CHAPTER 4: ALTERNATIVES DEVELOPMENT

Introduction

The previous chapters presented the study's purpose and need; goals and objectives; existing conditions in the study area and the resulting transportation issues and concerns; and the expected future conditions. This chapter documents the open and iterative process of conceptualizing specific transportation system interventions intended to address the corridor issues and concerns while pursuing the study goals and objectives, and the steps taken to develop short, medium and long-term alternatives for the corridor.

Alternatives Development Approach and Process

The public involvement process was essential to the development of alternatives. Throughout the early stages of the study and interaction with the Working Group, the project team listened carefully to stakeholder concerns and input. This early civic engagement helped to inform the project team's evaluation of the data and approach to developing alternatives.

At the August 2011 Working Group meeting, members provided detailed input to the project team regarding important connections and problem areas in the corridor that should be considered in the alternatives development task. The Working Group was divided into two groups, each facilitated by a member of the project team. The groups were provided with large roll plans of the corridor and were asked to note issues of importance (see Figure 4-1). A summary of the input received is provided in Appendix G.

Based on the Working Group discussion, the Grounding McGrath study began to transition to the development of alternative alignments. The Grounding McGrath study had a broad mandate to evaluate opportunities and to improve multi-modal travel within the study area. As described in previous chapters, the McCarthy Viaduct is nearing the end of its useful life. At the same time, the areas directly abutting the corridor (Union Square, Inner Belt/Brickbottom) and areas near the ends of the corridor (Assembly Square/NorthPoint) are experiencing significant development demand and opportunities. Meanwhile, the GLX and Somerville Community Path projects are underway, developing multi-modal connections in parallel to the McGrath corridor.

These elements together present a unique opportunity to re-envision the function, alignment, operation, look, feel, and character of the McGrath corridor. With such a broad canvas, the project team developed a staged approach to Alternatives Development. Ultimately, the Grounding McGrath study needed to develop certain alignments that could be developed to sufficient detail to be tested through the regional travel demand model by the Central Transportation Planning Staff (CTPS) and quantitatively analyzed using a range of tools. To take the Working Group through the process of developing and evaluating the potential range of alternatives, a screening approach was taken early in the process to enable consideration of a wide range of alternatives and to eliminate alternatives that did not meet the project goals or that were infeasible.

The process to develop a wide range of general options, and present and understand the issues and opportunities associated with each, was based both on the Existing Conditions work completed and an understanding of the goals and priorities developed during the initial stages of the Grounding McGrath study. These basics come from what MassDOT, project stakeholders, and the community at large defined, and provided the lens through which to view all concepts and alternatives. Even at a conceptual stage, these priorities are driven by the goals established, and defined at an early level by the objectives that support them. While the goals and objectives presented in Chapter 1 provide detailed explanations for these elements, the project team's initial charge was to collaborate with the Working Group to determine how even the conceptual alternatives provided the following elements:

- Greatly improved pedestrian connections to, through and around the McGrath corridor;
- Compatible with the GLX and planned Washington Street and Union Square stations;
- A connection to the proposed extension of the Somerville Community Path;
- A contiguous pedestrian and bicycle path along the McGrath corridor that supports and parallels the Somerville Community Path;
- Improved gateway and multimodal connections to Union Square, especially along the Somerville Avenue approach;
- Consistency with and support for the economic development potential and planning efforts of the Inner Belt/Brickbottom area;

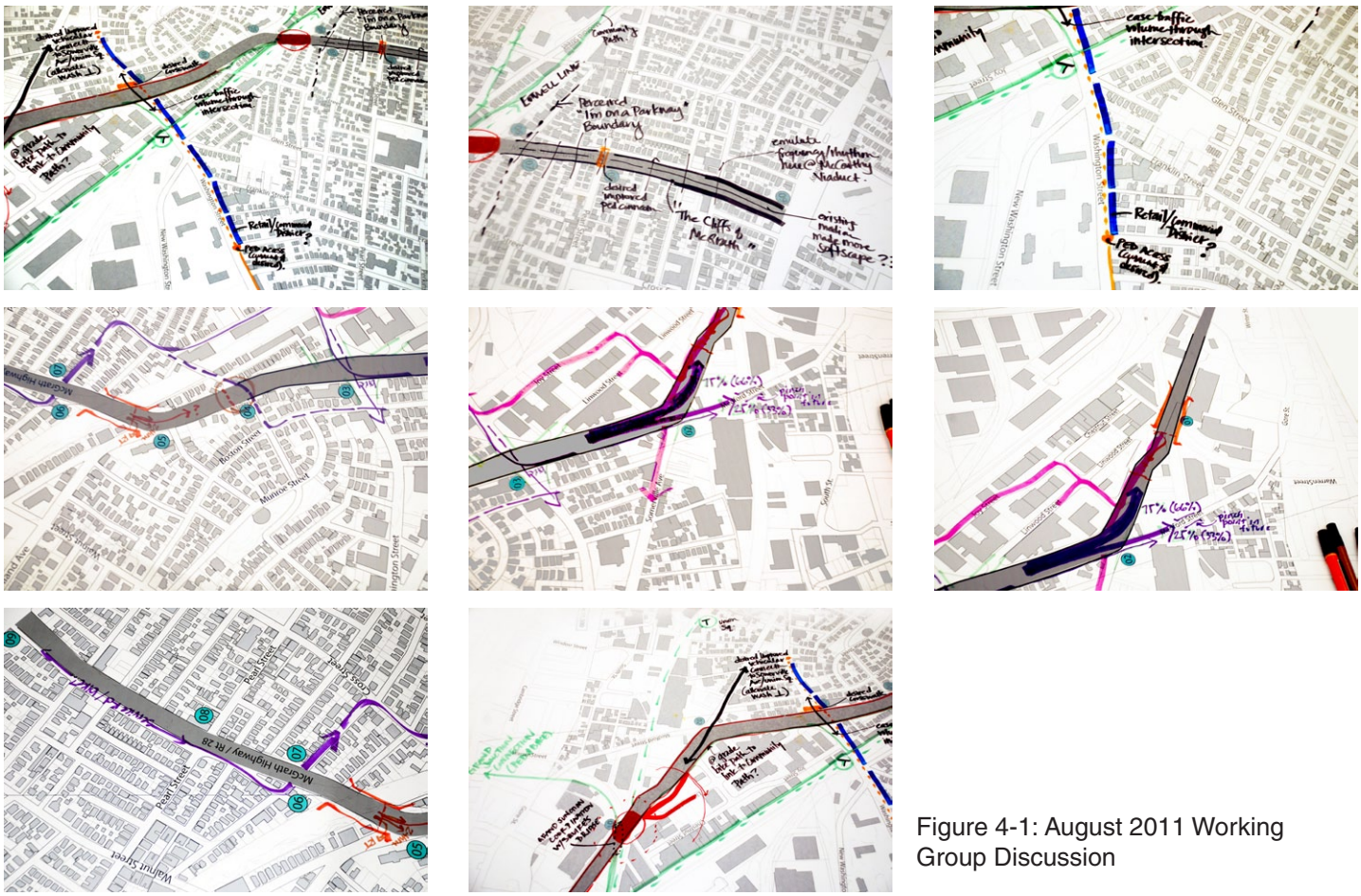


Figure 4-1: August 2011 Working Group Discussion

- Preservation of the sub-regional connectivity provided by the McGrath corridor;
- Maintenance of a level of vehicular carrying capacity consistent with local and regional goals; and,
- Balanced local and regional impacts of all proposed changes.

For the screening level analysis, conceptual alternatives need not be highly detailed to enable the project team and Working Group to understand how they respond to the challenges above. The project team developed the conceptual alternatives only to the level of detail necessary to allow the Working Group to understand if an option merited further analysis or if an option was undesirable. Nevertheless, the conceptual alternatives were also informed by solid planning principles and a review of engineering feasibility.

