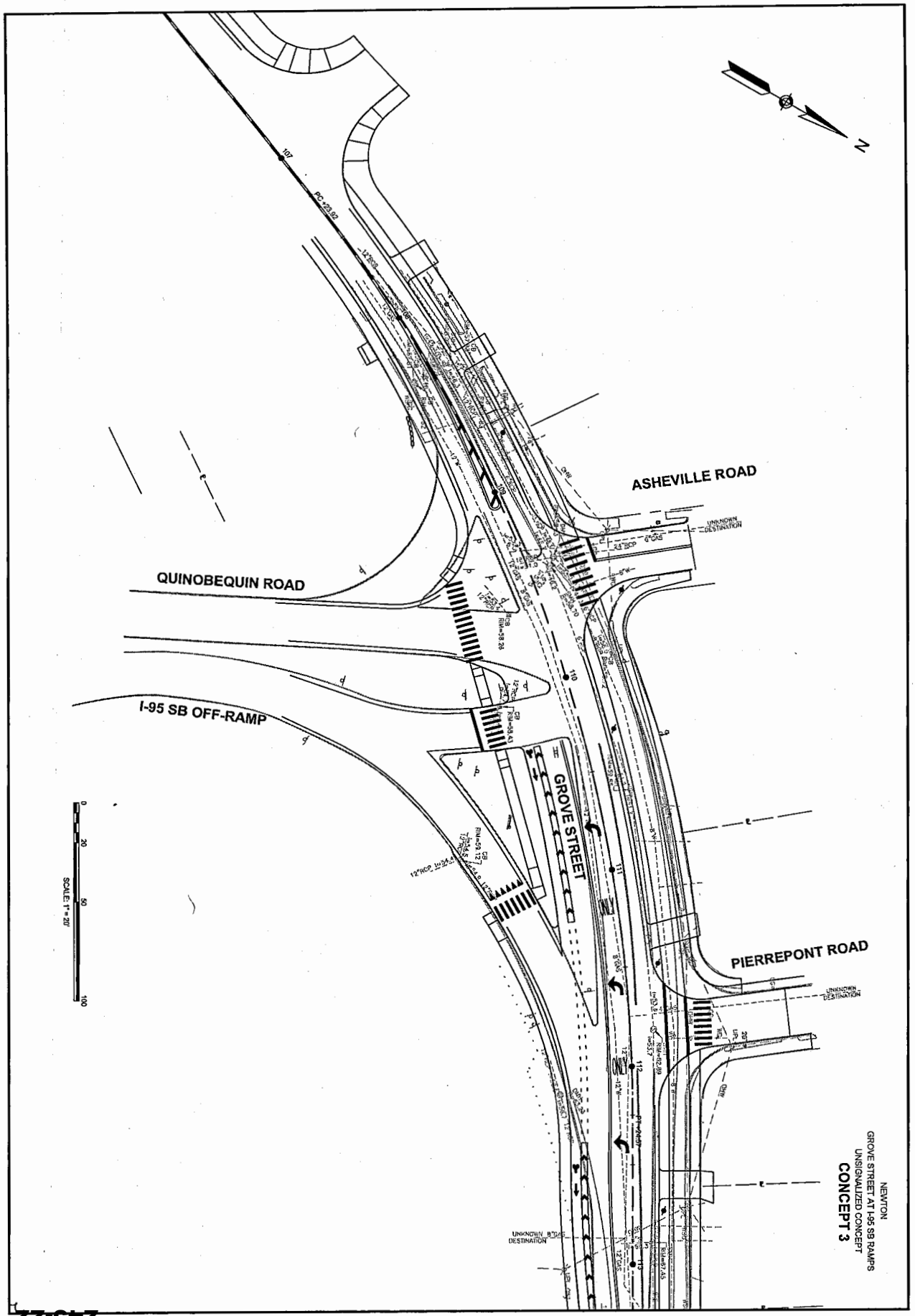
vhb
Memorandum

Attachments

- Concept Plans – Signalized
- Intersection Capacity Analyses – Roundabout
- Intersection Capacity Analyses – Signalized


NEWTON
GROVE STREET AT I-95 SB RAMPS
TRAFFIC SIGNAL CONCEPT
CONCEPT 1
N
ASHEVILLE ROAD
PIERREPONT ROAD
GROVE STREET
QUINOBEQUIN ROAD
I-95 SB OFF-RAMP
PREFERENTIAL PHASE SEQUENCE
PERM
* UPON PEDESTRIAN PUSH BUTTON ACTUATION
PERM = PERMISSIVE
OL=OVERLAP
0 20 50 100
SCALE: 1" = 20'
GROVE_SBRAMPS-SIGNAL CONCEPT.DWG Plotted on 25-May-2021 4:34 PM


NEWTON
GROVE STREET AT I-95 SB RAMPS
TRAFFIC SIGNAL CONCEPT
CONCEPT 2
N
ASHEVILLE ROAD
PIERREPONT ROAD
GROVE STREET
QUINOBEQUIN ROAD
I-95 SB OFF-RAMP
PREFERENTIAL PHASE SEQUENCE
Ø2 & Ø5
Ø2 & Ø6
ØPED *
Ø3
Ø7
PERM
PERM
OL
* UPON PEDESTRIAN PUSH BUTTON ACTUATION
PERM = PERMISSIVE
OL=OVERLAP
0
20
50
100
SCALE: 1" = 20'
243-22



NEWTON
GROVE STREET AT I-95 SB RAMPS
UNSIGNALIZED CONCEPT
CONCEPT 3

GROVE_SBRAMPS-SIGNALCONCEPT3.DWG Plotted on 4-Jun-2021 8:28 AM

LANE SUMMARY

Site: 101 [Weekday Morning_2031 Build with Mitigation]

Grove Street at Asheville Road / I-95 SB Ramps
Site Category: (None)
Roundabout

Lane Use and Performance													
	Demand Flows Total veh/h	HV %	Cap veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: I-95 SB Ramps													
Lane 1[d]	409	2.0	615	0.665	100	20.0	LOS C	5.6	143.1	Full	1600	0.0	0.0
Approach	409	2.0		0.665		20.0	LOS C	5.6	143.1				
East: Grove Street													
Lane 1[d]	413	3.0	1089	0.379	100	7.2	LOS A	2.0	50.1	Full	1600	0.0	0.0
Approach	413	3.0		0.379		7.2	LOS A	2.0	50.1				
North: Asheville Road													
Lane 1[d]	17	7.0	690	0.025	100	5.5	LOS A	0.1	2.1	Full	1600	0.0	0.0
Approach	17	7.0		0.025		5.5	LOS A	0.1	2.1				
West: Grove Street													
Lane 1[d]	626	2.0	832	0.752	100	20.0	LOS C	12.6	321.1	Full	1600	0.0	0.0
Approach	626	2.0		0.752		20.0	LOS C	12.6	321.1				
Intersection	1465	2.3		0.752		16.2	LOS C	12.6	321.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [Weekday Evening_2031 Build with Mitigation]

Grove Street at Asheville Road / I-95 SB Ramps
Site Category: (None)
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: I-95 SB Ramps													
Lane 1[d]	207	5.0	840	0.246	100	6.9	LOS A	0.9	24.7	Full	1600	0.0	0.0
Approach	207	5.0		0.246		6.9	LOS A	0.9	24.7				
East: Grove Street													
Lane 1[d]	793	2.0	1051	0.755	100	16.9	LOS C	8.3	212.0	Full	1600	0.0	0.0
Approach	793	2.0		0.755		16.9	LOS C	8.3	212.0				
North: Asheville Road													
Lane 1[d]	9	0.0	486	0.018	100	7.6	LOS A	0.1	1.4	Full	1600	0.0	0.0
Approach	9	0.0		0.018		7.6	LOS A	0.1	1.4				
West: Grove Street													
Lane 1[d]	284	3.0	665	0.427	100	11.5	LOS B	2.2	56.0	Full	1600	0.0	0.0
Approach	284	3.0		0.427		11.5	LOS B	2.2	56.0				
Intersection	1292	2.7		0.755		14.1	LOS B	8.3	212.0				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [Saturday Midday_2031 Build with Mitigation]

Grove Street at Asheville Road / I-95 SB Ramps
Site Category: (None)
Roundabout

Lane Use and Performance													
	Demand Flows Total veh/h	HV %	Cap veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: I-95 SB Ramps													
Lane 1[d]	304	1.0	934	0.326	100	7.3	LOS A	1.5	37.1	Full	1600	0.0	0.0
Approach	304	1.0		0.326		7.3	LOS A	1.5	37.1				
East: Grove Street													
Lane 1[d]	380	1.0	1065	0.357	100	7.0	LOS A	1.8	45.2	Full	1600	0.0	0.0
Approach	380	1.0		0.357		7.0	LOS A	1.8	45.2				
North: Asheville Road													
Lane 1[d]	17	0.0	745	0.023	100	5.1	LOS A	0.1	1.9	Full	1600	0.0	0.0
Approach	17	0.0		0.023		5.1	LOS A	0.1	1.9				
West: Grove Street													
Lane 1[d]	239	1.0	855	0.280	100	7.2	LOS A	1.2	29.3	Full	1600	0.0	0.0
Approach	239	1.0		0.280		7.2	LOS A	1.2	29.3				
Intersection	941	1.0		0.357		7.1	LOS A	1.8	45.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [Weekday Morning_2031 Build with Mitigation]