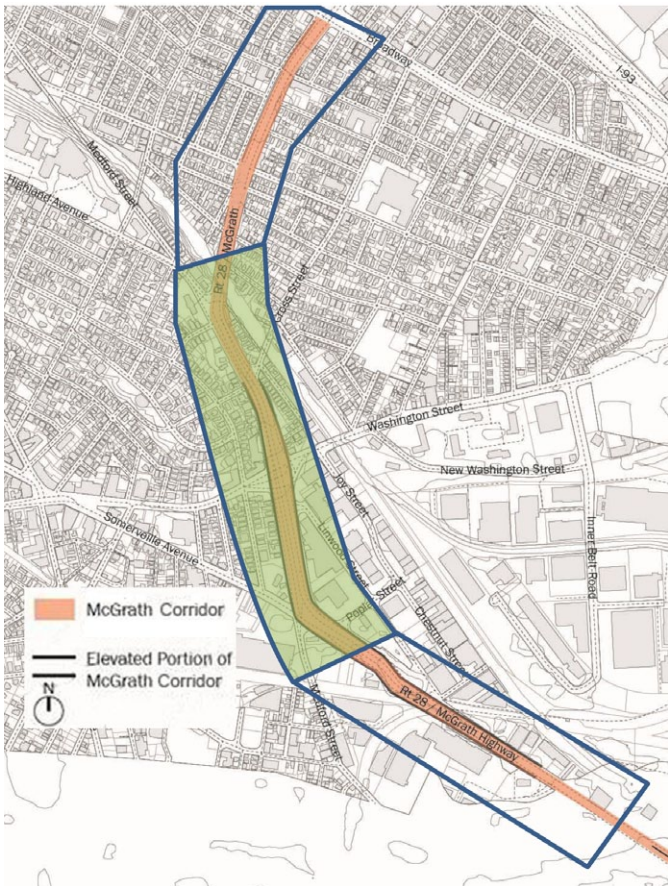


Figure 4-2: Focus Area

Through the Existing Conditions analysis, the Grounding McGrath study identified issues, opportunities and constraints that would drive the alternatives development process. While the issues and opportunities primarily informed the goals and the design approach, the constraints exercise established clear boundaries for feasibility and "fatal flaws." With the GLX transitioning from design into construction, and using the same right-of-way as the existing commuter rail lines, it was quickly established that the Lowell Line and Squire's bridges represented fixed points for the McGrath corridor alignment. These fixed points inherently divided the McGrath corridor into three distinct areas, with the area between the bridges seen as the focus area (see Figure 4-2).

The majority of the elevated structures are in the focus area, whereas north of the Lowell Line Bridge and south of the Squire's Bridge the McGrath corridor is essentially at grade. The community's strongest desire for change, and the greatest opportunity to effect substantive change, is within the focus area. Therefore, initial exercises were focused on understand the challenges within this area and developing a broad range of conceptual alternatives. Meanwhile, for the north and south areas, the Grounding McGrath study developed a range of complementary approaches that could be applied independently from the focus area.

For a long-range planning study, all designs and plans must be responsive to the proposed future horizon year of 2035, the assumptions and conditions of which are described in detail in Chapter 3. Even with the added development, infrastructure, and travel demand forecast for the 2035 year, a fully grounded alternative for the focus area was immediately seen by the Working Group as a desired alternative. However, understanding the implications of at-grade options on a preliminary level was necessary in order to develop approaches to alignment development that would meet these challenges. Thus, the project team undertook a conceptual evaluation of how the focus area of the McGrath corridor would function in the year 2035 if all lanes and ramps were to be "grounded in place."

This "grounded in place" concept was developed to look and function like an at-grade roadway within the current corridor alignment, with a focus on understanding

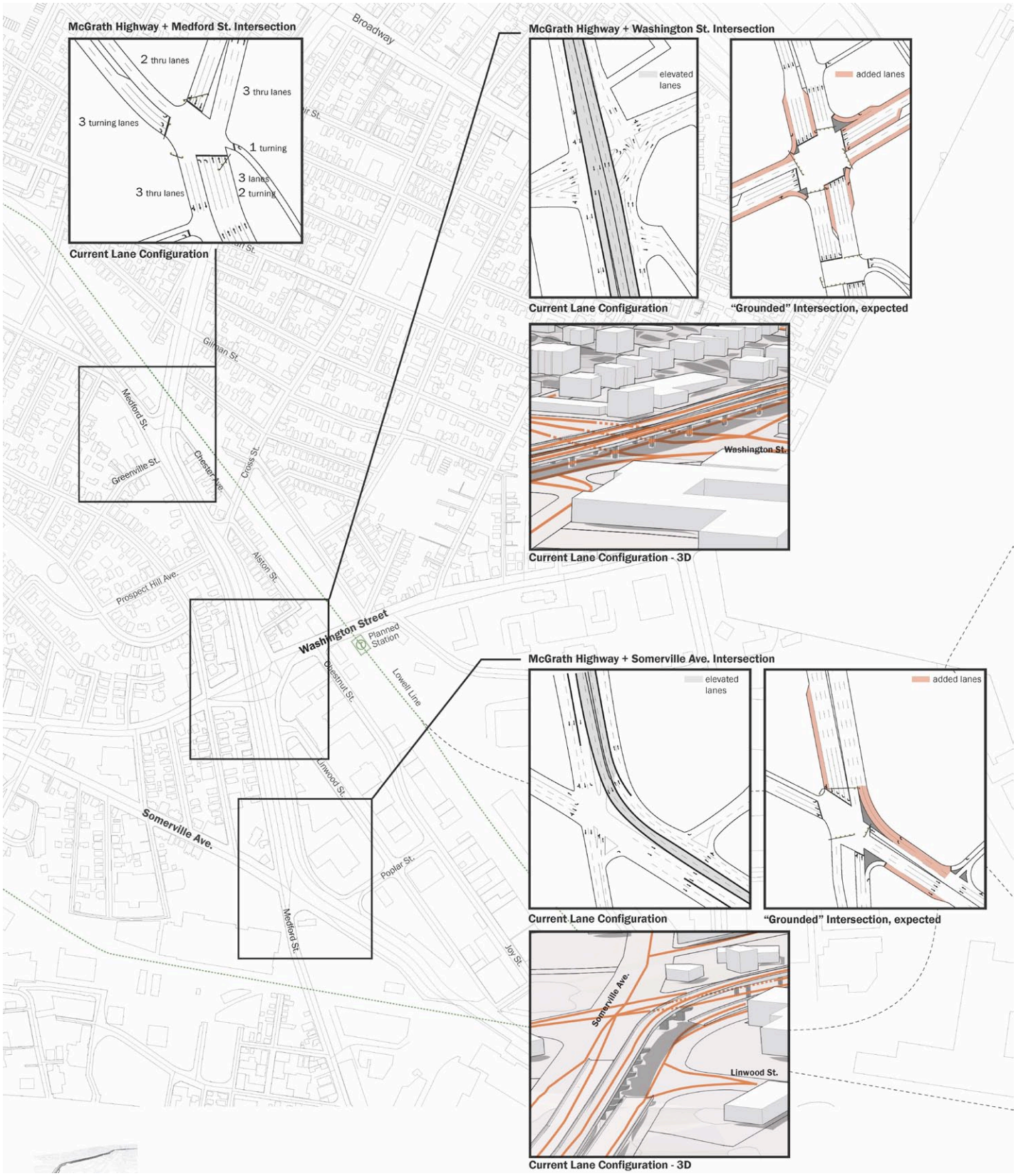


Figure 4-3: Traffic Factors – Lane Comparison at Intersections

overall functionality and identifying potential conflicts so that it could be used as a point of departure for further discussion of at-grade options. The travel patterns and volumes were based primarily on the 2035 Future No-Build transportation conditions developed by CTPS.

It was initially assumed that all turning movements to east/west cross-streets were permitted and that cross traffic did not alter its patterns based on the changed McGrath corridor. This scenario resulted in roadway cross-sections up to eight lanes wide at key intersections, not including additional dedicated turning lanes beyond those that exist today to accommodate new connections created at-grade. While these widened cross-sections could be physically accommodated within the existing configuration of elevated highway, ramps and surface roads, it clearly violated many of the livability, development and connectivity goals and objectives previously described. Figure 4-3: Traffic Factors - Lane Comparison at Intersections provides a graphic representation of how the initial “grounded in place” option was represented.

While this initial concept was assumed to generally accommodate the expected future levels of vehicular traffic, by simply dropping the McGrath corridor to grade with traditional intersections, the following more-specific key challenges were quickly identified and needed to be addressed:

- High turning movement volumes to and from cross streets, particularly at Washington Street, expands the roadway cross-section because of the additional lanes needed to process both through movements and turning movements.
- Due to the McGrath corridor’s skewed alignment at the Somerville Avenue / Medford Street intersection, a traditional intersection results in the southbound through movements becoming roughly 2,000 left turns during the weekday morning peak hour.

Based on this first step, a range of overall approaches was developed for the elevated portion of the McGrath corridor, essentially between the MBTA Lowell Line and Squire’s Bridge fixed points. Alternatives for the north and south ends of the focus area will be impacted by the choices made in the section that is currently elevated. The northern portion of the study area (north of the Lowell Line Bridge) is currently at-grade, but could benefit from cross-section improvements, described later in this report. The southern portion of the study area (south of the Squire’s Bridge) will be informed by the NorthPoint development process in Cambridge.

While neither the future No-Build Alternative nor the “grounded in place” options adequately addressed the study goals and objectives, together they provided a useful basis from which more refined concepts could be further developed that better serve the goals and objectives. Such options were then developed in four general ”families” or categories of alternatives:

Keep It:	No Build with structural improvements required for comparison (Future No-Build Conditions)
Move It:	Change the alignment of the McGrath corridor
Bring It Down:	At-grade roadway
Partial Grounding:	A combination of Keep It and Bring It Down options

At the Working Group meeting on December 12, 2011, the members were provided with maps of the project scope and primary intersections along the corridor (see Figure 4-4). Attendees were encouraged to gather around the table to review and provide suggestions to various approaches and options. This resulted in an interactive approach designed to shape a consensus among the project team and the Working Group on which alternatives should receive more in-depth analysis, and which concepts were infeasible or undesirable.

The following sections provide more detail on the concepts developed, as well as the input received that generally guided the alternatives development process.

Keep It Option
The Keep It option is the future No Build Alternative described in Chapter 3.

As described in previous chapters, the McCarthy Viaduct was identified for repairs or replacement as part of MassDOT’s Accelerated Bridge Program (ABP). Repair

work to ensure safety, and design of some short-term circulation improvements are underway. As a result of public meetings for the repair work, the City of Somerville and members of the Working Group expressed a strong desire for removal of the McCarthy Viaduct. As a result, MassDOT committed to working with the local community to identify a long-term vision for the corridor that removes the McCarthy Viaduct, while exploring short-term improvements, including the safety and structural stability repairs on the viaduct as well as pedestrian and bicycle access improvements along and across the corridor. Therefore, the "Keep It" option exists as the future No Build condition, against which other options can be compared.

"Take the overpass down. Take it down yesterday,"
Mayor Joseph Curtatone, City of Somerville

"We are as committed as the community is to removing the McCarthy overpass, and redesigning and reconstructing this corridor, so that it is part again of your community,"
Frank DePaola , MassDOT Highway Administrator

"Fix Now, Flatten Later"
Somerville Journal, June 6, 2012

Figure 4-4: December 2011 Working Group Meeting

Move It Option
This option evaluated the possibility of relocating all or part of the McGrath corridor outside of the current alignment, but still retaining the fixed points at the Squire's and Lowell Line bridges. As it evolved, an alternative that assumed the separation of the north and southbound portions of the corridor was developed. In this case, the northbound portion and function of the McGrath corridor is explored for relocation in an alignment within the adjacent Brickbottom area to the east of the McGrath corridor. The primary objectives of this option were to:

- Promote access, connectivity, and economic development potential for the Brickbottom area of Somerville.
- Establish a separated road boulevard with a developable or large/wide useable central area, similar to the Rose Kennedy Greenway in Boston.

As part of presenting this alternative, variations of this concept included moving the northbound elevated portion of the McGrath corridor to touch down at a point on Joy Street in the vicinity of Poplar Street. The northbound McGrath corridor would then "take off" onto another elevated structure that would pass over Washington Street, similarly to how the existing northbound move works within the corridor alignment today. This approach opened a range of possibilities, defined only by the restrictions of where the touch-down and take-off locations of ramps from the fixed points could land. Conceptual engineering showed that these were dependent on the alignment and potential design speed for the ramp. To demonstrate the possibilities, this concept examined design speeds[1] of 35 mph, 40 mph and 45 mph in a range of different alignments. The corresponding touchdown and take-off locations are shown graphically in Figure 5: Speed and Structure Factors - Rotational Range of On/Off Ramps.

Working Group participants expressed the following primary concerns about the "Move It" option:

- The need for acquiring additional right-of-way and associated potential negative impacts on the Brickbottom area.
- High cost and time that it would take to implement this option as a result of right-of-way issues.
- Limited access to Union Square from the northbound McGrath corridor.
- Difficulty in navigating one-way pairs of roadways for newcomers and visitors to the area.
- Disjointed pedestrian and bicycle connections, especially across Washington Street.
- Separation of transit access, but with a northbound move closer to the planned GLX station at Washington Street.
- Potential need for ramps and difficulty defining the relocated northbound McGrath corridor in relation to Washington Street.

Partial Grounding Option
Consideration was also given to retaining only part of the McCarthy Viaduct by maintaining an elevated structure near Somerville Avenue, and over Washington Street, but providing an at-grade roadway in between the two points. Maintaining part or all of these structures and seeing how much of the corridor could be transitioned to an at-grade roadway for the segment between these two points was explored. The Partial Grounding option would keep the McGrath corridor in its current corridor alignment, but still retain some of the challenges explored in the Move It option. The fixed points of the Squire's Bridge and the Lowell Line Bridge still require a substantial distance to reach grade, even at moderate design speeds. Therefore, only a short length of the McGrath corridor would be at-grade between the Squire's Bridge and a Washington Street bridge due to the length of the ramps that would be required. See Figure 4-6: Speed and Structure Factors - Touchdown Points.

Points
If the elevated structure were retained to cross only one of the two primary intersections of Washington Street or Somerville Avenue, a somewhat greater length of at-grade roadway could be developed for the McGrath corridor. However, the lengths of ramps required would continue to limit the total area of the McGrath corridor that could be at-grade in between the two points. The need to retain the Squire's Bridge to cross the railroad tracks limits the touchdown points in the vicinity of Poplar Street and Somerville Avenue.

1 The design speed for the ramp is the maximum safe speed for the facility, and is typically about 10 mph above the posted speed.

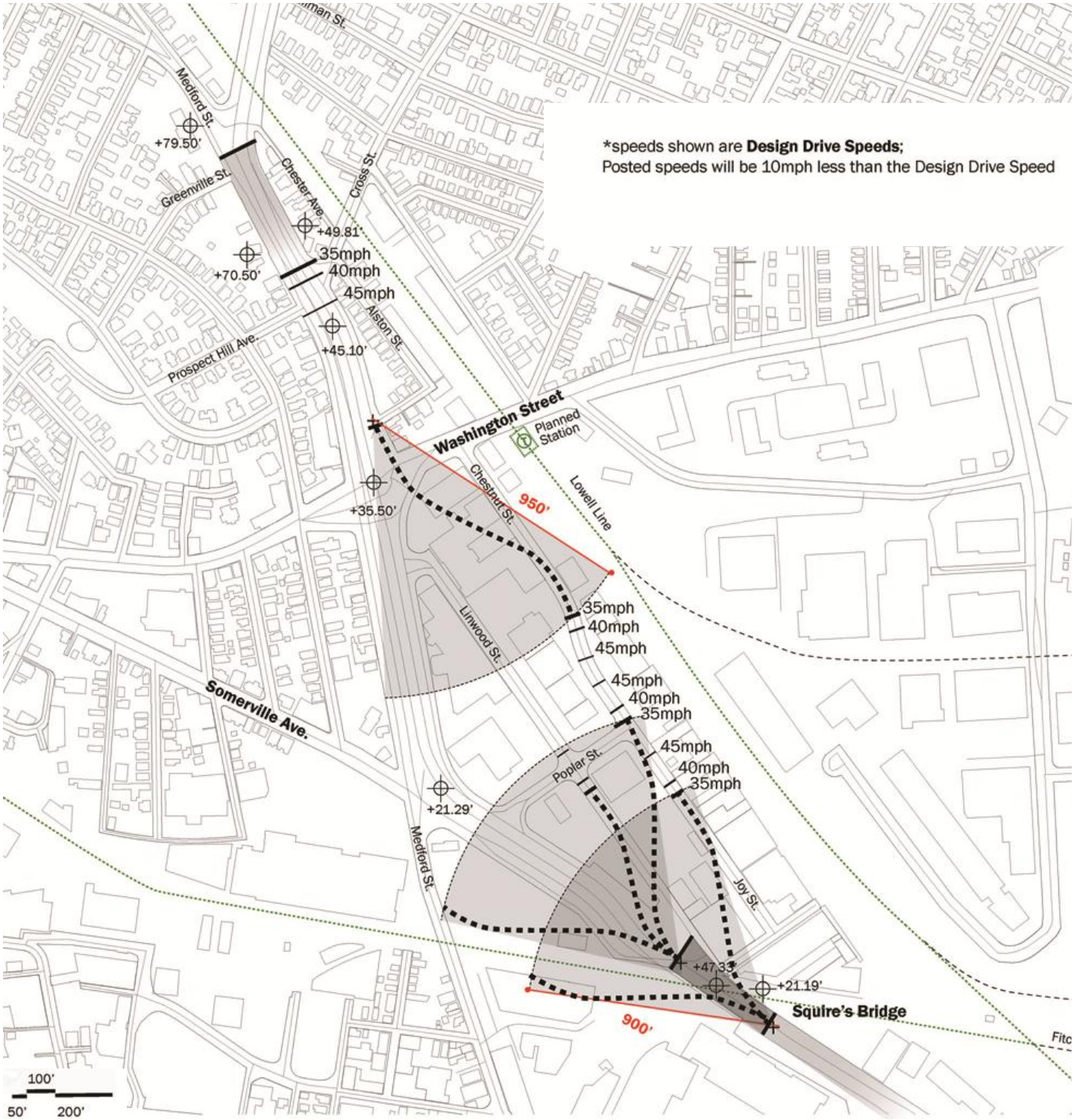


Figure 4-5: Speed and Structure Factors - Rotational Range of On/Off Ramps

*speeds shown are **Design Drive Speeds**;
Posted speeds will be 10mph less than the Design Drive Speed