Grove Street at Asheville Road / I-95 SB Ramps
Site Category: (None)
Roundabout

Lane Use and Performance													
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: I-95 SB Ramps													
Lane 1[d]	408	2.0	616	0.662	100	19.9	LOS C	5.6	141.8	Full	1600	0.0	0.0
Approach	408	2.0		0.662		19.9	LOS C	5.6	141.8				
East: Grove Street													
Lane 1[d]	413	3.0	1091	0.379	100	7.2	LOS A	2.0	50.0	Full	1600	0.0	0.0
Approach	413	3.0		0.379		7.2	LOS A	2.0	50.0				
West: Grove Street													
Lane 1[d]	641	2.0	847	0.757	100	20.0	LOS C	13.4	339.3	Full	1600	0.0	0.0
Approach	641	2.0		0.757		20.0	LOS C	13.4	339.3				
Intersection	1462	2.3		0.757		16.3	LOS C	13.4	339.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [Weekday Evening_2031 Build with Mitigation]

Grove Street at Asheville Road / I-95 SB Ramps
Site Category: (None)
Roundabout

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: I-95 SB Ramps													
Lane 1[d]	207	5.0	841	0.245	100	6.9	LOS A	0.9	24.6	Full	1600	0.0	0.0
Approach	207	5.0		0.245		6.9	LOS A	0.9	24.6				
East: Grove Street													
Lane 1[d]	793	2.0	1052	0.754	100	16.8	LOS C	8.3	211.8	Full	1600	0.0	0.0
Approach	793	2.0		0.754		16.8	LOS C	8.3	211.8				
West: Grove Street													
Lane 1[d]	288	3.0	670	0.430	100	11.5	LOS B	2.2	57.0	Full	1600	0.0	0.0
Approach	288	3.0		0.430		11.5	LOS B	2.2	57.0				
Intersection	1288	2.7		0.754		14.1	LOS B	8.3	211.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

Site: 101 [Saturday Midday_2031 Build with Mitigation]

Grove Street at Asheville Road / I-95 SB Ramps
Site Category: (None)
Roundabout

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: I-95 SB Ramps													
Lane 1[d]	304	1.0	939	0.324	100	7.3	LOS A	1.5	36.9	Full	1600	0.0	0.0
Approach	304	1.0		0.324		7.3	LOS A	1.5	36.9				
East: Grove Street													
Lane 1[d]	380	1.0	1071	0.355	100	7.0	LOS A	1.8	44.9	Full	1600	0.0	0.0
Approach	380	1.0		0.355		7.0	LOS A	1.8	44.9				
West: Grove Street													
Lane 1[d]	250	1.0	869	0.288	100	7.2	LOS A	1.2	30.5	Full	1600	0.0	0.0
Approach	250	1.0		0.288		7.2	LOS A	1.2	30.5				
Intersection	935	1.0		0.355		7.2	LOS A	1.8	44.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

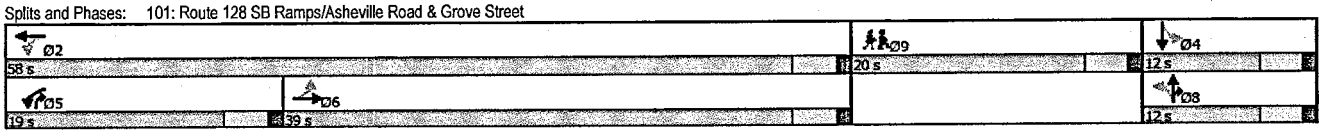
d Dominant lane on roundabout approach

Riverside Station Development :: 10865.03 — 2031 Build Conditions with Mitigation - Signal at SB Ramps - Concept 1
101: Route 128 SB Ramps/Asheville Road & Grove Street — Timing Plan: Weekday Morning

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9
Lane Configurations													
Traffic Volume (vph)	1	520	55	240	135	5	5	1	370	10	5	0	
Future Volume (vph)	1	520	55	240	135	5	5	1	370	10	5	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	200		0	0		200	0		0	
Storage Lanes	0		0	1		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1835	0	1752	1834	0	0	1788	1583	0	1717	0	
Flt Permitted				0.243				0.837			0.843		
Satd. Flow (perm)	0	1835	0	448	1834	0	0	1559	1583	0	1497	0	
Right Turn on Red			No			No			No			No	
Satd. Flow (RTOR)													
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1604			920			838			182		
Travel Time (s)		36.5			20.9			19.0			4.1		
Confl. Peds. (#/hr)	7					7							
Confl. Bikes (#/hr)			1			1							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	2%	2%	2%	7%	7%	7%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	626	0	261	152	0	0	6	402	0	16	0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pt+ov	Perm	NA		
Protected Phases		6		5	2			8	5 8		4		9
Permitted Phases	6			2			8			4			
Detector Phase	6	6		5	2		8	8	5 8	4	4		
Switch Phase													
Minimum Initial (s)	10.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0		4.0
Minimum Split (s)	14.0	14.0		10.0	14.0		10.0	10.0		10.0	10.0		20.0
Total Split (s)	39.0	39.0		19.0	58.0		12.0	12.0		12.0	12.0		20.0
Total Split (%)	43.3%	43.3%		21.1%	64.4%		13.3%	13.3%		13.3%	13.3%		22%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0		
Total Lost Time (s)		4.0		4.0	4.0			4.0			4.0		
Lead/Lag	Lag	Lag		Lead									
Lead-Lag Optimize?													
Recall Mode	Min	Min		None	Min		None	None		None	None		None
Act Effct Green (s)		28.0		45.8	45.8			8.4	26.1		6.8		
Actuated g/C Ratio		0.43		0.70	0.70			0.13	0.40		0.10		
v/c Ratio		0.80		0.45	0.12			0.03	0.64		0.10		
Control Delay		27.0		7.0	4.5			33.0	25.3		34.5		
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0		
Total Delay		27.0		7.0	4.5			33.0	25.3		34.5		
LOS		C		A	A			C	C		C		
Approach Delay		27.0			6.1			25.4			34.5		
Approach LOS		C			A			C			C		
Queue Length 50th (ft)		192		22	12			2	115		6		
Queue Length 95th (ft)		#526		103	61			15	#374		28		
Internal Link Dist (ft)		1524			840			758			102		
Turn Bay Length (ft)				200					200				
Base Capacity (vph)		1026		626	1531			199	683		191		
Starvation Cap Reductn		0		0	0			0	0		0		
Spillback Cap Reductn		0		0	0			0	0		0		
Storage Cap Reductn		0		0	0			0	0		0		
Reduced v/c Ratio		0.61		0.42	0.10			0.03	0.59		0.08		

Intersection Summary
Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 65.4
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 20.7 — Intersection LOS: C
Intersection Capacity Utilization 68.7% — ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 101: Route 128 SB Ramps/Asheville Road & Grove Street

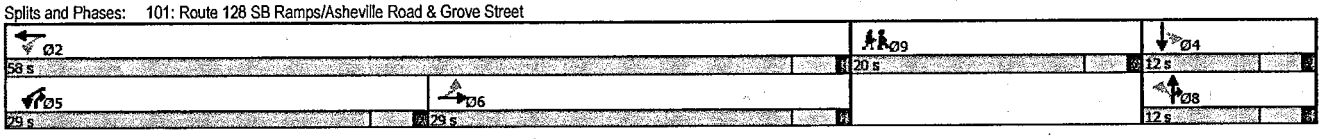


Riverside Station Development :: 10865.03 — 2031 Build Conditions w/ Mitigation - Signal at SB Ramps - Concept 1
101: Route 128 SB Ramps/Asheville Road & Grove Street — Timing Plan: Weekday Evening