Medford St.
+79.50'
Greenville St.
525'
Chester Ave.
Cross St.
+49.81'
+70.50'
35mph
40mph
45mph
Alston St.
+45.10'
Prospect Hill Ave.
Washington Street
Planned Station
+56.38'
+35.50'
Chestnut St.
Lowell Line
187.5'
659'
Linwood St.
Somerville Ave.
35mph
40mph
45mph
Poplar St.
+21.29'
45mph
40mph
35mph
Medford St.
Joy St.
590'
+47.33'
+21.19'
Squire's Bridge
396'
100'
50'
200'

Figure 4-6: Speed and Structure Factors - Touchdown Points

The Working Group did not support this option due to the following primary concerns:

- A substantial amount of elevated structure was retained in this concept, which would continue to serve as a barrier and therefore not achieve many of the project goals and objectives, such as improving local access and connectivity.
- A clear stated preference to minimize structures to the extent possible for connectivity, aesthetics, and development preferences.

At the concept development stage, MassDOT agreed to table discussion on any Partial Grounding options in pursuit of a full grounding option, and to revisit partial grounding only if an at-grade solution proved to be infeasible.

Bring it Down

The final approach evaluated options that eliminated as many structures and ramps as possible within the McGrath corridor area. This "Bring it Down" approach expanded on the initial "grounded in place" scenario to attempt to work through the connectivity and design challenges that occur by assuming a fully at-grade solution between the Squire's and Lowell Line bridges. As described in the other concepts, the locations where existing fixed high points could touch down to grade were taken as a starting point. See Figure 4-6: Speed and Structure Factors - Touchdown Points.

Natural changes in the topography created additional challenges for a fully at-grade solution. This is particularly true in the McGrath corridor section between Washington Street and Medford Street/Highland Avenue. At the Medford Street/Highland Avenue intersection with the McGrath corridor, the roadway is not elevated, but is at-grade at a point well above Washington Street. There is a substantial change in topography as Prospect Hill slopes down from west to east across the corridor and down to the Lowell Line tracks, thereby making connections across the McGrath corridor difficult to accommodate.

To explore the "Bring It Down" option, individual configurations were conceptually drawn to test various possibilities at each intersection in the focus area, as well as connectivity in the larger area. A general overview of vehicular, transit, pedestrian, bicycle, and aesthetic concerns could then also be discussed through each option. A series of at-grade lane configuration concepts were developed for discussion with the Working Group, which focused on the intersections of the McGrath corridor with Somerville Avenue and with Washington Street.

Since one of the primary purposes of the elevated McCarthy Viaduct of the McGrath corridor is to carry vehicles over Washington Street and Somerville Avenue in free-flow conditions, the alternatives development process needed to focus on options and solutions that accommodate both side street and McGrath mainline traffic at intersections. Instead of the complex system of ramps and surfaces streets that exist today, the options focused on potential surface intersection designs at:

- Somerville Avenue
- Washington Street
- Focus area between Washington Street and Somerville Avenue

Those designs deemed undesirable were eliminated, and those with promise carried forward into more realized design refinements. The intersections and the conceptual variations are discussed in greater detail in the following sections.

Somerville Avenue Intersection Options

Developing an alternative for the intersection of the McGrath corridor with Somerville Avenue is challenging due to the complicated intersection alignment and offset signal timing needed for an at-grade intersection with five approaches, four of them major, high-volume roadways. The series of options for the Somerville Avenue intersection with the McGrath corridor were developed in an attempt to:

- Improve connections between the McGrath corridor, Somerville Avenue, Poplar Street, and Medford Street.
- Provide new connections - for vehicles, pedestrians, and bicyclists - that do not currently exist.
- Open up access to the Brickbottom area as it is poised to develop.
- Clarify and simplify pedestrian crossings
- Maximize the potential reclaimed area from the

rights-of-way.
- Maintain a level of traffic flow through the area.

The options evaluated are described below:

Somerville Avenue 3-Leg Intersection (See Figure 4-7):
In this option Poplar Street would be extended west of the McGrath corridor to intersect with a new alignment of Somerville Avenue that does not intersect with the McGrath corridor. This would reduce southbound conflicts on the McGrath corridor with Somerville Avenue and create access to Inner Belt/Brickbottom. This configuration, however, would also create two closely-spaced, high-volume signalized intersections, with heavy conflicting traffic flows.

Poplar Street 4-Leg Intersection (See Figure 4-8):
In this option Somerville Avenue and Medford Street would be realigned to create two separate intersections with the McGrath corridor. This option would create access to Inner Belt/Brickbottom and Medford Street.

Somerville Avenue 3-Leg Roundabout (See Figure 4-9):
In this option, Somerville Avenue and Medford Street are directly connected by a roundabout west of the McGrath corridor. A short roadway section just north of Poplar Street would provide access from the roundabout to the McGrath corridor via a signalized intersection. This option would reduce left-turn conflicts from Somerville Avenue and the McGrath corridor, but would not provide access from the McGrath corridor southbound, Medford Street, or Somerville Avenue to Brickbottom.

Washington Street Intersection Options
The major challenge at the intersection of Washington Street with the McGrath corridor is to process the high east/west traffic volumes on Washington Street. In a grounded solution the east/west volumes would be in conflict with the heavy north/south volumes on the McGrath corridor. Overall improvements for this option must consider the following concerns and desires;
- Accommodating turning movements, especially from Washington Street, which connects Union Square to Sullivan Square.
- Providing a strong pedestrian connection to the