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9
Lane Configurations													
Traffic Volume (vph)	1	215	45	445	275	10	40	5	145	5	2	1	
Future Volume (vph)	1	215	45	445	275	10	40	5	145	5	2	1	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	200		0	0		200	0		0	
Storage Lanes	0		0	1		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1802	0	1770	1851	0	0	1732	1538	0	1812	0	
Flt Permitted		0.999		0.341				0.743			0.813		
Satd. Flow (perm)	0	1800	0	635	1851	0	0	1344	1538	0	1518	0	
Right Turn on Red			No			No			No			No	
Satd. Flow (RTOR)													
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1604			883			838			182		
Travel Time (s)		36.5			20.1			19.0			4.1		
Confl. Peds. (#/hr)	16					16							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	5%	5%	5%	0%	0%	0%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	284	0	484	310	0	0	48	158	0	8	0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pt+ov	Perm	NA		
Protected Phases		6		5	2			8	5 8		4		9
Permitted Phases	6			2			8			4			
Detector Phase	6	6		5	2		8	8	5 8	4	4		
Switch Phase													
Minimum Initial (s)	10.0	10.0		6.0	6.0		6.0	6.0		6.0	6.0		4.0
Minimum Split (s)	14.0	14.0		10.0	10.0		10.0	10.0		10.0	10.0		20.0
Total Split (s)	29.0	29.0		29.0	58.0		12.0	12.0		12.0	12.0		20.0
Total Split (%)	32.2%	32.2%		32.2%	64.4%		13.3%	13.3%		13.3%	13.3%		22%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0		
Total Lost Time (s)		4.0		4.0	4.0			4.0			4.0		
Lead/Lag	Lag	Lag		Lead									
Lead-Lag Optimize?													
Recall Mode	Min	Min		None	None		None	None		None	None		None
Act Effct Green (s)		15.2		40.4	41.9			8.1	29.5		8.1		
Actuated g/C Ratio		0.27		0.72	0.74			0.14	0.52		0.14		
v/c Ratio		0.58		0.56	0.23			0.25	0.20		0.04		
Control Delay		26.7		8.1	5.0			33.0	10.4		31.0		
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0		
Total Delay		26.7		8.1	5.0			33.0	10.4		31.0		
LOS		C		A	A			C	B		C		
Approach Delay		26.7			6.9			15.6			31.0		
Approach LOS		C			A			B			C		
Queue Length 50th (ft)		81		46	26			14	19		2		
Queue Length 95th (ft)		220		212	122			62	102		18		
Internal Link Dist (ft)		1524			803			758			102		
Turn Bay Length (ft)				200					200				
Base Capacity (vph)		907		1027	1660			216	975		244		
Starvation Cap Reductn		0		0	0			0	0		0		
Spillback Cap Reductn		0		0	0			0	0		0		
Storage Cap Reductn		0		0	0			0	0		0		
Reduced v/c Ratio		0.31		0.47	0.19			0.22	0.16		0.03		

Intersection Summary
Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 56.3
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.58
Intersection Signal Delay: 12.8 — Intersection LOS: B
Intersection Capacity Utilization 53.8% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 101: Route 128 SB Ramps/Asheville Road & Grove Street



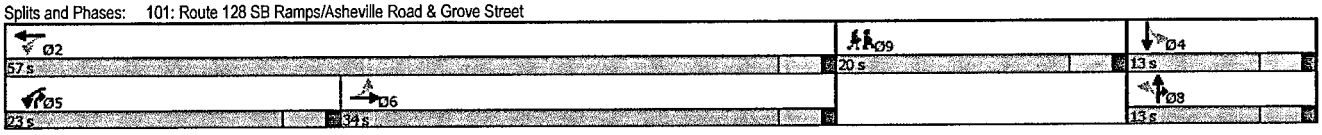
Riverside Station Development :: 10865.03
101: Route 128 SB Ramps/Asheville Road & Grove Street

2031 Build Conditions with Mitigation - Signal at SB Ramps - Concept 1
Timing Plan: Saturday Midday

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9
Lane Configurations													
Traffic Volume (vph)	5	150	65	230	115	5	35	5	240	10	5	1	
Future Volume (vph)	5	150	65	230	115	5	35	5	240	10	5	1	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	200		0	0		200	0		0	
Storage Lanes	0		0	1		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1804	0	1787	1868	0	0	1802	1599	0	1826	0	
Flt Permitted		0.995		0.398				0.767			0.849		
Satd. Flow (perm)	0	1797	0	749	1868	0	0	1443	1599	0	1600	0	
Right Turn on Red			No			No			No			No	
Satd. Flow (RTOR)													
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1604			883			759			182		
Travel Time (s)		36.5			20.1			17.3			4.1		
Confl. Peds. (#/hr)	4					4							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	239	0	250	130	0	0	43	261	0	17	0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pt+ov	Perm	NA		
Protected Phases		6		5	2			8	5 8		4		9
Permitted Phases	6			2			8			4			
Detector Phase	6	6		5	2		8	8	5 8	4	4		
Switch Phase													
Minimum Initial (s)	10.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0		4.0
Minimum Split (s)	14.0	14.0		10.0	14.0		10.0	10.0		10.0	10.0		20.0
Total Split (s)	34.0	34.0		23.0	57.0		13.0	13.0		13.0	13.0		20.0
Total Split (%)	37.8%	37.8%		25.6%	63.3%		14.4%	14.4%		14.4%	14.4%		22%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0		
Total Lost Time (s)		4.0		4.0	4.0			4.0			4.0		
Lead/Lag	Lag	Lag		Lead									
Lead-Lag Optimize?													
Recall Mode	Min	Min		None	Min		None	None		None	None		None
Act Effct Green (s)		12.9		29.4	29.4			9.0	25.5		6.9		
Actuated g/C Ratio		0.26		0.59	0.59			0.18	0.52		0.14		
v/c Ratio		0.51		0.36	0.12			0.16	0.32		0.08		
Control Delay		22.5		7.4	5.9			25.0	10.8		25.9		
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0		
Total Delay		22.5		7.4	5.9			25.0	10.8		25.9		
LOS		C		A	A			C	B		C		
Approach Delay		22.5			6.9			12.8			25.9		
Approach LOS		C			A			B			C		
Queue Length 50th (ft)		51		22	11			9	28		4		
Queue Length 95th (ft)		173		104	56			52	157		27		
Internal Link Dist (ft)		1524			803			679			102		
Turn Bay Length (ft)				200					200				
Base Capacity (vph)		1179		876	1738			283	1052		315		
Starvation Cap Reductn		0		0	0			0	0		0		
Spillback Cap Reductn		0		0	0			0	0		0		
Storage Cap Reductn		0		0	0			0	0		0		
Reduced v/c Ratio		0.20		0.29	0.07			0.15	0.25		0.05		

Intersection Summary
Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 49.5
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.51
Intersection Signal Delay: 13.1 Intersection LOS: B
Intersection Capacity Utilization 42.4% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 101: Route 128 SB Ramps/Asheville Road & Grove Street



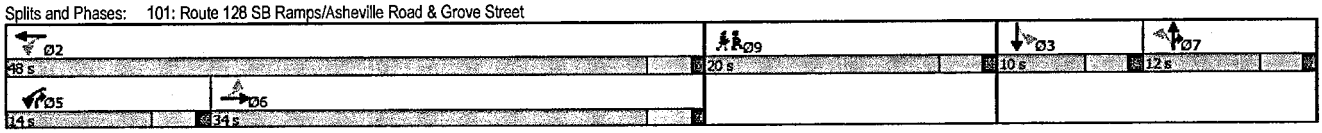
Riverside Station Development :: 10865.03
101: Route 128 SB Ramps/Asheville Road & Grove Street

2031 Build Conditions with Mitigation - Signal at SB Ramps - Concept 2
Timing Plan: Weekday Morning

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9
Lane Configurations													
Traffic Volume (vph)	1	520	55	240	135	5	5	1	370	10	5	0	
Future Volume (vph)	1	520	55	240	135	5	5	1	370	10	5	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	200		0	0		200	0		0	
Storage Lanes	0		0	1		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1835	0	1752	1834	0	0	1788	1583	0	1717	0	
Flt Permitted				0.253				0.832					
Satd. Flow (perm)	0	1835	0	467	1834	0	0	1550	1583	0	1776	0	
Right Turn on Red			No			No			No			No	
Satd. Flow (RTOR)													
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1604			920			838			182		
Travel Time (s)		36.5			20.9			19.0			4.1		
Confl. Peds. (#/hr)	7					7							
Confl. Bikes (#/hr)			1			1							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	2%	2%	2%	7%	7%	7%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	626	0	261	152	0	0	6	402	0	16	0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pt+ov	Perm	NA		
Protected Phases		6		5	2			7	5 7		3		9
Permitted Phases	6			2			7			3			
Detector Phase	6	6		5	2		7	7	5 7	3	3		
Switch Phase													
Minimum Initial (s)	10.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0		4.0
Minimum Split (s)	14.0	14.0		10.0	14.0		10.0	10.0		10.0	10.0		20.0
Total Split (s)	34.0	34.0		14.0	48.0		12.0	12.0		10.0	10.0		20.0
Total Split (%)	37.8%	37.8%		15.6%	53.3%		13.3%	13.3%		11.1%	11.1%		22%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0		
Total Lost Time (s)		4.0		4.0	4.0			4.0			4.0		
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lead	Lead		
Lead-Lag Optimize?													
Recall Mode	Min	Min		None	Min		None	None		None	None		None
Act Effct Green (s)		30.8		45.2	45.2			8.2	22.6		6.2		
Actuated g/C Ratio		0.47		0.68	0.68			0.12	0.34		0.09		
v/c Ratio		0.73		0.50	0.12			0.03	0.74		0.10		
Control Delay		23.8		11.0	6.4			31.3	32.4		33.6		
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0		
Total Delay		23.8		11.0	6.4			31.3	32.4		33.6		
LOS		C		B	A			C	C		C		
Approach Delay		23.8			9.3			32.4			33.6		
Approach LOS		C			A			C			C		
Queue Length 50th (ft)		158		22	12			2	120		5		
Queue Length 95th (ft)		#587		#148	81			15	#426		29		
Internal Link Dist (ft)		1524			840			758			102		
Turn Bay Length (ft)				200					200				
Base Capacity (vph)		856		519	1254			192	541		165		
Starvation Cap Reductn		0		0	0			0	0		0		
Spillback Cap Reductn		0		0	0			0	0		0		
Storage Cap Reductn		0		0	0			0	0		0		
Reduced v/c Ratio		0.73		0.50	0.12			0.03	0.74		0.10		