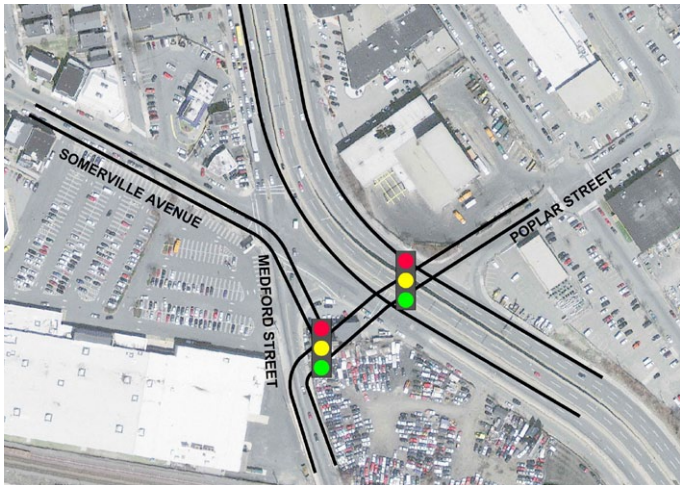


Figure 4-7: Somerville Avenue 3-Leg Intersection

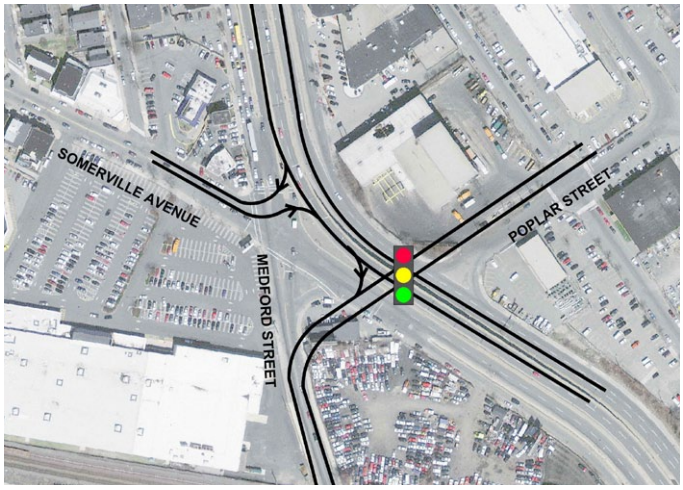


Figure 4-8: Poplar Street 4-Leg Intersection

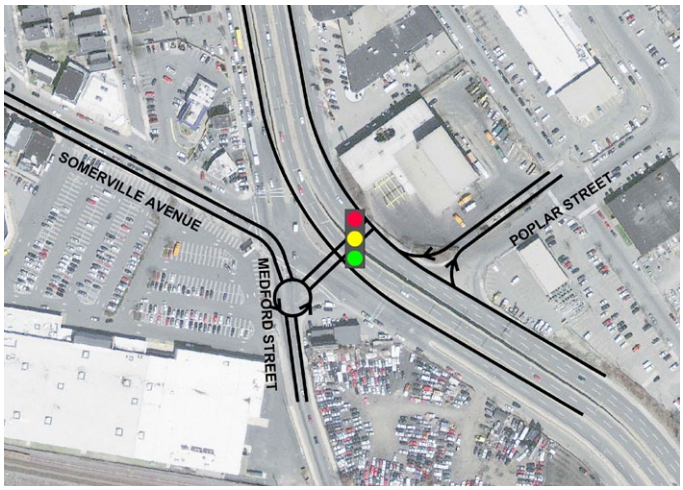


Figure 4-9: Somerville Avenue 3-Leg Roundabout

proposed Washington Station on the Green Line extension.
- Creating a gateway to Union Square.
- Providing for development potential along the north and west edges of Brickbottom.
- An already difficult east-west pedestrian crossing at the intersection must be configured to cross pedestrians against traffic volumes that include surface and previously elevated vehicles.

The options evaluated are described below:

Traditional Intersection with Turn Restrictions (See Figure 4-10):
This option signalizes the intersection of Washington Street with the McGrath corridor, but eliminates left turns from the McGrath corridor, thus removing certain conflicting movements at Washington Street. The left turning vehicles would need to find a new route to their destination.

Jughandle Intersection (See Figure 4-11):
This option would include the creation of a jughandle, or partial diamond, at the Washington Street intersection with the McGrath corridor to accommodate the left-turns onto Washington Street, removing those turns from the central signalized intersection.

Median U-turn Intersection (See Figure 4-12):
This option removes the left-turns from the McGrath corridor onto Washington Street signalized intersection, and accommodates those turns through mid-block U-turns. For example, northbound traffic that wishes to turn left from the McGrath corridor to head westbound, would instead pass straight through the intersection and then perform a U-turn to go in the southbound direction and then turn right at the Washington Street intersection to head westbound. In this option, the mid-block U-turns would be signalized, which would create additional pedestrian access across the McGrath corridor north and south of the intersection.

Focus Area Options
While maintaining circulation and connectivity at the Washington Street and Somerville Avenue intersections with the McGrath corridor for all modes is challenging, bringing the McGrath corridor down to grade also opens opportunities to realign a new at-grade segment between

Figure 4-10: Washington Street - Traditional Intersection with Turn Restrictions

Figure 4-11: Washington Street - Jughandle Intersection

Figure 4-12: Washington Street - Median U-turn Intersections

the two intersections. The following other changes to overall circulation between Union Square, the McGrath corridor, Inner Belt/Brickbottom, and other regional destinations were also explored:

- Traditional Intersections (See Figure 4-13): Both intersections would be signalized with a new connection between Somerville Avenue and the northbound McGrath corridor.
- Double Roundabout (See Figure 4-14): Both intersections configured as roundabouts. This option would also provide a new connection between Somerville Avenue and the northbound McGrath corridor. Based on projected traffic volumes for 2035, this option may exceed capacity of a three lane roundabout.
- One-Way Pair (See Figure 4-15): West of the McGrath corridor, Washington Street would become one-way westbound and Somerville Avenue would become one-way eastbound.

Working Group Feedback

Based on the concept diagrams, Working Group participants provided the following feedback on the preliminary concepts for the "Bring It Down" options:

- Bicycle and pedestrian accommodations need to be fully integrated; these modes should be fairly considered on an equitable footing with motor vehicles.
- The alternatives analysis should include a traditional boulevard with a "road diet" option, and the impacts of potential trip diversion that may occur as a result of providing a reduced capacity along the McGrath corridor need to be understood.
- Preference should be given to local traffic over regional traffic access.
- The Accelerated Bridge Program interim repairs for the McCarthy Viaduct should be used as a test for traffic diversion to incorporate in the alternatives analysis.
- The projection that a roundabout would require more than three lanes of traffic is not consistent with community development goals. A combination of signals and roundabouts may provide better design options for locations where roundabouts are considered.
- Connections to Poplar Street are important for the future access to Brickbottom.
- Efforts to reduce roadway cross-sections, while providing new pedestrian connections, are desirable. For example, prohibit left turns if it results in fewer lanes at the intersection approach.
- Connections to and from Union Square are very important in achieving the vision of the future for the City of Somerville.

Figure 4-13: Focus Area - Traditional Intersections

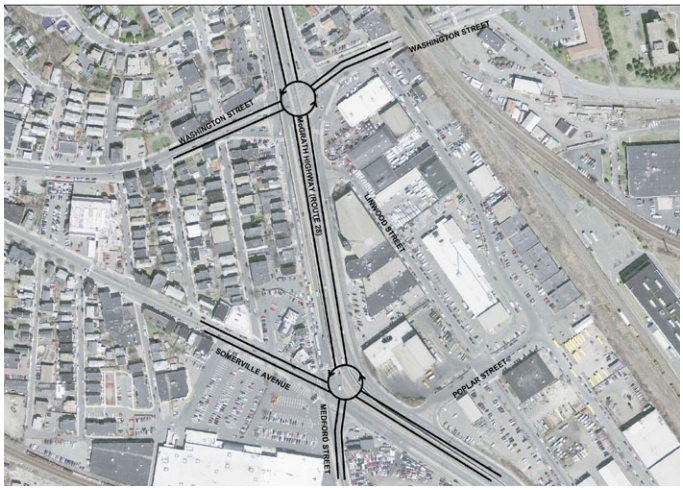


Figure 4-14: Focus Area - Double Roundabout

Figure 4-15: Focus Area - One-Way Pair

Refinement of Alternatives

The Working Group provided extensive feedback on the concepts presented at the December 2011 meeting, and expressed preferences for which alternatives should be refined further.

The "Move It" option was eliminated from further discussion as it was too disruptive to potential Brickbottom development, required additional right-of-way, and it would create challenges at Washington Street with the potential need for ramps and difficulty defining the relocated northbound McGrath corridor in relation to Washington Street.

The "Partial Grounding" option was tabled in favor of further development of fully at-grade solutions. With the Health Impact Assessment taking shape, and ongoing MassDOT communication around the short-term repairs, the Working Group preference was to explore "Bring It Down" options, in keeping with the larger community vision of a connected, walkable, balanced corridor.

One of the primary goals of the Grounding McGrath study is to balance the impacts and benefits of local and regional transportation. A more congested McGrath corridor may be acceptable if it provided greatly improved connectivity, circulation and sense of place, as well as reasonable regional mobility. This end was felt to be best achieved through an at-grade alternative. The preliminary concepts provided enough detail to understand the challenges, and the project team and Working Group agreed that workable designs could likely emerge through further effort and discussion.

Process

The alternatives refinement process began by developing a series of at-grade approaches in the focus area. Ultimately, three alternatives were to be carried through the CTPS regional travel demand model for evaluation and testing. Based on the previous focus area alignment options, the project team created four basic alternatives that advanced these concepts in an attempt to show the distinctions between them. Working Group discussion could then explore the implications and discard, extend, or combine these approaches as needed for further testing. With transformative change (in the form of grounding) proposed, the CTPS modeling would provide further feedback that could be incorporated into the design and alternative evaluation process.

The three alternatives would need to be developed and designed sufficiently to provide all model inputs, including the multimodal connections that would be enhanced or severed, basic intersection operations, and transit routing. Each concept was further developed through a preliminary assessment using the Synchro traffic analysis software program. This allowed the project team to further develop the concepts and provide inputs – such as the number of lanes, lane assignments and roadway connections – for further regional travel demand modeling described in Chapter 5.

Assumptions

As these initial alternatives were not intended to be final, certain assumptions were made at the outset for all alternatives. Individual alternative approaches also required more specific assumptions, which are defined subsequently. Overall, for each alternative:

- No adjustments were made for redirected or shifted traffic in or around the corridor.
- Basic signal phasing and timing were used for initial capacity analysis.
- The McGrath corridor should remain within the existing right-of-way to the greatest extent possible.
- Concepts are shown varyingly aligned on the east or west side of the existing right-of-way, but could be shifted during refinement to best meet goals and objectives of the project.