Intersection Summary
Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 66
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 22.2 Intersection LOS: C
Intersection Capacity Utilization 68.7% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 101: Route 128 SB Ramps/Asheville Road & Grove Street



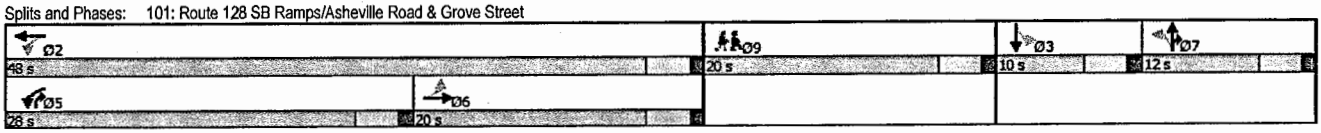
Riverside Station Development :: 10865.03
101: Route 128 SB Ramps/Asheville Road & Grove Street

2031 Build Conditions w/ Mitigation - Signal at SB Ramps - Concept 2
Timing Plan: Weekday Evening

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9
Lane Configurations													
Traffic Volume (vph)	1	215	45	445	275	10	40	5	145	5	2	1	
Future Volume (vph)	1	215	45	445	275	10	40	5	145	5	2	1	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	200		0	0		200	0		0	
Storage Lanes	0		0	1		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1802	0	1770	1851	0	0	1732	1538	0	1812	0	
Flt Permitted		0.999		0.283				0.743					
Satd. Flow (perm)	0	1800	0	527	1851	0	0	1344	1538	0	1868	0	
Right Turn on Red			No			No			No			No	
Satd. Flow (RTOR)													
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1604			883			838			182		
Travel Time (s)		36.5			20.1			19.0			4.1		
Confl. Peds. (#/hr)	16					16							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	5%	5%	5%	0%	0%	0%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	284	0	484	310	0	0	48	158	0	8	0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pt+ov	Perm	NA		
Protected Phases		6		5	2			7	5 7		3		9
Permitted Phases	6			2			7			3			
Detector Phase	6	6		5	2		7	7	5 7	3	3		
Switch Phase													
Minimum Initial (s)	10.0	10.0		6.0	6.0		6.0	6.0		6.0	6.0		4.0
Minimum Split (s)	14.0	14.0		10.0	10.0		10.0	10.0		10.0	10.0		20.0
Total Split (s)	20.0	20.0		28.0	48.0		12.0	12.0		10.0	10.0		20.0
Total Split (%)	22.2%	22.2%		31.1%	53.3%		13.3%	13.3%		11.1%	11.1%		22%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0		
Total Lost Time (s)		4.0		4.0	4.0			4.0			4.0		
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lead	Lead		
Lead-Lag Optimize?													
Recall Mode	Min	Min		None	None		None	None		None	None		None
Act Effct Green (s)		15.2		40.9	40.9			7.8	33.5		6.3		
Actuated g/C Ratio		0.25		0.67	0.67			0.13	0.55		0.10		
v/c Ratio		0.64		0.61	0.25			0.28	0.19		0.04		
Control Delay		32.4		12.7	7.0			34.4	10.8		32.9		
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0		
Total Delay		32.4		12.7	7.0			34.4	10.8		32.9		
LOS		C		B	A			C	B		C		
Approach Delay		32.4			10.5			16.3			32.9		
Approach LOS		C			B			B			C		
Queue Length 50th (ft)		86		47	26			15	22		3		
Queue Length 95th (ft)		#302		#344	162			62	104		18		
Internal Link Dist (ft)		1524			803			758			102		
Turn Bay Length (ft)				200					200				
Base Capacity (vph)		497		866	1405			185	904		193		
Starvation Cap Reductn		0		0	0			0	0		0		
Spillback Cap Reductn		0		0	0			0	0		0		
Storage Cap Reductn		0		0	0			0	0		0		
Reduced v/c Ratio		0.57		0.56	0.22			0.26	0.17		0.04		

Intersection Summary
Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 61.2
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 16.4 Intersection LOS: B
Intersection Capacity Utilization 53.8% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 101: Route 128 SB Ramps/Asheville Road & Grove Street



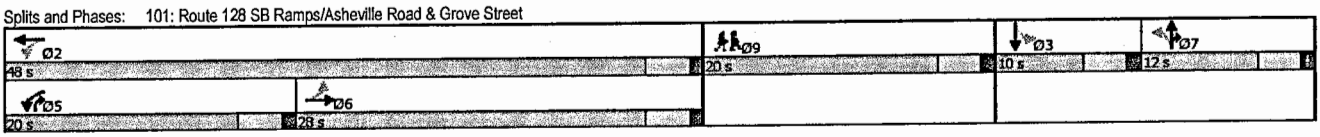
Riverside Station Development :: 10865.03
101: Route 128 SB Ramps/Asheville Road & Grove Street

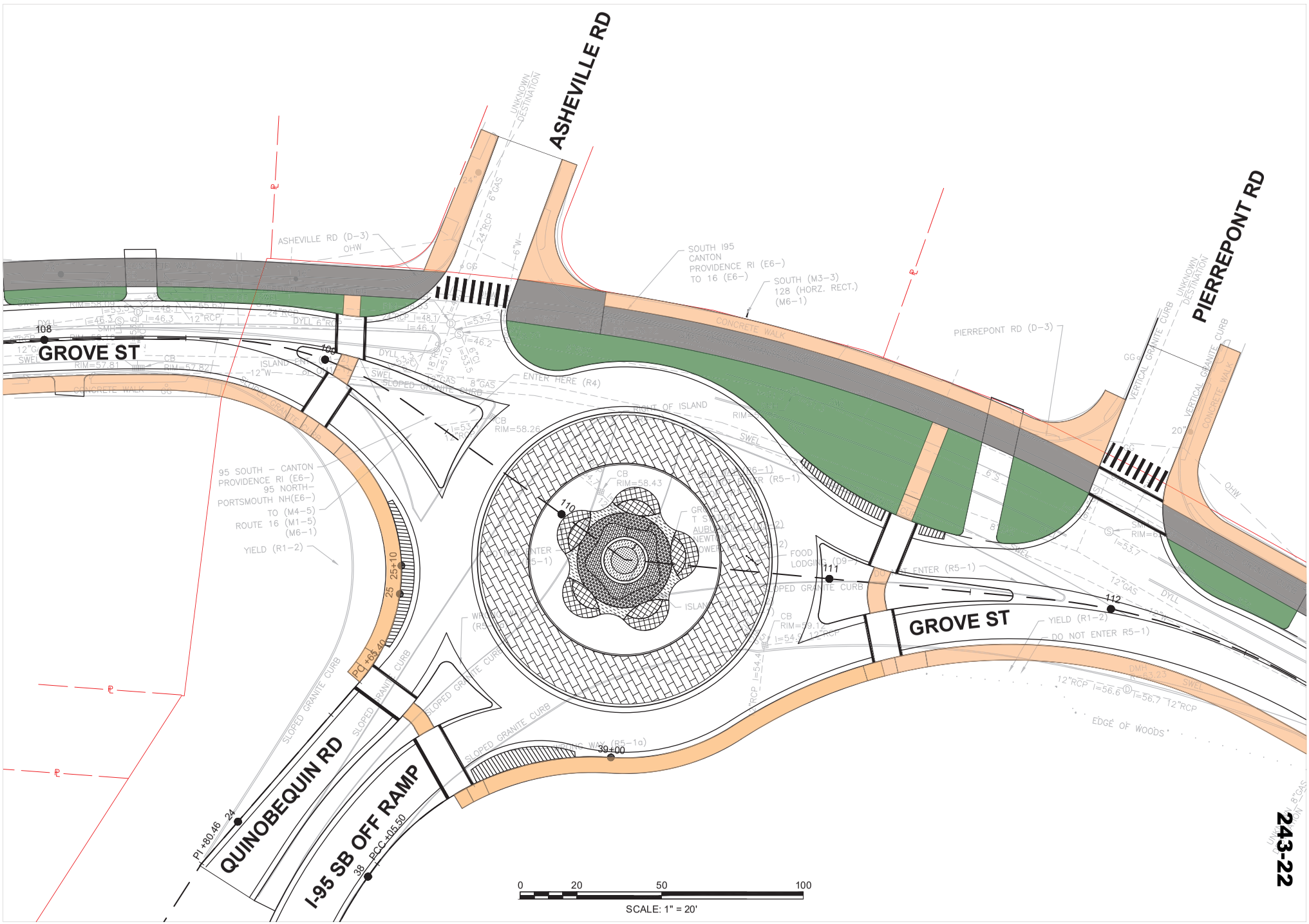
2031 Build Conditions with Mitigation - Signal at SB Ramps - Concept 2
Timing Plan: Saturday Midday

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9
Lane Configurations													
Traffic Volume (vph)	5	150	65	230	115	5	35	5	240	10	5	1	
Future Volume (vph)	5	150	65	230	115	5	35	5	240	10	5	1	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		0	200		0	0		200	0		0	
Storage Lanes	0		0	1		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1804	0	1787	1868	0	0	1802	1599	0	1826	0	
Flt Permitted		0.995		0.380				0.756					
Satd. Flow (perm)	0	1797	0	715	1868	0	0	1422	1599	0	1885	0	
Right Turn on Red			No			No			No			No	
Satd. Flow (RTOR)													
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1604			883			759			182		
Travel Time (s)		36.5			20.1			17.3			4.1		
Confl. Peds. (#/hr)	4					4							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	239	0	250	130	0	0	43	261	0	17	0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pt+ov	Perm	NA		
Protected Phases		6		5	2			7	5 7		3		9
Permitted Phases	6			2			7			3			
Detector Phase	6	6		5	2		7	7	5 7	3	3		
Switch Phase													
Minimum Initial (s)	10.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0		4.0
Minimum Split (s)	14.0	14.0		10.0	14.0		10.0	10.0		10.0	10.0		20.0
Total Split (s)	28.0	28.0		20.0	48.0		12.0	12.0		10.0	10.0		20.0
Total Split (%)	31.1%	31.1%		22.2%	53.3%		13.3%	13.3%		11.1%	11.1%		22%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0		3.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)		0.0		0.0	0.0			0.0			0.0		
Total Lost Time (s)		4.0		4.0	4.0			4.0			4.0		
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lead	Lead		
Lead-Lag Optimize?													
Recall Mode	Min	Min		None	Min		None	None		None	None		None
Act Effct Green (s)		13.7		30.7	30.7			8.6	25.6		6.6		
Actuated g/C Ratio		0.27		0.59	0.59			0.17	0.50		0.13		
v/c Ratio		0.50		0.36	0.12			0.18	0.33		0.07		
Control Delay		23.0		8.6	7.1			28.4	13.6		29.6		
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0		
Total Delay		23.0		8.6	7.1			28.4	13.6		29.6		
LOS		C		A	A			C	B		C		
Approach Delay		23.0			8.1			15.7			29.6		
Approach LOS		C			A			B			C		
Queue Length 50th (ft)		49		20	10			9	28		4		
Queue Length 95th (ft)		188		131	71			56	194		30		
Internal Link Dist (ft)		1524			803			679			102		
Turn Bay Length (ft)				200					200				
Base Capacity (vph)		924		793	1633			244	924		242		
Starvation Cap Reductn		0		0	0			0	0		0		
Spillback Cap Reductn		0		0	0			0	0		0		
Storage Cap Reductn		0		0	0			0	0		0		
Reduced v/c Ratio		0.26		0.32	0.08			0.18	0.28		0.07		

Intersection Summary
Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 51.6
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.50
Intersection Signal Delay: 14.7 Intersection LOS: B
Intersection Capacity Utilization 42.4% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 101: Route 128 SB Ramps/Asheville Road & Grove Street





GROVE STREET ROUNDABOUT
ASHEVILLE ROAD RIGHT IN RIGHT OUT
03/24/2022

First Reason MassDOT Design is not Consistent with Conceptually Approved Design:

Because the purpose of a roundabout is to manage traffic at an intersection, whether and how it allows turning movements is a key aspect of its performance. A performance objective of the conceptually approved plan was to maintain all turning movements that now exist at the intersection of Asheville, Grove and the Rt. 128/I-95 southbound entrance and exit ramps. The conceptually approved plan allowed vehicles exiting the highway to turn either left or right onto Grove or to enter Asheville, allowed vehicles coming from either direction on Grove to turn onto the highway on-ramp, allowed vehicles exiting the highway or travelling from either direction on Grove to enter Asheville, ***and allowed vehicles exiting Asheville to turn either direction onto Grove or to access the highway on-ramp***. The fact that the conceptually approved plan preserved the existing turning movements from Asheville was not an accident. The roundabout was intentionally aligned with Asheville so that the roundabout would perform in this way. Because the re-designed roundabout does not permit left turns from Asheville onto Grove or access to the highway ramp from Grove, it cannot reasonably be said that the re-designed roundabout achieves the same performance objectives as the conceptually approved plan.

This is apparent if one considers the elimination of other turning movements now allowed at this intersection. If, for example, the roundabout was re-designed so that it no longer allowed left turns from Grove St. westbound onto the highway on-ramp, no one would even think of saying that the re-designed roundabout achieves the same performance objectives as the original roundabout. The analysis is no different for Asheville turning movements.

Second Reason MassDOT Design is not Consistent with Conceptually Approved Design:

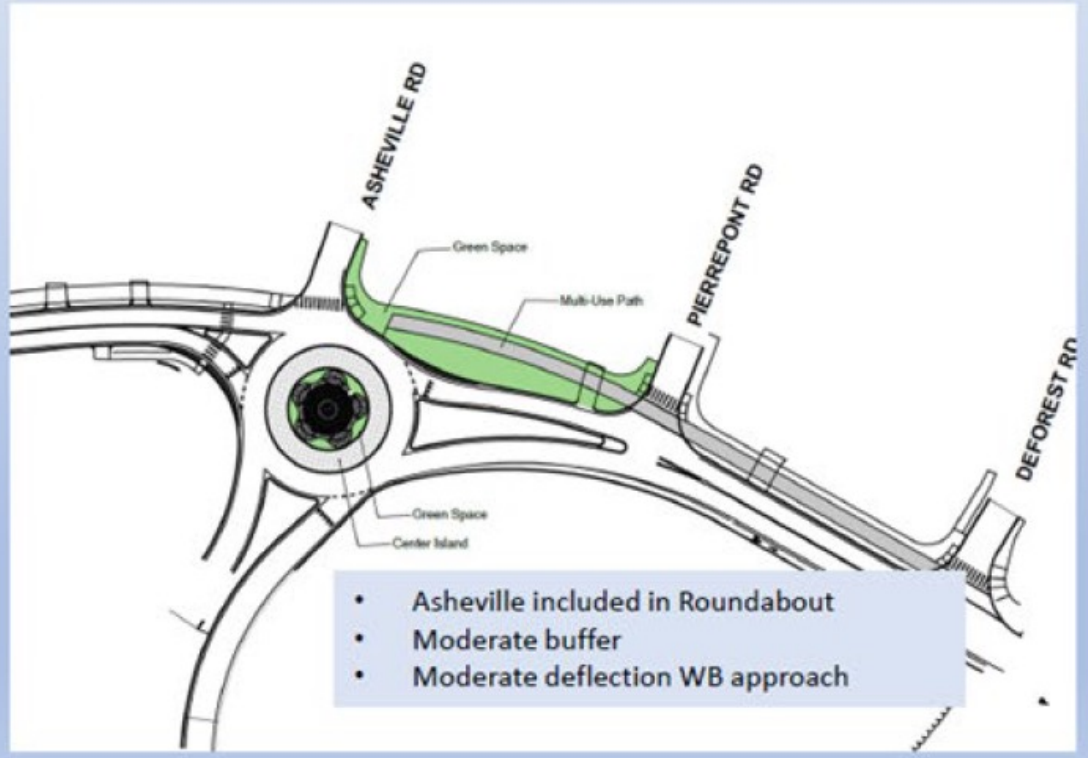
With the increased traffic volume generated by the project, it will be challenging to make left turns onto Grove Street from the portion of Lower Falls that is east of Hamilton Park. A performance objective of the original roundabout was to provide one street (Asheville) from which vehicles would be able to turn left onto Grove Street both safely and efficiently, without having to compete with vehicles travelling on Grove Street. The original roundabout design would permit drivers to exit the neighborhood from Asheville and thereby avoid the left turn challenge/hazard of exiting from DeForest, Pierrepont or Pine Grove. The re-designed roundabout does not achieve this performance objective.