- Pedestrian and bicycle connections are shown and presumed, but not defined to a level of design detail at this stage. The presence of connections alone is a sufficient input into the CTPS model.
- Space within the right-of-way that is not needed for vehicular circulation/paved area is shown in green. Further refinement of a preferred design will determine what portions of the space would be used for sidewalk, on-street parking, bicycle accommodations, green space, development or any other desired use.
- All of the alternatives assume a continuous pedestrian and bicycle connections along both sides of the McGrath corridor and across the corridor at all major intersections.

The range of refined options and the key assumptions, issues, and opportunities were presented to the Working Group on March 7, 2012. These options were refined to develop more specific alternatives and included the following:

- Signalized Rotaries
- Median U-turns
- Access Roads
- Boulevard

Signalized Rotaries
This alternative included two signalized rotaries, one at the Washington Street intersection with the McGrath corridor, and one at the McGrath/Medford Street/ Somerville Avenue intersection. As shown in Figure 4-16, the mainline northbound and southbound through movements on the McGrath corridor would pass through the center of each rotary. The McGrath corridor and other new roadways would generally remain within the existing right-of-way, but with potential property impacts as determined by the size and radii of the rotary. Pedestrian and bicycle connections would occur along the roadway, and crossings would be at the signal locations. The level of expected vehicular volumes on the McGrath corridor would require signalized rotaries, rather than traditional roundabouts. Utilizing signalized rotaries in place of a traditional intersection separates the left turning traffic from the primary intersections, helping reduce overall traffic delay.

Poplar Street would be relocated slightly north of its current location. This relocation impacts a parcel currently occupied by Waste Management, Inc. but owned by the City of Somerville. The alignment of Poplar Street at Linwood Street could be angled southeast to meet the current alignment, or extended to meet the proposed crossing under the Green Line tracks to access the Inner Belt District. See Figure 16: Signalized Rotaries Option.

Opportunities
- Allows for a narrower mainline on the McGrath corridor, providing the ability to create wider spaces for parks and pedestrian and bicycle access.
- Creates new access from the McGrath corridor northbound to Somerville Avenue and Union Square.
- Allows travel to/from each major roadway intersecting the McGrath corridor, facilitating new connections that are not possible under the existing or future No-Build traffic conditions.
- Allows for full access to the McGrath corridor from Poplar Street and the Brickbottom area. Full access is not currently available today or under the future No-Build scenario.
- There is potential for landscaping and green space inside the rotaries to strengthen visual character and create a sense of place.
- Opportunities are presented to enhance visibility for businesses along the McGrath corridor, with options for new architecture to define the rotary edges with pedestrian networks and building facades.
- Pedestrians could cross concurrently with vehicles at most signalized intersections.

Identified or Potential Issues
- Allowing left-turns from the rotaries onto the McGrath corridor may cause vehicle queues on the circulating lanes to block other traffic movements. Addressing this would require that left-turns from cross street traffic be processed as circular moves (270 degree movements), similar to existing conditions at the intersection of Washington Street and the McGrath corridor.
- Lane configurations for the intersection of Linwood Street with the McGrath corridor would be challenging:

Figure 4-16: Signalized Rotaries Option

  - » The right-turn in and right-turn out only movements from Linwood Street may be too close to the Washington Street rotary for it to function properly.
  - » The right-out only restrictions from Linwood Street would likely result in traffic diverting to Poplar Street where full access to the McGrath corridor is provided via the rotary.
  - » Linwood Street traffic could be rerouted to Joy Street, but this could require new traffic control at the Joy Street/Washington Street intersection to accommodate the increased volumes.
  - » Convert Linwood Street to one-way south from the McGrath corridor toward Poplar Street to reduce conflicts with turning movements from Linwood Street onto the McGrath corridor.
- Providing direct east/west pedestrian connectivity along Washington Street across the McGrath corridor is a challenge. An additional pedestrian signal could be added through the center of the rotary, changing the balance of operations, as pedestrian crossing distances and wait times would be reduced. However, vehicular delay, and potentially the number of lanes would grow. Pedestrian crossings that follow the circular roadway would result in longer walking distances to cross the McGrath corridor.
- This alternative results in a wider right-of-way at Washington Street and at Somerville Avenue, with potential impacts to private property.
- Specific bus stop locations need to be considered in the area of the rotaries to facilitate transfers between routes and different modes of transportation.

Median U-turns

The Median U-turn option attempts to eliminate all left-turns from the main McGrath corridor intersections, to simplify their operations, shorten the pedestrian crossings and minimize their overall footprint. All left-turns from Washington Street and the McGrath corridor would be processed as U-turns at adjacent intersections north and south of that intersection. For example, traffic wishing to turn left from the McGrath corridor northbound to Washington Street westbound would have to pass through the intersection, make a U-turn at the McGrath corridor/Cross Street/Prospect Hill Avenue intersection, and then turn right onto Washington Street westbound. This alternative would also provide new signalized pedestrian crossings at the points where the U-turns are accommodated. See Figure 4-17: Median U-turns Option. Turning radii of U-turns are conceptual. A center median will be required to accommodate a sufficient turning radius.

This alternative also included the conversion of the Medford Street/Highland Avenue eastbound approach movements to the McGrath corridor to all right turns (eliminating the left-turn move to McGrath northbound) and utilizing the U-turn to make that move. The intent was to improve the vehicular level of service at the intersection without changing the roadway width, and to add a protected pedestrian crossing. Access to the McGrath corridor northbound would be provided via a U-turn at the Cross Street/Prospect Hill Avenue intersection. This option is further explored in the next section for potential improvements of the McGrath corridor north of the Lowell Line Bridge.

Opportunities

- Allows for a new signalized pedestrian crossing at Cross Street. Pedestrians would cross on the north side of the intersection concurrently with the northbound to southbound McGrath corridor U-turn.
- Allows for a new signalized pedestrian crossing between Linwood and Somerville Avenue. Pedestrians would cross on the south side of the intersection concurrently with the McGrath southbound to northbound U-turn.
- The new intersection north of Washington Street could also serve the left turns from Medford Street/ Highland Avenue as a southbound to northbound U-turn. This would improve traffic operations at the Medford/Highland/McGrath intersection without geometric changes to the intersection. However, this change needs to be balanced with the intersection operations at Cross Street (described below).

Identified or Potential Issues

- There is the potential for a “dual U-turn” in the vicinity of Cross Street to accommodate both northbound and southbound vehicle turns. This dual U-turn intersection which would require an all pedestrian phase to safely allow for pedestrian crossings which would provide added delay to the traffic on the McGrath corridor, and potentially creating longer

Figure 4-17: Median U-turns Option

queues at the closely spaced intersections.

- Further assessment of the impacts to cross-streets such as Prospect Hill Avenue, Chester Avenue, and others is necessary, as connections across the corridor may be possible in this alignment, but not desirable for topography, access and safety reasons. Vehicular right-in/right-out is assumed for Greenville Avenue and Prospect Hill Avenue.
- Vehicular access to Brickbottom continues to be limited with a right-in, right-out access at Linwood and Poplar Streets, with access from Brickbottom to the southbound McGrath corridor via the U-turn.
- Heavy southbound volume on the McGrath corridor at Somerville Avenue could require at least three right-turn lanes for this scenario, making pedestrian crossings longer due to the added overall roadway width.
- McGrath corridor northbound traffic must continue to use a U-turn movement to access Somerville Avenue, not unlike existing operations.
- Providing signalized intersections for the U-turn movements leads to the creation of four closely-spaced intersections along the McGrath corridor (at Washington Street, Linwood Street, the median U-turns, and Somerville Avenue) which may result in spillback issues for vehicle queues that would then create gridlock along the corridor.
- Provides new connections compared to the future No Build conditions, but the turning lanes required result in a wide cross-section for each of the new at-grade intersections.
- While potentially simplifying the main intersections, this option does not offer a defining element that would contribute to a strong sense of place. The U-turn intersections would also be wider in between the main intersections reducing the amount of open space and developable sites available along the corridor.
- There are limited options for developing pedestrian and bicycle access along the corridor due to the wider roadway width required for the U-turn segments.
- The additional intersections potentially limit the ability to provide on-street parking along the McGrath corridor blocks.
- New bus stop locations would need to be identified, and certain bus route moves may require the use of the U-turns.

Access Road

In this alternative, an access road parallel to the McGrath corridor would be constructed along the western edge of the corridor between the Washington Street and Somerville Avenue/Medford Street intersections. This access road would be designed to accommodate vehicular traffic accessing Washington Street, Somerville Avenue, and Medford Street. Processing the local traffic along this access road allows the mainline McGrath corridor cross-section to be significantly narrowed. Northbound circulating traffic would be diverted through the Brickbottom area in lieu of a parallel access road. Two options were developed for this alternative, using either Joy Street (Figure 4-18) or Linwood Street (Figure 4-19). Similar to the prior options, Poplar Street could be relocated slightly north of the current location to connect to the McGrath corridor via a new at-grade intersection. Required turning radii of the access roads' connection to the McGrath corridor were not determined for this phase of analysis, but would be assessed if this option advanced for further consideration.

Opportunities

- Under this alternative the number of lanes on the southbound access road that parallels the McGrath corridor has been reduced because the improved access to Somerville Avenue allows for the potential shift in trips originating in Union Square to Somerville Avenue eastbound from Washington Street. This may also result in more balanced traffic demand between Washington Street and Somerville Avenue.
- The northbound access road incorporated through the existing Brickbottom area roadways would potentially enhance access for economic development.
- The northbound and southbound mainline of the McGrath corridor could be narrowed to two lanes in this alternative, expanding to three only when additional vehicle storage is needed at the intersection approaches.

Figure 4-18: Access Road Option - Joy Street

Figure 4-19: Access Road Option - Linwood Street

Identified or Potential Issues

- The unbalanced higher demand for southbound travel requires the southbound access road to be two to three lanes in width. The higher southbound traffic volumes are a function of traffic:
  - » Destined to Medford Street
  - » Washington Street eastbound left-turns that are removed from the intersection (to narrow it and improve operations) but would use the access road to get to the northbound McGrath corridor.
- Washington Street eastbound cross-street traffic exceeds capacity with the two-lane southbound access road during the PM peak period.
- Washington Street through traffic would be forced to drive a longer distance through three signals, since the through movement is shifted to the north of the existing Washington Street alignment, compared to the future No-Build.
- The proximity of the McGrath/Somerville Avenue/ Medford Street/Poplar Street intersection to the projected "touchdown" point from the Squire's Bridge is problematic for northbound traffic's lines of sight, and for providing the physical and geometric connections to Somerville Avenue.
- The circular pattern of the access roads creates circuitous east-west connectivity throughout the corridor, particularly northbound McGrath corridor access to Union Square.
- Buses would be separated with some using the access road and some using the mainline, making co-location of stops difficult.
- Wide circulating patterns, with very wide overall cross-sections would be created, resulting in:
  - » Limited opportunities for economic development, open space, and other uses.
  - » Longer paths of travel for pedestrian crossings due to the circulating nature of the roadways.

Boulevard

This alternative was initially termed a "Road Diet" option to reflect the reduced roadway cross-section, as compared to other options and the No Build. It was deliberately designed with capacity limitations to demonstrate and test the extent to which vehicular traffic would divert from the corridor. From a design perspective, the Boulevard responds to the Working Group's desire to reconnect the adjacent neighborhoods and provide greater emphasis on the McGrath corridor's local connections.

The boulevard layout narrows the roadway to three lanes in both the northbound and southbound directions on the McGrath corridor. Compared to the previous alternatives, this narrowed cross-section would reduce capacity in the corridor, which would force vehicle trips to be diverted to alternate routes or alternative modes of transportation. See Figure 4-20: Boulevard Road Diet Option. While even this alignment does not fully meet the operational capacity demands of the estimated 2035 future No-Build projected volumes, it should also be noted that many members of the Working Group and the public expressed a preference for a cross-section of two lanes in both the northbound and southbound directions to further enhance pedestrian connections and the desired local nature of the corridor. However, in order to strike a balance between the needs of the community and the continued need for regional mobility, the option of three lanes in each direction was developed for this stage in the study process.

Opportunities

- The roadway layout incorporates more traditional intersection treatments, which leads to less confusion for drivers, pedestrians, and bicyclists.
- Shorter crossings of major roads are provided, benefitting pedestrians.
- The Medford Street/Somerville Avenue intersection with the McGrath corridor can be consolidated into a single, though complex, functioning intersection.
- Maintains straightforward, high volume connection from the McGrath corridor southbound to Medford Street.
- Provides full, signalized access from Linwood Street to the McGrath corridor, improving connections for all, and creating shorter overall block sizes.
- Allows for the northbound McGrath corridor access to Somerville Avenue and Union Square.
- Traditional alignment re-knits adjacent communities, and provides evident development and frontage potential.
- Provides potential for center median planting area or linear parks along the edge of the McGrath corridor.

Figure 4-20: Boulevard Road Diet Option

Identified or Potential Issues

- Narrow, restricted alignment will likely result in vehicle trips diverting from the McGrath corridor to other neighborhood and regional roadways due to reduced roadway capacity on the McGrath corridor.
- The close proximity of the two signals on the McGrath corridor at Washington Street and at Linwood Street may result in queuing issues both northbound and southbound on the McGrath corridor.
- Northbound queues at the intersection of Washington Street with the McGrath corridor may spill back and impact operations at Linwood Street.
- Access from Poplar Street is limited and remains right-in, right-out due to the difficulties of incorporating a westbound approach through movement at the primary intersection.
- This alternative requires a complex intersection layout, signal phasing and timing at the McGrath/ Medford Street/Somerville Avenue intersection. The layout has the potential for "trapping" vehicles between the two closely spaced traffic signals which could result in added congestion between Medford Street/Somerville Avenue and the northbound McGrath corridor.
- This alternative requires prohibiting left turns from the McGrath corridor onto Washington Street, in order to minimize the roadway cross-section. This forces vehicles who wish to make a left turn to take an alternative route. For example, vehicles traveling southbound on McGrath turn at Somerville Avenue/ Poplar Street/Medford Street, travel northbound on McGrath to access Washington Street eastbound.
- This alternative favors northbound traffic access to the Brickbottom area and Washington Street, while southbound connections remain difficult.

Working Group Feedback – Focus Area

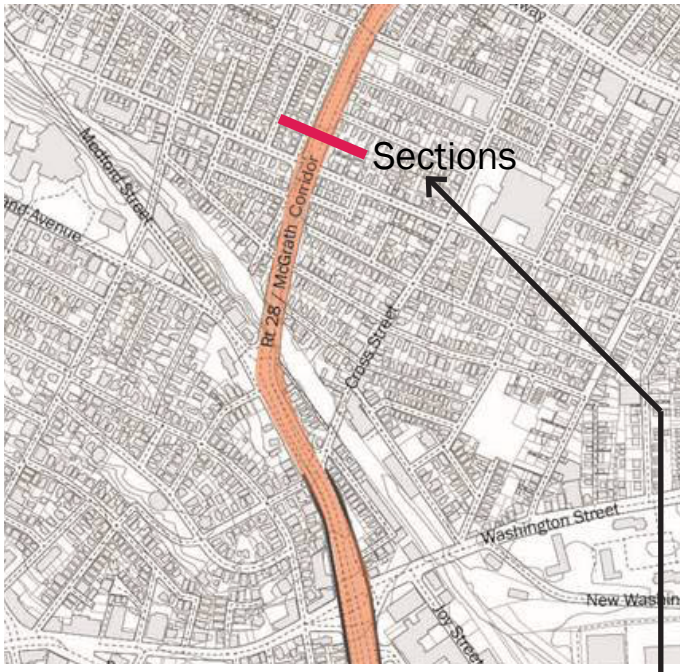
The four alternatives were presented to the Working Group, with a review of the alignment, layout, capacity, and multimodal connections. An initial assessment of how well they matched the goals and objectives adopted was also discussed. The Working Group provided the following general feedback regarding these four alternatives:

- There should be a pedestrian/bicycle connection between Brickbottom and Medford Street under the Squire's Bridge.
- The size of the rotary at Washington Street in the Signalized Rotaries Alternative is too large to support urban design goals.
- The green space within the Signalized Rotaries Alternative is difficult to access, and even though large, may not be functional or add to community benefits in a meaningful way.
- The circulating pattern of the rotaries in the Signalized Rotaries Alternative may be difficult for drivers to understand and navigate. However, these rotaries provide the advantage of full access to all cross-streets, connections that are not provided in the Median U-turns and Access Road alternatives.
- With three potential circulating lanes processing high volumes, the signalized rotary at Washington Street in the Signalized Rotaries Alternative is not pedestrian friendly.
- All scenarios should provide a direct physical and visual east/west connection along Washington Street to Union Square.
- The median U-turn and Access Road alternatives may help shift traffic from Washington Street to Somerville Avenue, improving access to Union Square and operations on Washington Street.
- Connections to Joy Street and to Allston Street should be considered for the median U-turn Alternative.
- Options that increase and improve direct east/ west pedestrian connections at major and minor intersections are supported.
- Cross-sections of intersections should be reduced when possible through reduction in the number of turn lanes.
- Connections to Poplar Street are important to the development of Brickbottom.
- The Access Road Alternative may not support retail development and ease of access to and from Union Square due to the circuitous access route from the northbound McGrath corridor, but could encourage more development in Brickbottom.
- The Boulevard Alternative received the most initial support with some members requesting analysis of further reduced vehicular capacity and cross-sections to further narrow the roadway from six lanes to four lanes.

Preliminary Concepts – North Section

The northern segment of the study area consists of the McGrath corridor north of the intersection with Medford Street/Highland Avenue. This generally includes the area between Broadway to the north, the Otis Street pedestrian bridge, intersection of Pearl Street with the McGrath corridor, Gilman Street Bridge, the Lowell Line Bridge, and the intersection of the McGrath corridor with Medford Street/Highland Avenue. This segment is already at-grade but could benefit from improvements to the cross-section in order to improve overall accessibility. MassDOT's Complete Streets policy requires balancing the use of the public right-of-way for all transportation modes.

Potential changes in the roadway cross-section in the vicinity of the Otis Street pedestrian bridge were developed to convey how the public right-of-way could be reallocated to better serve all modes of transportation



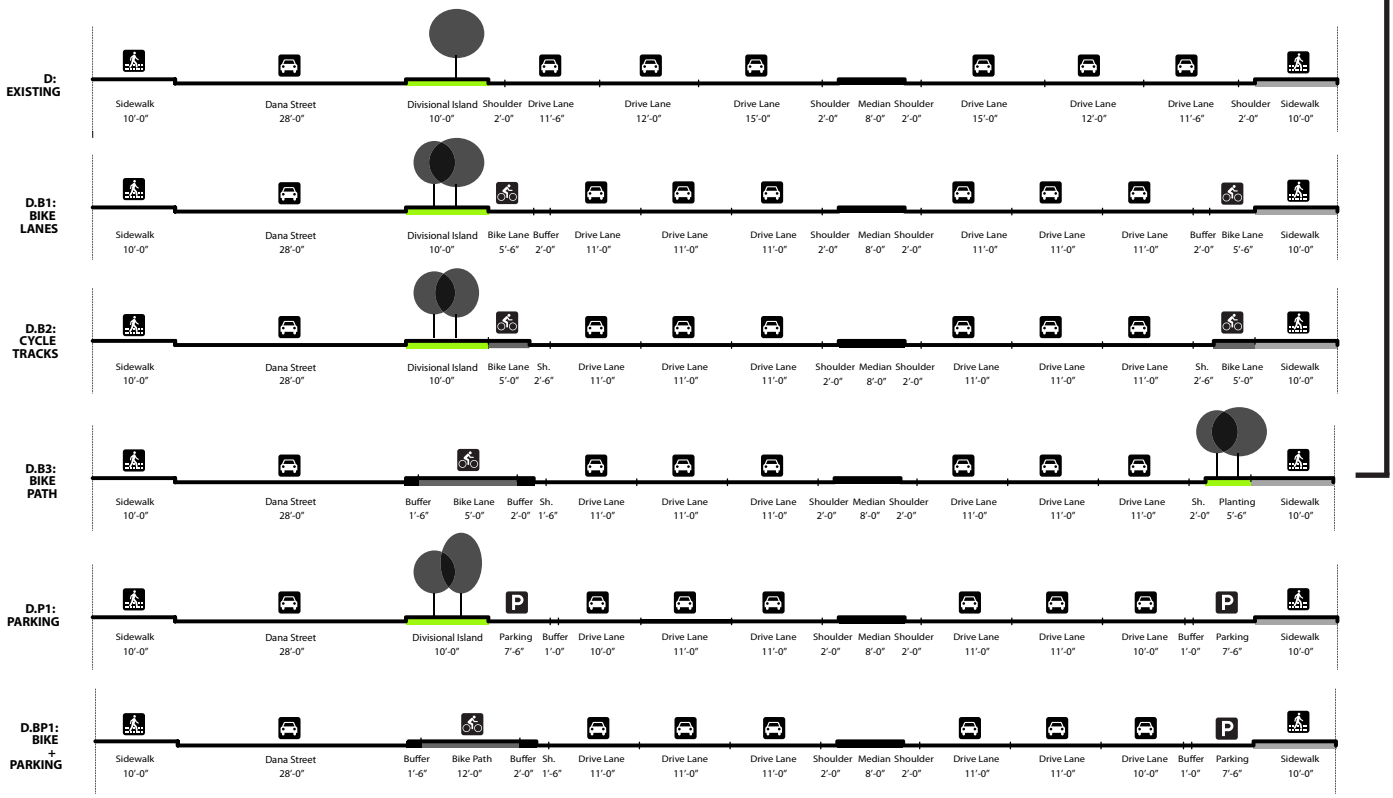


Figure 4-21: Conceptual Cross-Sections for McGrath Highway, North of Lowell Line Bridge

in the corridor and provide additional green space. The options include items such as dedicated bicycle lanes or cycle tracks, addition of on-street parking, and additional landscaped areas. The concepts are shown in Figure 4-21.

The intersection of the McGrath corridor with Medford Street/Highland Avenue is currently at-grade, and experiences delays and congestion during peak periods (see Chapter 2). One potential improvement, as presented previously in the Median U-turn Alternative for the focus area, would be the removal of the eastbound left-turn from Medford Street to the McGrath corridor northbound (see Figure 22). This option could improve traffic operations for the McGrath corridor mainline because all traffic heading northbound must stop to allow these left turns. Removing the left turns would provide more signal time to those other high-volume approaches. Removing the Medford Street left-turns onto the McGrath corridor northbound could shift more vehicles onto Pearl Street and other local streets. If so, some changes to lane configurations at the intersection of Pearl Street with the McGrath corridor and other intersections would be needed to accommodate this increased demand.

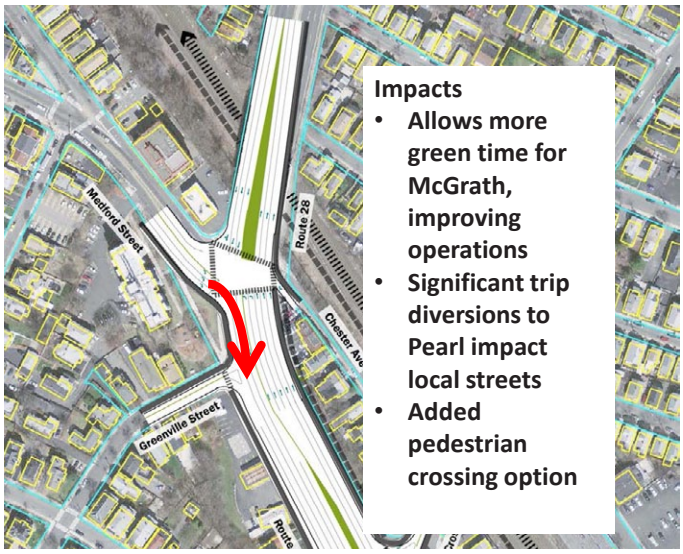


Figure 4-22: Potential Modification to Medford Street/ Highland Avenue Intersection with Route 28

Refinement of Alternatives

The Grounding McGrath Working Group was able to carry three alternatives forward to be tested through the CTPS regional travel demand model, and fully evaluated against the criteria developed. Based on the feedback from the March 7, 2012 Working Group meeting, the Boulevard option was seen as preferable and thus carried forward in a three lane alignment. The Access Road option was also brought forward because it provided additional visibility (and traffic) through Brickbottom, while also keeping the smallest mainline cross-section. Lastly, elements of both the Signalized Rotary and Median U-turn options were seen as beneficial.

The Working Group favored the traditional intersection approach at Washington Street that the Median U-turn allowed. For Somerville Avenue, the curved, wider overall right-of-way and multiple intersecting roadways lend themselves more to the rotary approach. Preliminary analysis showed that there was enough space between the two Washington Street and Somerville Avenue approaches for these elements to be combined, and thus a hybrid U-turn/rotary alternative was carried through design refinement. These three options were provided to the Boston MPO's Central Transportation Planning Staff (CTPS) for further analysis using their regional travel demand model. The results of this modeling were used by the project team to analyze the alternatives. The results of the analysis are presented in the next chapter.