This is particularly important given the anticipated peak hour traffic queues, which will extend beyond the intersection of Grove and Pierrepont the afternoons and beyond the intersection of Grove and Pine Grove in the mornings. The conceptually approved design provided a way for people exiting the neighborhood that would avoid crossing or entering into these queues. This is a key performance objective of the conceptually approved design which is lost in the re-designed plan. To understand the queues, please see the attached. These are portions of a figure from Mark Development's traffic study. These graphics show the anticipated 95th percentile queues for the conceptually approved design - one shows the morning peak and the other shows the evening peak. VHB has said that the new design will extend the morning peak eastbound queue by18 feet (the queue that extends beyond Pine Grove). I have noted this on the morning peak graphic. Per VHB, the other queues will remain essentially unchanged. As you can see, even with the roundabout moving further to the east, there will be traffic queues at both Pine Grove (in the morning) and Pierrepont (in the evening). Also note that, although these are 95th percentile queues (no other queues are provided in the traffic study), even somewhat shorter queues will still extend to these intersections.

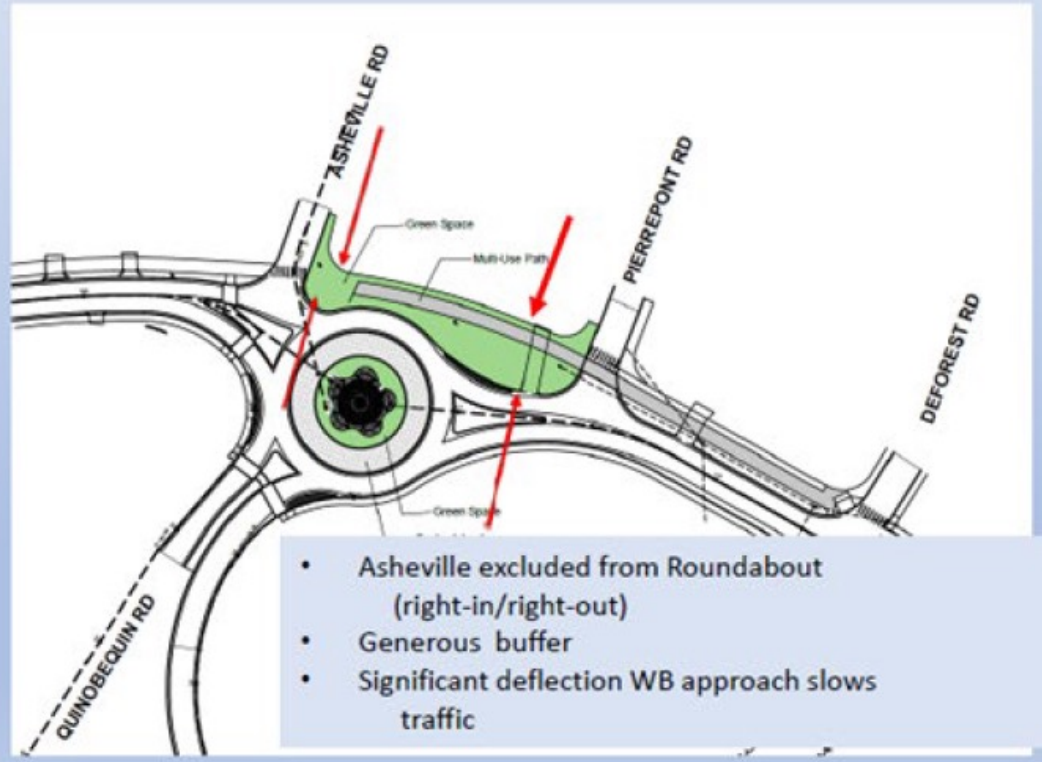
Roundabout Comparison

Figure 1 Comparison of Previous and Current Roundabout Concepts

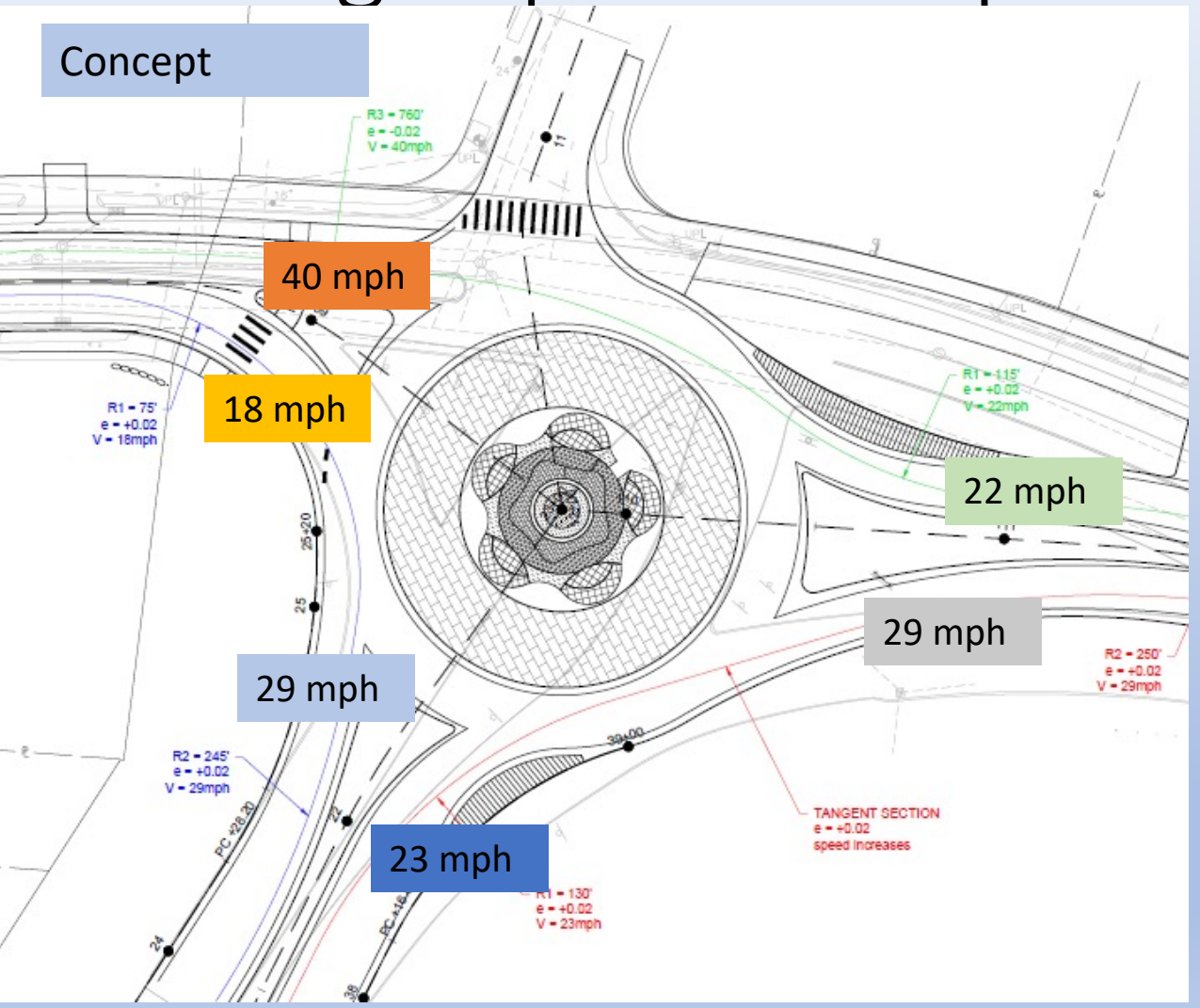
Previous

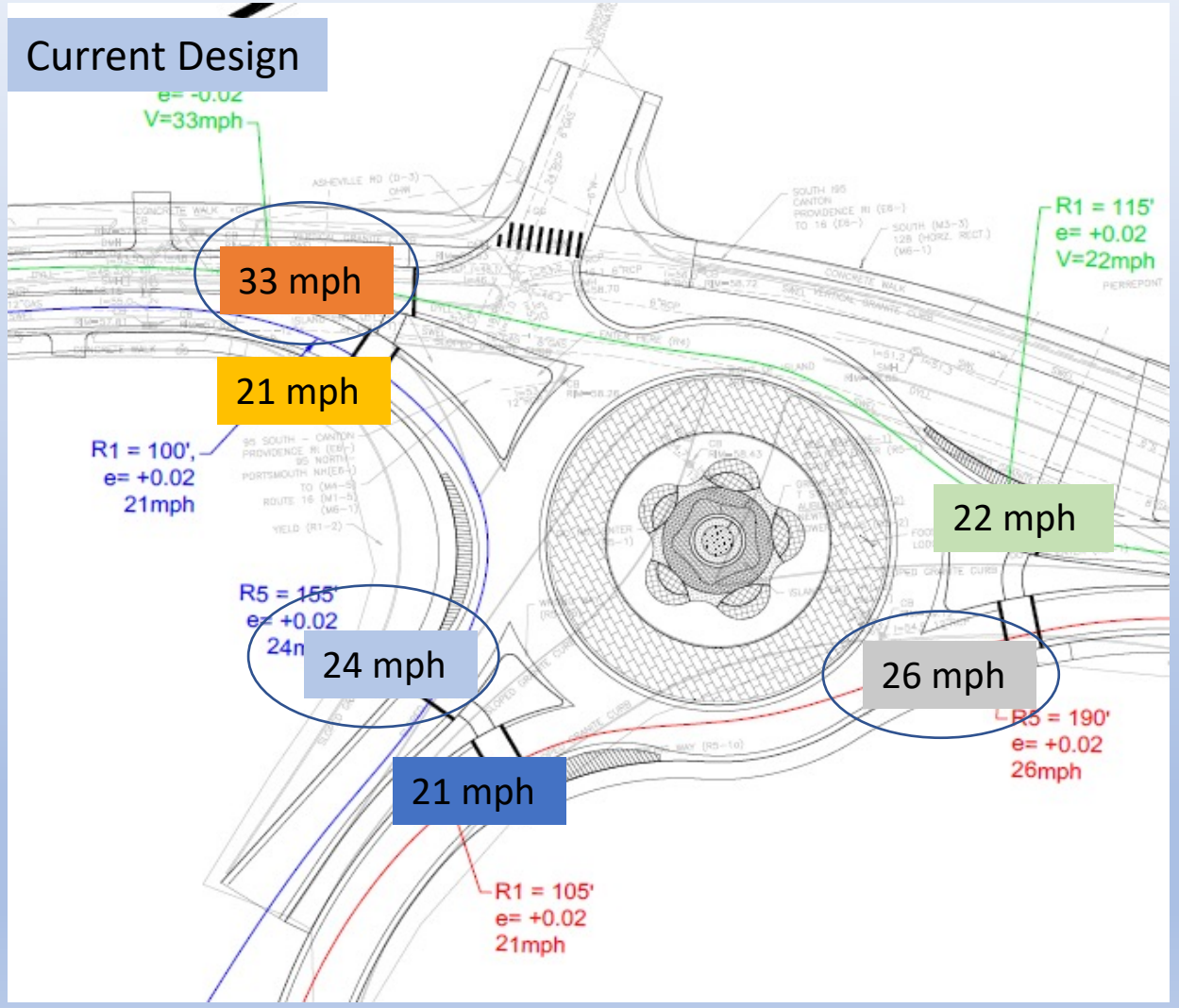


Current



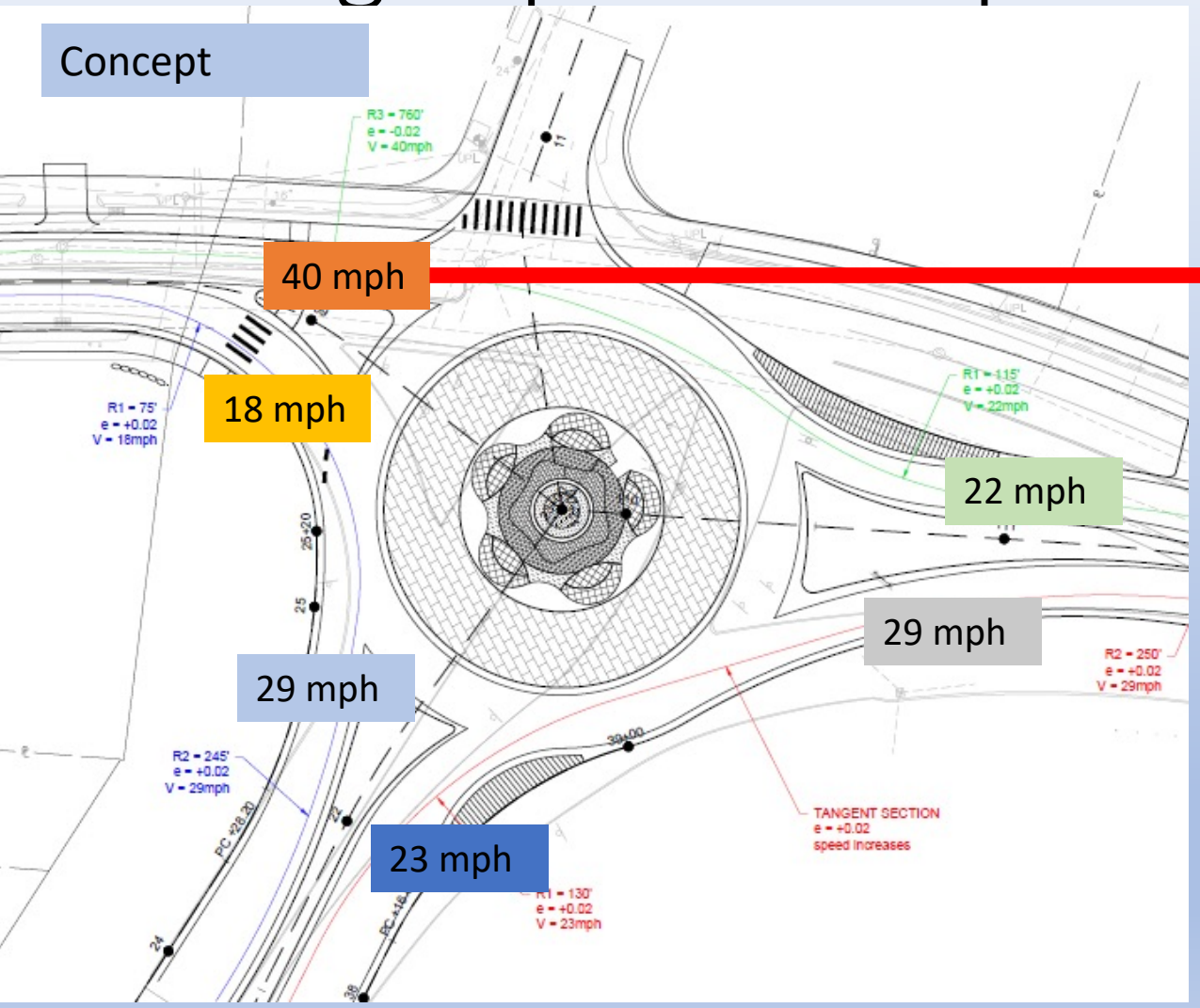
Design Speed Comparison

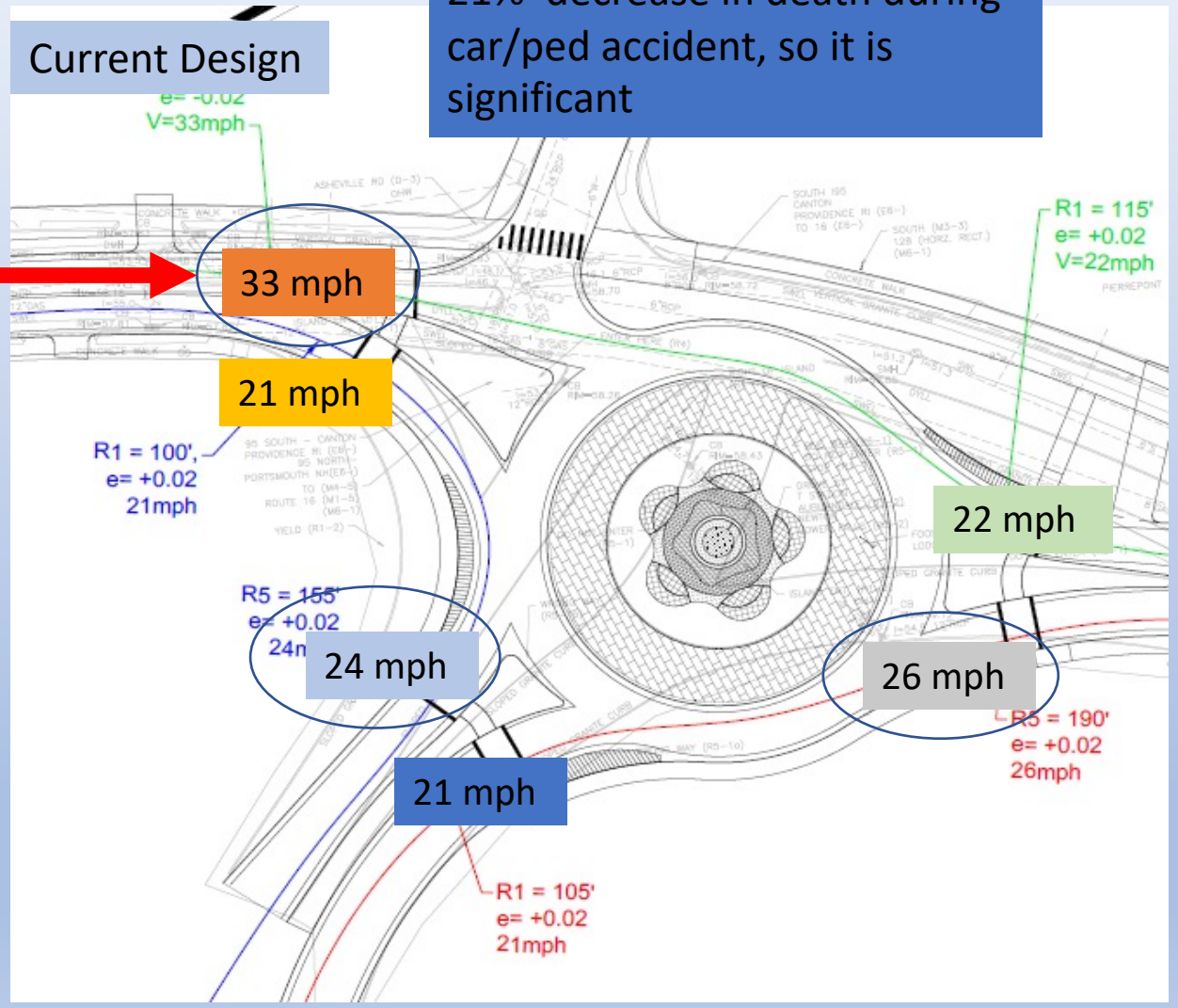




Design Speed Comparison

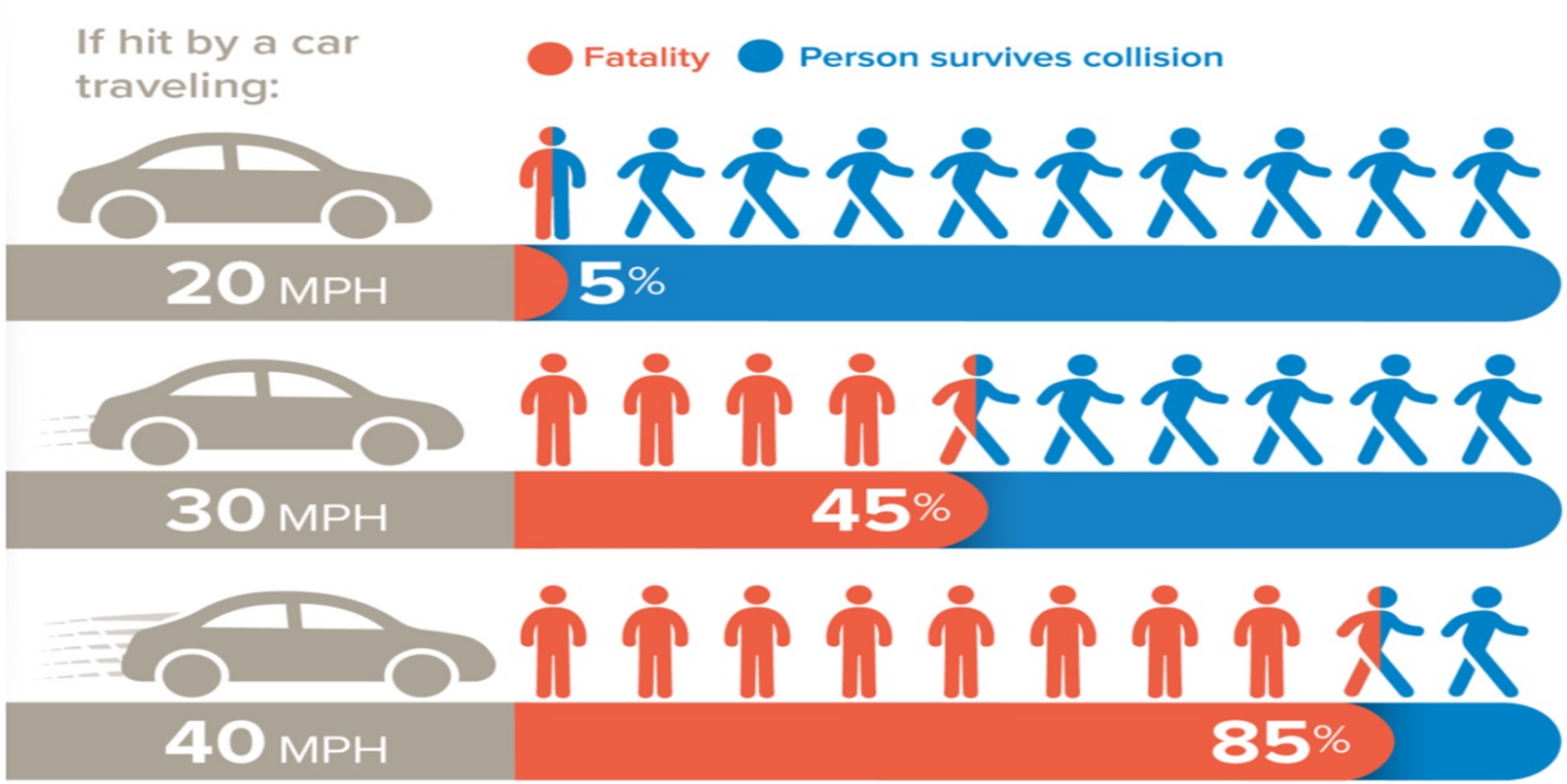
The 7 MPH reduction is the equivalent of an approximately 21% decrease in death during car/ped accident, so it is significant





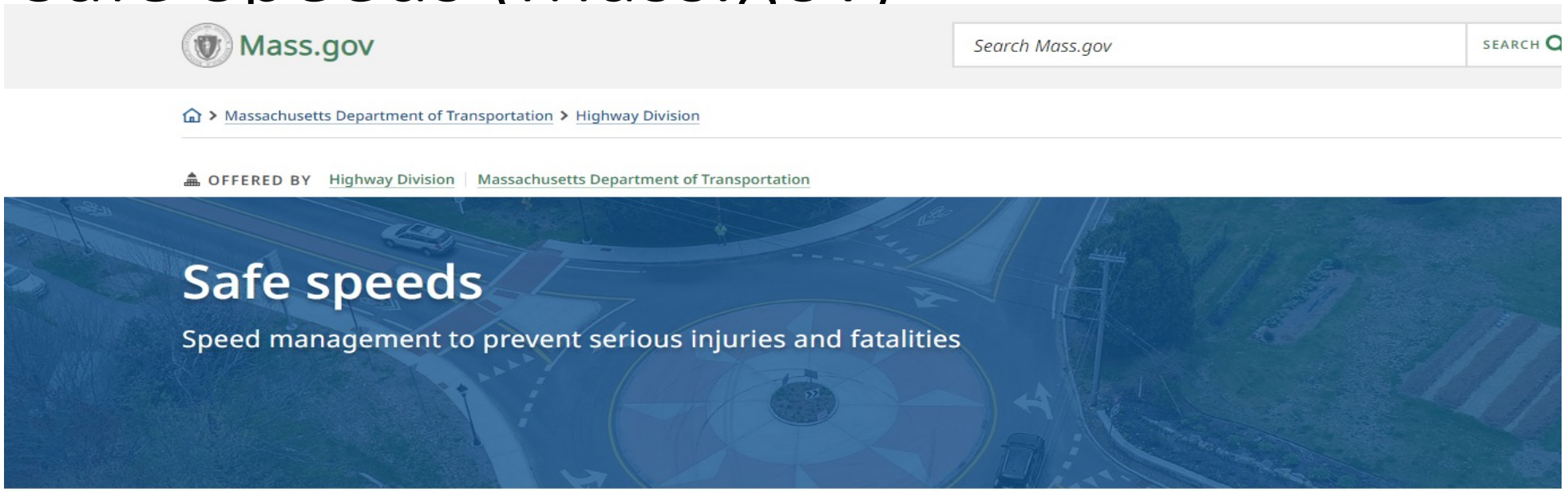
Speed and Pedestrian Crashes

Speed is the most important factor that determines whether or not a person walking, rolling or getting around with an assistive device su
collision with the driver of a car. Increase the vehicle speed and the likelihood of survival drops massively. From our Driving Down Emiss
in 2020:



National Traffic Safety Board (2017) Reducing Speeding-Related Crashes Involving Passenger Vehicles. Available from: https://www.ntsb.gov/safety/safety-studies/Documents/SS1701.pdf

Safe Speeds (Mass.gov)



Keeping people safe on Massachusetts roadways is Massachusetts Department of Transportation's priority. One life lost or altered by a serious injury on any roadway is unacceptable. In Massachusetts and across the US, the speed that people drive can make a big difference on the safety of our roadways. Higher speed increases the risk of a fatal or serious crash and reduces the likelihood of survival. Every mph matters: each 1 mph increase that a person drives can be attributed to a 3% increase in potential loss of life. Safe vehicle speeds make streets better for everyone, whether you are traveling by car, wheelchair, bicycle, stroller, foot, or bus.

MassDOT is committed to helping realize safer speeds across the Commonwealth to prevent serious crashes. Our goal is zero fatalities and serious injuries. Learn more about speed management and resources to implement speed management in your community.

Note: